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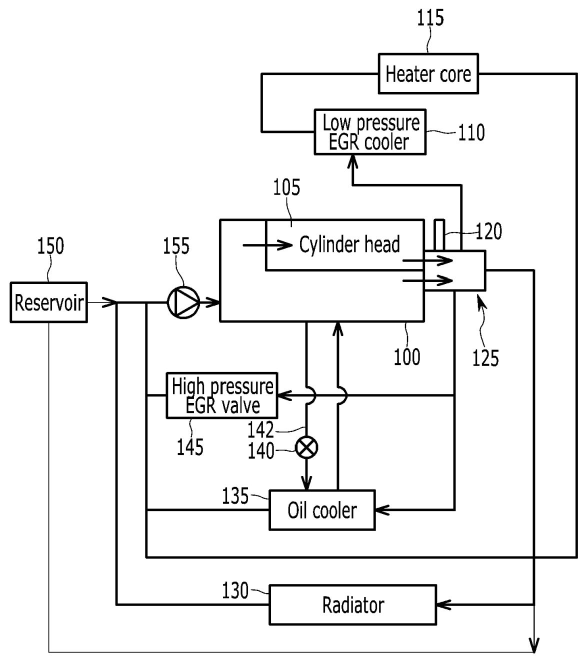
(54) CONTROL METHOD OF COOLING SYSTEM HAVING COOLANT CONTROL VALVE UNIT

(57) A cooling system has a coolant control valve unit receiving a coolant exhausted from a cylinder head. A control method of the cooling system is configured to control opening rates of a first coolant passage through which the coolant is distributed to a heater core, a second coolant passage through which the coolant is distributed to a radiator, and a third coolant passagethrough which the coolant is exhausted from a cylinder block, and further includes sensing a driving condition, and controlling an operation of the coolant control valve depending on the sensed driving condition.

FIG. 1



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Description

BACKGROUND

(a) Technical Field

[0001] The present disclosure relates to a control method of a cooling system incorporating a coolant control valve unit for improving a warm-up performance and a cooling performance by also controlling a coolant flowing through a cylinder block as well as a coolant flowing through each part of an engine according to a driving condition.

(b) Description of the Related Art

[0002] An engine discharges thermal energy while generating torque based on combustion of fuel, and a coolant absorbs thermal energy while circulating through an engine, a heater, and a radiator, and releases the thermal energy to the outside.

[0003] When a temperature of the coolant of the engine is low, viscosity of oil may increase to increase frictional force and fuel consumption, and a temperature of an exhaust gas may increase gradually to lengthen a time for a catalyst to be activated, which degrades quality of the exhaust gas. In addition, as a time required for a function of the heater to be normalized is increased, a driver may feel discomfort.

[0004] When the coolant temperature is excessively high, since knocking occurs, performance of the engine may deteriorate by adjusting ignition timing in order to suppress the knocking. In addition, when a temperature of lubricant is excessively high, a viscosity is lowered such that a lubrication performance may be deteriorated.

[0005] Therefore, a system for controlling several cooling elements through one valve unit so as to keep the coolant temperature high at a specific part of the engine and keep the coolant temperature low at other parts of the engine is applied.

[0006] In addition, a system for controlling coolant passing through a radiator, a heater core, an EGR cooler, an oil cooler, or a cylinder block through one coolant control valve unit has been considered. For example, this type of system is disclosed in Japanese Laid Open Patent No. 2015-59615.

[0007] As an example of the related art, the coolant control valve unit includes a motor, a cam rotated by the motor, a rod moved by a track formed at one surface of the cam, and a valve formed on the rod, and has a structure for opening and closing a coolant passage through the valve if the cam is rotated by the motor and the track pushes the rod.

[0008] According to the above arrangement, a valve control strategy is implemented depending on a shape of the cam and the track, because since the configuration thereof differs from a cooling circuit diagram according to specifications of the engine, an optimized coolant flow may be not implemented.

[0009] Accordingly, a rotation control strategy of the cam for configuring the coolant flow suitable to a predetermined engine is required. In particular, it would be desirable to obtain a structure and a method for stopping the flow of coolant of the cylinder block according to a driving condition and controlling the coolant distributed to the heater core and the radiator according to the driving condition.

[0010] The above information disclosed in this Background section is only for enhancement of understanding of the background of the disclosure and therefore it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

SUMMARY

[0011] The present disclosure provides a control method of a cooling system incorporating a coolant control valve unit to distribute coolant exhausted from a cylinder head to a side of a heater core, a radiator, or an oil cooler when a flow of the coolant through a cylinder block is stopped and to direct the coolant passing through the cylinder block according to a predetermined condition.

[0012] A cooling system has a coolant control valve unit receiving a coolant exhausted from a cylinder head. A control method of the cooling system is configured to control opening rates of a first coolant passage through which the coolant is distributed to a heater core, a second coolant passage through which the coolant is distributed to a radiator, and a third coolant passage through which the coolant is exhausted from the cylinder block, where the control method further includes sensing a driving condition by a controller; and controlling, by the controller, an operation of the coolant control valve depending on the sensed driving condition.

[0013] The controlling of the operation of the coolant control valve may include a first mode blocking the first and second coolant passages and blocking the third coolant passage.

[0014] The controlling of the operation of the coolant control valve may include a second mode variably controlling an opening rate of the first coolant passage and blocking the second and third coolant passages.

[0015] The controlling of the operation of the coolant control valve may include a third mode maximizing the opening rate of the first coolant passage, variably controlling the opening rate of the second coolant passage, and blocking the third coolant passage.

[0016] The controlling of the operation of the coolant control valve may include a fourth mode maximizing the opening rate of the first coolant passage, maximizing the opening rate of the second coolant passage, and variably controlling the opening rate of the third coolant passage.

[0017] The controlling of the operation of the coolant control valve may include a fifth mode maximizing the opening rate of the first coolant passage, maximizing the opening rate of the second coolant passage, and maximizing the opening rate of the third coolant passage.

[0018] The controlling of the operation of the coolant control valve may include a sixth mode maximizing the opening rate of the first coolant passage, variably controlling the opening rate of the second coolant passage, and maximizing the opening rate of the third coolant passage.

[0019] The controlling of the operation of the coolant control valve may include a seventh mode maximizing the opening rate of the first coolant passage, blocking the second coolant passage, and maximizing the opening rate of the third coolant passage.

[0020] According to an exemplary embodiment of the present disclosure, as the first, second, and third coolant passages corresponding to the heater core and the low pressure EGR cooler, the radiator, and the cylinder block are blocked in the first mode, the engine may be fully warmed-up.

[0021] In the second mode, the second and third coolant passages corresponding to the radiator and the cylinder block are blocked the opening rate of the first coolant passage corresponding to the heater core and the low pressure EGR cooler are controlled, thereby quickly executing the warm-up.

[0022] In the third mode, the third coolant passage corresponding to the cylinder block is blocked, the opening rate of the second coolant passage corresponding to the radiator is controlled, and the opening rate of the first coolant passage corresponding to the heater core and the low pressure EGR cooler is maximized, thereby appropriately controlling the temperature of the coolant.

[0023] In the fourth mode, the opening rate of the third coolant passage corresponding to the cylinder block is controlled, the opening rate of the second coolant passage corresponding to the radiator is maximized, and the opening rate of the first coolant passage corresponding to the heater core and the low pressure EGR cooler is maximized, thereby controlling the temperature of the cylinder block and preventing an over-heating of the coolant.

[0024] In the fifth mode, the opening rate of the third coolant passage corresponding to the cylinder block is maximized, the opening rate of the second coolant passage corresponding to the radiator is maximized, and the opening rate of the first coolant passage corresponding to the heater core and the low pressure EGR cooler is maximized, thereby maximizing release of heat of the coolant to an outside.

[0025] In the sixth mode, the opening rate of the third coolant passage corresponding to the cylinder block is maximized, the opening rate of the second coolant passage corresponding to the radiator is controlled, and the opening rate of the first coolant passage corresponding to the heater core and the low pressure EGR cooler is maximized, thereby controlling the temperature of the cylinder block and preventing the over-heating of the coolant.

[0026] In the seventh mode, the opening rate of the third coolant passage corresponding to the cylinder block is maximized, the second coolant passage corresponding to the radiator is blocked, and the opening rate of the first coolant passage corresponding to the heater core and the low pressure EGR cooler is maximized, thereby maximizing the performance of the heater in a condition that the outdoor temperature is low.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

FIG. 1 is a schematic diagram of a flow of a coolant in a cooling system incorporating a coolant control valve unit according to an exemplary embodiment of the present disclosure.

FIG. 2 is a partial cross-sectional view of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

FIG. 3 is a partial exploded perspective view of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

FIG. 4 is a graph showing a control mode of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

FIG. 5 is a flowchart showing a control method of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0028] It is understood that the term "vehicle" or "vehicular" or other similar term as used herein is inclusive of motor vehicles in general such as passenger automobiles including sports utility vehicles (SUV), buses, trucks, various commercial vehicles, watercraft including a variety of boats and ships, aircraft, and the like, and includes hybrid vehicles, electric vehicles, plug-in hybrid electric vehicles, hydrogen-powered vehicles and other alternative fuel vehicles (e.g. fuels derived from resources other than petroleum). As referred to herein, a hybrid vehicle is a vehicle that has two or more sources of power, for example both gasoline-powered and electric-powered vehicles.

[0029] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. Throughout the specification, unless explicitly described to the contrary, the word "comprise" and variations such as "comprises" or "comprising" will be understood to imply the inclusion of stated elements but not the exclusion of any other elements. In addition, the terms "unit", "-er", "-or", and "module" described in the specification mean units for processing at least one function and operation, and can be implemented by hardware components or software components and combinations thereof.

[0030] Further, the control logic of the present disclosure may be embodied as non-transitory computer readable media on a computer readable medium containing executable program instructions executed by a processor, controller or the like. Examples of computer readable media include, but are not limited to, ROM, RAM, compact disc (CD)-ROMs, magnetic tapes, floppy disks, flash drives, smart cards and optical data storage devices. The computer readable medium can also be distributed in network coupled computer systems so that the computer readable media is stored and executed in a distributed fashion, e.g., by a telematics server or a Controller Area Network (CAN).

[0031] Hereinafter, an exemplary embodiment of the present disclosure will be described in detail with reference to the accompanying drawings.

[0032] However, the size and thickness of each component illustrated in the drawings are arbitrarily shown for ease of description and the present disclosure is not limited thereto, and the thicknesses of portions and regions may be exaggerated for clarity.

[0033] In addition, parts that are irrelevant to the description are omitted to clearly describe the exemplary embodiments of the present disclosure, and like reference numerals designate like elements throughout the specification.

[0034] In the following description, dividing names of components into first, second, and the like is to divide the names because the names of the components are the same, and an order thereof is not particularly limited.

[0035] FIG. 1 is a schematic diagram of a flow of a coolant in a cooling system incorporating a coolant control valve unit according to an exemplary embodiment of the present disclosure.

[0036] Referring to FIG. 1, a cooling system includes a cylinder block 100, a cylinder head 105, a low pressure EGR cooler 110, a heater core 115, a coolant temperature sensor 120, a coolant control valve unit 125, a radiator 130, an oil cooler 135, an oil control valve 140, an oil supply line 142, a high pressure EGR valve 145, a reservoir 150, and a coolant pump 155.

[0037] The coolant pump 155 pumps coolant to a coolant inlet side of the cylinder block 100, and the pumped coolant is distributed to the cylinder block 100 and the cylinder head 105.

[0038] The coolant control valve unit 125 is mounted at the coolant outlet side of the cylinder head 105, always receives the coolant from the cylinder head 105, and may control an opening rate of a coolant outlet side coolant passage of the cylinder block 100.

[0039] The coolant temperature sensor 120 sensing the temperature of the coolant exhausted from the cylinder head 105 or the cylinder block 100 is disposed on the coolant control valve unit 125.

[0040] The coolant control valve unit 125 may respectively control the coolant flow distributed to the heater core 115 and the radiator 130. In particular, the coolant may pass through the low pressure EGR cooler 110 before passing through the heater core 115, and the heater core 115 and the low pressure EGR cooler 110 may be disposed in series or in parallel.

[0041] The coolant control valve unit 125 distributes the coolant to the side of the high pressure EGR valve 145 and the oil cooler 135.

[0042] Also, a part of engine oil circulated along the cylinder block 100 and the cylinder head 105 is cooled while circulating through the oil cooler 135, and the oil control valve 140 is disposed on the oil supply line 142. In particular, the oil control valve 140 may be actively controlled or may be mechanically operated such as a thermostat.

[0043] FIG. 2 is a partial cross-sectional view of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

[0044] Referring to FIG. 2, the coolant control valve unit 125 includes a cover 205, a cam 210, a track 320, a housing 200, a rod 215, a valve 220, an elastic member 225, and a holder 230.

[0045] The holder 230 is fixed and disposed at a lower part of the housing 200, and the holder 230 supports a lower end of the elastic member 225.

[0046] The elastic member 225 supports a lower surface of the valve 220 upward so that the valve 220 closes a coolant passage 322.

[0047] The lower surface of the valve 220 is flat, the valve 220 has a shape protruding in a center upper direction, the rod 215 is connected to the upper end thereof, and the rod 215 extends upward by a predetermined length.

[0048] The track 320 having a predetermined inclination and height is formed on the lower surface of the cam 210, and the track 320 pushes the upper end of the rod 215 downward according to a rotation position of the cam 210.

[0049] Accordingly, while the elastic member 225 is compressed, the valve 220 may open and close the coolant passage 322. In particular, an opening rate of the coolant passage 322 may be controlled according to a rotation position of the cam 210.

[0050] In an exemplary embodiment of the present disclosure, two or more of the valve 220 and the rod 215 may be configured, and the coolant passage 322 may be configured by two or more corresponding thereto.

[0051] FIG. 3 is a partial exploded perspective view of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

[0052] Referring to FIG. 3, the controller 300 controls the motor 305 by using a driving condition (a coolant temperature, an outdoor temperature, etc.) and a position of the cam 210 received from a cam position detecting sensor 600, and the motor 305 varies the rotation position of the cam 210 through a gear box 310.

[0053] The cam position detecting sensor 600 may be a sensor directly sensing the rotation position of the cam 210, and the controller 300 may indirectly calculate the rotation position of the cam 210 by sensing the rotation position of the motor 305 through a resolver (not shown).

[0054] Three tracks 320 are formed at the lower surface of the cam 210, and three rods 215a, 215b, and 215c and three valves 220a, 220b, and 220c are correspondingly configured thereto. In particular, first, second and third coolant passages (referring to 322 of FIG. 2) may be formed corresponding to the valves 220a, 220b, and 220c, respectively.

[0055] A first coolant passage is connected to the heater core 115 and the low pressure EGR cooler 110, a second coolant passage is connected to the radiator 130, and a third coolant passage is connected to the cylinder block 100.

[0056] Further, the coolant control valve unit 125 always receives the coolant from the cylinder head 105 and distributes the coolant to the oil cooler 135 and the high pressure EGR valve 145.

[0057] The controller 300 may be implemented by one or more processors operated by a predetermined program, and the predetermined program may include a series of commands for performing a method according to an exemplary embodiment of the present disclosure described later.

[0058] The coolant control valve unit according to an exemplary embodiment of the present disclosure may correspond to the coolant control valve unit shown in FIG. 2 and 3, but other known coolant control valve units capable of opening and closing at least two coolant passages may be used.

[0059] FIG. 4 is a graph showing a control mode of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

[0060] Referring to FIG. 4, a horizontal axis represents a rotation position of the cam 210, and a vertical axis represents a moving distance (e.g., referred to as a "valve lift") of the valve 220. In particular, an opening rate of the coolant passage 322 may be controlled through a lift of the valve 220.

[0061] In the first mode, the first, second, and third coolant passages corresponding to the heater core 115 and the low pressure EGR cooler 110, the radiator 130 and the cylinder block 100 are blocked. According to the first mode, the valve lift is zero.

[0062] In the second mode, the second and third coolant passages corresponding to the radiator 130 and the cylinder block 100 are blocked, and the opening rate of the first coolant passage corresponding to the heater core 115 and the low pressure EGR cooler 110 is controlled.

[0063] In the third mode, the third coolant passage corresponding to the cylinder block 100 is blocked, the opening rate of the second coolant passage corresponding to the radiator 130 is controlled, and the opening rate of the first coolant passage corresponding to the heater core 115 and the low pressure EGR cooler 110 is maximized.

[0064] In the fourth mode, the opening rate of the third coolant passage corresponding to the cylinder block 100 is controlled, the opening rate of the second coolant passage corresponding to the radiator 130 is maximized, and the opening rate of the first coolant passage corresponding to the heater core 115 and the low pressure EGR cooler 110 is maximized.

[0065] In the fifth mode, the opening rate of the third coolant passage corresponding to the cylinder block 100 is maximized, the opening rate of the second coolant passage corresponding to the radiator 130 is maximized, and the opening rate of the first coolant passage corresponding to the heater core 115 and the low pressure EGR cooler 110 is maximized.

[0066] In the sixth mode, the opening rate of the third coolant passage corresponding to the cylinder block 100 is maximized, the opening rate of the second coolant passage corresponding to the radiator 130 is controlled, and the opening rate of the first coolant passage corresponding to the heater core 115 and the low pressure EGR cooler 110 is maximized.

[0067] In the seventh mode, the opening rate of the third coolant passage corresponding to the cylinder block 100 is maximized, the second coolant passage corresponding to the radiator 130 is blocked, and the opening rate of the first coolant passage corresponding to the heater core 115 and the low pressure EGR cooler 110 is maximized.

[0068] In the first mode, as the flow of the coolant is minimized, the temperature of the engine oil and the coolant quickly increases in the low temperature state.

[0069] The second mode is a section that is operated by using the heater core 115 or the low pressure EGR cooler 110 and a warm-up is executed.

[0070] The third mode is a section controlling a target water temperature by adjusting a cooling amount according to a driving region of the engine as a radiator cooling section.

[0071] The fourth mode controls the temperature of the cylinder block 100 as a cylinder block cooling section.

[0072] The fifth mode is a section used in a driving condition that an engine heating amount is high and it is difficult to secure the cooling amount as a maximum cooling section. In the fifth mode, a separation cooling is released such that a cooling performance of the block may be secured.

[0073] The sixth mode may separately control a target coolant temperature of the cylinder head and the block as a cylinder block and radiator cooling section.

[0074] In the seventh mode, when the temperature of the coolant is a predetermined value or more, and an outdoor temperature is less than a predetermined value, the second coolant passage corresponding to the radiator 130 may be closed, the first coolant passage corresponding to the heater core 115 and the low pressure EGR cooler 110 may be fully opened, and the third coolant passage corresponding to the cylinder block 100 may be fully opened. That is, the seventh mode is a section all circulating the coolant of the cylinder head and the block to a heater core as a section maximizing a heating performance during the warm up in an area where the outdoor temperature is low.

[0075] FIG. 5 is a flowchart showing a control method of a coolant control valve unit according to an exemplary embodiment of the present disclosure.

[0076] Referring to FIG. 5, the controller 300 senses the driving condition including the coolant temperature and the outdoor temperature, etc. (S550).

[0077] The controller 300 calculates a target rotation position of the cam 210 according to the driving condition (S520), and the controller 300 calculates an actual rotation position of the cam 210 or measures the actual rotation position (S525).

[0078] The controller 300 calculates a difference value between the target rotation position and the actual rotation position (S530), and the controller 300 applies a power to the motor 305 depending on the difference value to rotate the cam 210 (S535).

[0079] The controller 300 determines whether the difference value is less than the predetermined value (S540), if the difference value is the predetermined value or more, the controller 300 again executes S530, if the difference value is less than the predetermined value, the controller 300 again executes S500.

[0080] In an exemplary embodiment of the present disclosure, the target rotation position and the actual rotation position of the cam 210 may substantially include the content of FIG. 4. That is, if the target rotation position of the cam 210 is 50 degrees, this corresponds to the second mode, if the target rotation position of the cam 210 is 230 degrees, this corresponds to the fifth mode.

[0081] While this disclosure has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the disclosure is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

Claims

1. A control method of a cooling system, comprising:

providing a coolant control valve unit of the cooling system that receives a coolant exhausted from a cylinder head and is configured to control opening rates of a first coolant passage through which the coolant is distributed to a heater core, a second coolant passage through which the coolant is distributed to a radiator, and a third coolant passage through which the coolant is exhausted from a cylinder block;
sensing a driving condition by a controller; and
controlling, by the controller, an operation of the coolant control valve depending on the sensed driving condition.

2. The control method of claim 1, wherein:

the controlling of the operation of the coolant control valve includes a first mode blocking the first and second coolant passages and blocking the third coolant passage.

3. The control method of claim 1, wherein:

the controlling of the operation of the coolant control valve includes a second mode variably controlling an opening rate of the first coolant passage and blocking the second and third coolant passages.

4. The control method of claim 1, wherein:

the controlling of the operation of the coolant control valve includes a third mode maximizing the opening rate of the first coolant passage, variably controlling the opening rate of the second coolant passage, and blocking the third coolant passage.

5. The control method of claim 1, wherein:

the controlling of the operation of the coolant control valve includes a fourth mode maximizing the opening rate of the first coolant passage, maximizing the opening rate of the second coolant passage, and variably controlling the opening rate of the third coolant passage.

6. The control method of claim 1, wherein:

the controlling of the operation of the coolant control valve includes a fifth mode maximizing the opening rate of the first coolant passage, maximizing the opening rate of the second coolant passage, and maximizing the opening rate of the third coolant passage.

7. The control method of claim 1, wherein:

the controlling of the operation of the coolant control valve includes a sixth mode maximizing the opening rate of the first coolant passage, variably controlling the opening rate of the second coolant passage, and maximizing the opening rate of the third coolant passage.

8. The control method of claim 1, wherein:

the controlling of the operation of the coolant control valve includes a seventh mode maximizing the opening rate of the first coolant passage, blocking the second coolant passage, and maximizing the opening rate of the third coolant passage.

FIG. 1

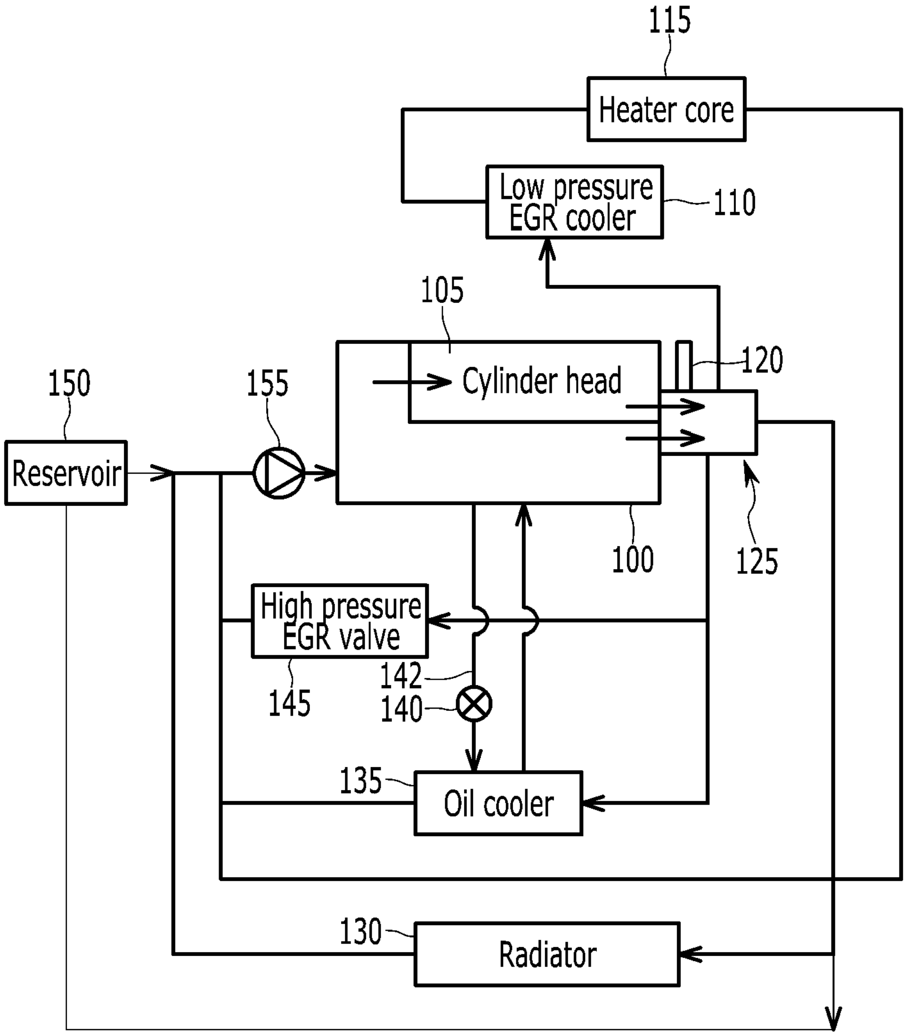

115
Heater core
Low pressure EGR cooler
110
105
Cylinder head
120
150
155
Reservoir
100
125
High pressure EGR valve
142
140
145
135
Oil cooler
130
Radiator

FIG. 2

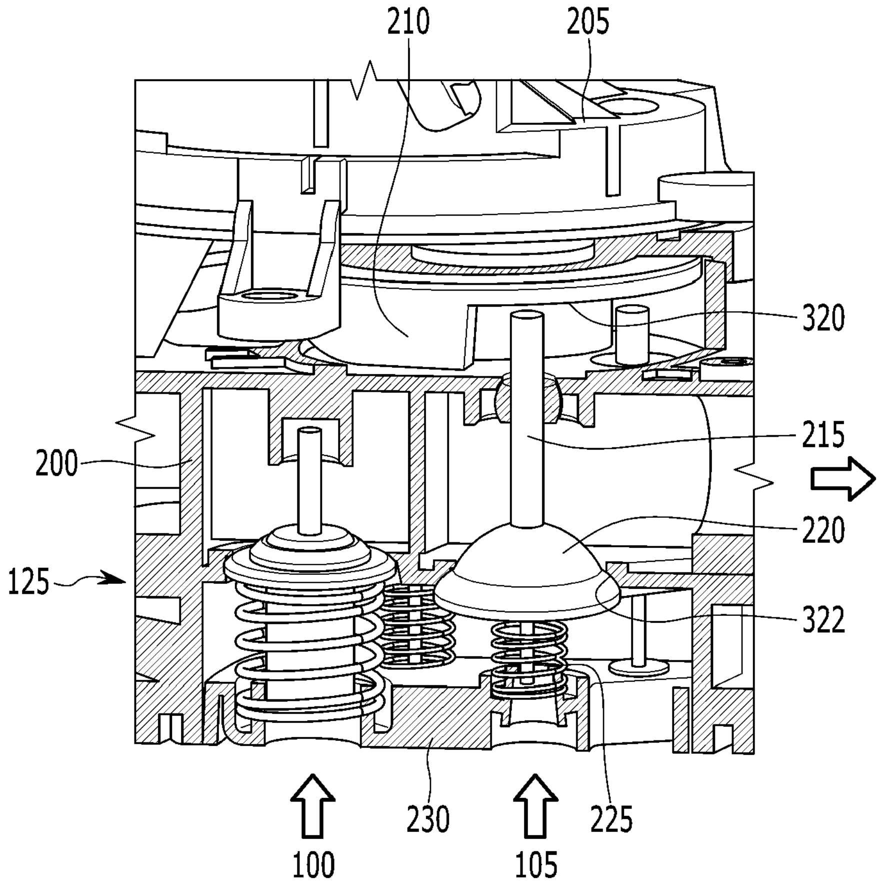


FIG. 3

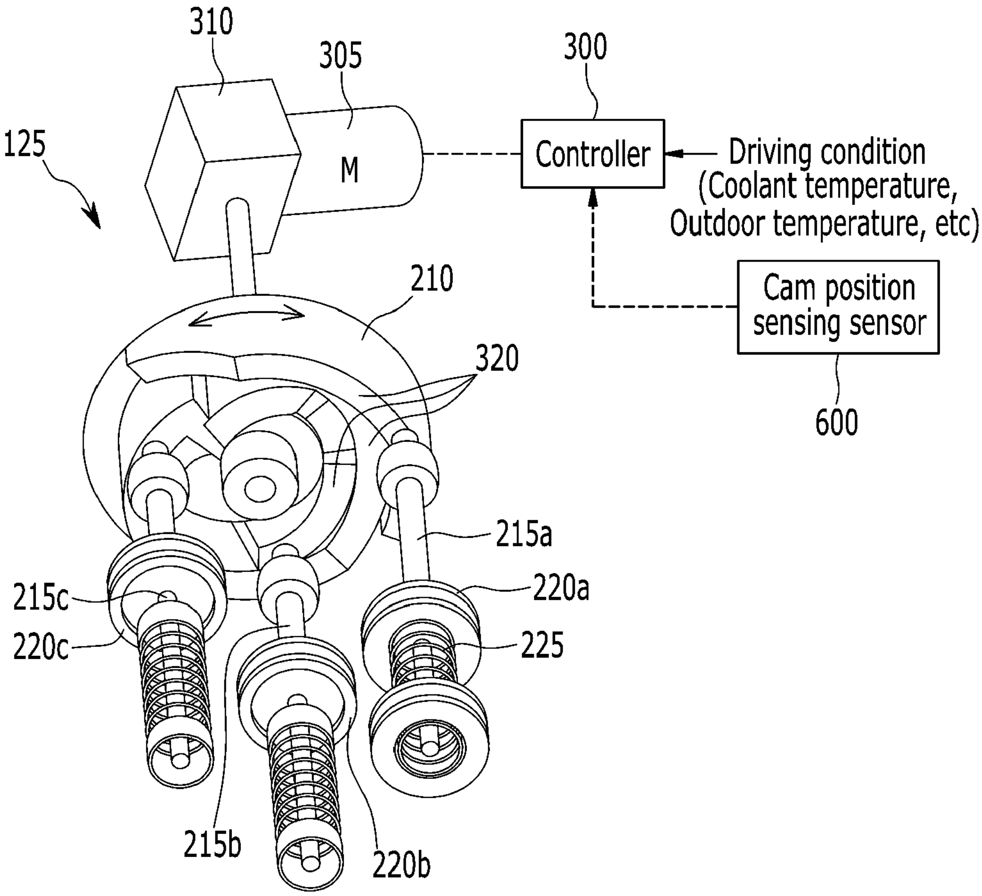

310
305
300
125
M
Controller
Driving condition
(Coolant temperature,
Outdoor temperature, etc)
210
Cam position
sensing sensor
320
600
215a
215c
220a
220c
225
215b
220b

FIG. 4

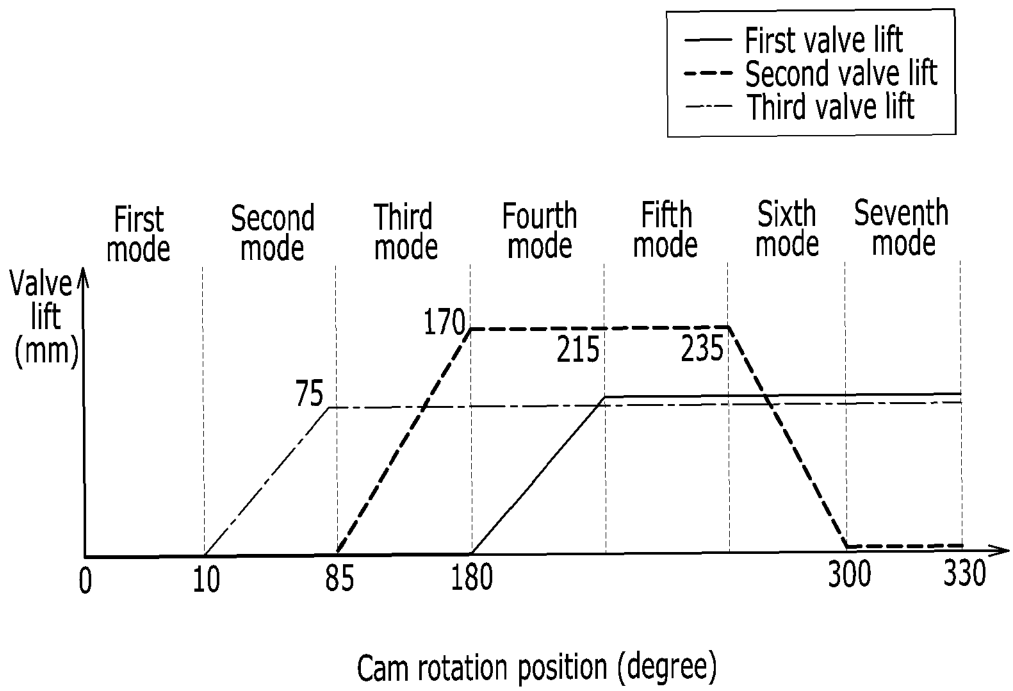
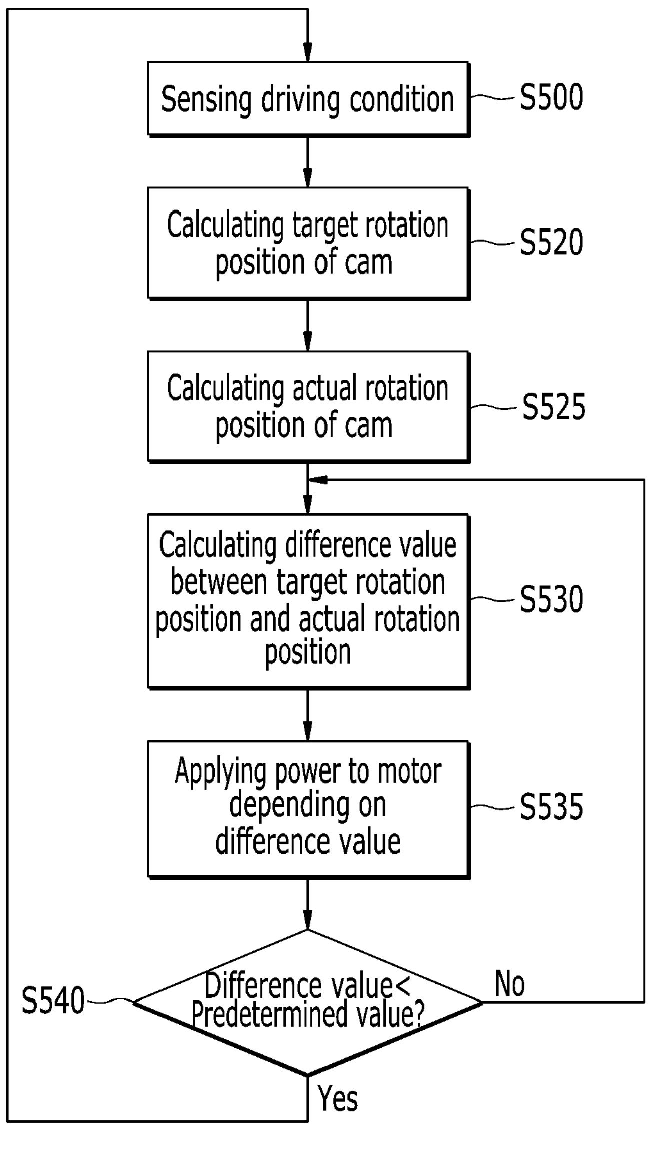

First valve lift
Second valve lift
Third valve lift
First mode
Second mode
Third mode
Fourth mode
Fifth mode
Sixth mode
Seventh mode
Valve lift (mm)
170
215
235
75
0
10
85
180
300
330
Cam rotation position (degree)

FIG. 5


Sensing driving condition
S500
Calculating target rotation position of cam
S520
Calculating actual rotation position of cam
S525
Calculating difference value between target rotation position and actual rotation position
S530
Applying power to motor depending on difference value
S535
Difference value< Predetermined value?
S540
No
Yes

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 20 6064

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 2017/058753 A1 (LEE YONGGYU [KR] ET AL) 2 March 2017 (2017-03-02) * paragraphs [0046] - [0078]; figures 3-8 *	1-6 7,8	INV. F01P3/02 F01P7/16
X A	US 2013/160723 A1 (MIYAGAWA MASASHI [JP]) 27 June 2013 (2013-06-27) * paragraphs [0032] - [0036]; figures 1,2 * * paragraphs [0044] - [0049] *	1 2-7	

TECHNICAL FIELDS SEARCHED (IPC)
F01P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 March 2018	Luta, Dragos

1

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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

EP 17 20 6064

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

28-03-2018

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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