



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**08.03.2006 Bulletin 2006/10**

(51) Int Cl.:  
**F01L 1/24<sup>(2006.01)</sup> F02F 1/38<sup>(2006.01)</sup>**  
**F02F 1/40<sup>(2006.01)</sup>**

(21) Application number: **04021096.5**

(22) Date of filing: **04.09.2004**

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

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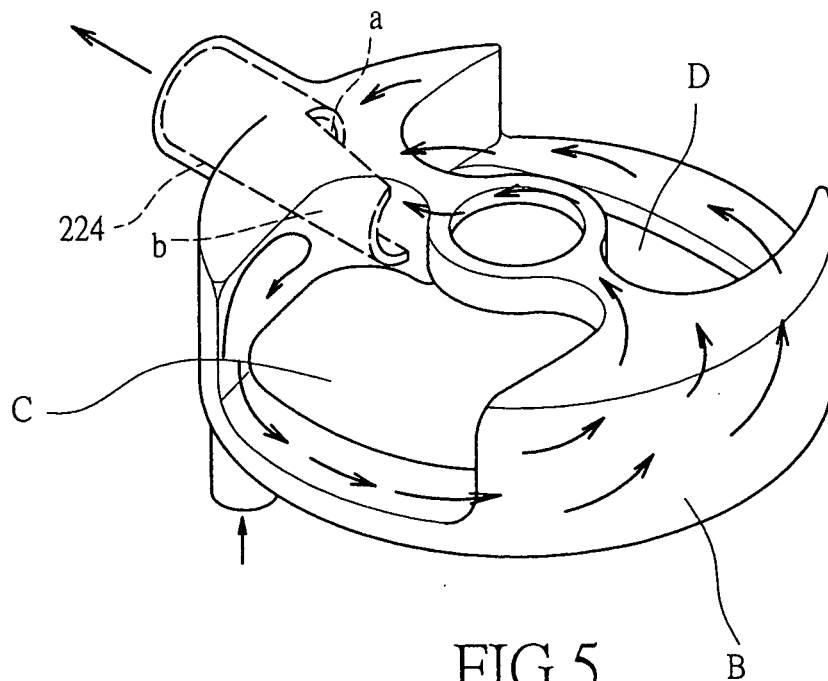
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(54) **Cooling water passage in engine cylinder head**

(57) A cooling water passage in the cylinder head (22) of engine to evenly absorb heat to prevent deformed mechanical parts has a spacer (26) between cylinder and cylinder head (22), a water connection port on the exhaust passage side of the spacer (26), cooling water flow-

ing through the port into the cylinder head and limited by a retainer (224) to extend the flow route, the cooling water first passing the exhaust passage side at a higher temperature before cooling the inlet passage side at a lower temperature to upgrade the cooling effects.



**FIG.5**

## Description

### BACKGROUND OF THE INVENTION

#### (a) Technical Field of the Invention

**[0001]** The present invention is related to a cooling water passage, and more particularly, to a construction of a cooling water passage applied to the cylinder head of an engine.

#### (b) Description of the Prior Art

**[0002]** Motor vehicles including motorcycles and all-terrain vehicles among others operate by introducing fresh air to mix with fuel. The air-fuel mixture is then injected into engine to be ignited and exploded to produce motive power to push piston to engage in reciprocal motion for the crankshaft to drive belt gearshift mechanism to transmit the motive power.

**[0003]** Air-cooling engine and water-cooling engine are available depending on the way of heat dissipation. A water-cooling engine is usually selected for a larger vehicle. A water-cooling engine 1 of the prior art as illustrated in Fig. 1 of the accompanying drawings is essentially comprised of a cylinder 11, a cylinder head 12, a piston 13, and a valve mechanism 14. The cylinder head 12 is provided on the top of the cylinder and contains an air inlet passage 121 and an exhaust passage 122. The cylinder 11 containing a cooling water passage 111 and a cooling water outlet 123 is provided to the cylinder head 12. The cylinder head 12 contains a combustion chamber 15 wherein the air-fuel mixture undergoes instantaneous combustion in the course of compression travel. The valve mechanism 14 is provided with an air inlet valve 141 and an exhaust valve 142, and the diameter of the air inlet valve 141 is usually made slightly greater than that of the exhaust valve 142.

**[0004]** The air-fuel mixture upon entering into the combustion chamber 15 is ignited by an ignition member, i.e. the spark plug, and exploded. The gas pressure of the expansion pushes the piston 13 to engage in vertically reciprocal motion. When the piston 13 descends, the air inlet valve 141 is opened up to introduce the air-fuel mixture into the combustion chamber 15 for combustion and the resultant waste gas is fast discharge out of the exhaust valve 142 while the crankshaft drives the belt gearshift mechanism to operate (not illustrated), thus driving the rear wheels for the vehicle to move forward.

**[0005]** As the vehicle is driven along, the temperature of the running engine 1 rises and must be cooled down to avoid damages to the mechanical parts. The way of cooling in the cylinder head 12 of the water-cooling engine 1 of the prior art works by having the cooling water to flow from the cooling water passage 111 into the cylinder head 12 when the engine 1 is running. The cylinder head 12 is provided with a cooling water passage A around the valve mechanism as indicated by the arrow.

When the cooling water flows from both sides of the cooling water passage 111 in the cylinder 11 into the cooling water passage A in the cylinder head 12, the cooling water flows upward from the cooling water passage A; and the cooling water passes through the cooling water passage A between the air inlet valve 141 and the exhaust valve 142 to exit from a cooling water outlet 123 provided to the cylinder head 12 to complete a cooling cycle in the cylinder head 12 to absorb heat at high temperature produced as the engine runs for achieving the cooling effects.

**[0006]** As the engine runs, it is not necessary that various parts of the engine are at the same temperature. For example, the newly introduced air-fuel mixture constantly cools down the temperature of the air inlet valve 141 while the exhaust valve 142 is continuously exposed to the waste gas at higher temperature. Therefore, the temperature readings respectively measured at both valves 141 and 142 are not the same. Furthermore, the cooling water passage A of a water-cooling engine of the prior art enters at the same time where it surrounds the valve mechanism 14 of the cylinder head 12. Once the cooling water flows up to exit from the cooling water passage A, the heat absorption results of the cooling water passage A located on the side air inlet passage 121 and that on the side of an exhaust passage 122 are not consistent, resulting in poor cooling consistency due to the excessive temperature difference existing between the air inlet valve 141 and the exhaust valve 142. Consequently, the mechanism parts of the engine are vulnerable to deformation due to the inconsistent heat dissipation.

**[0007]** As described above, the water-cooling construction of the water-cooling engine 1 of the prior art is essentially comprised of having the cooling water passage entering from both sides into the cylinder head 12 and dispersing around the valve mechanism 14, resulting in inconsistent heat absorption of the cooling water between the cooling water passage A located on the side of the air inlet passage 121 and that on the side of the exhaust passage 122 when the cooling water flows up to exit from the cooling water passage A. As a result, the poor cooling consistency due to the excessive temperature difference between the air inlet valve 141 and the exhaust valve 142 subjects the mechanical parts of the engine to deformation.

### SUMMARY OF THE INVENTION

**[0008]** The primary purpose of the present invention is to provide a construction of cooling water passage in the cylinder head of an engine to upgrade the cooling effects for the cylinder head as a whole to avoid deformed mechanical parts due to inconsistent heat dissipation. To achieve the purpose, a spacer is provided between the cylinder and the cylinder head. The spacer has a port connecting through the cooling water disposed on the side of the exhaust passage. The cooling water flow-

ing from the cooling water connection port into the cylinder head is limited by a retainer thus to extend the flow route for the cooling water. The cooling water first cools the side of the exhaust passage at a higher temperature before cooling the side of the air inlet passage at a lower temperature thus evenly absorbing the heat at high temperature produced on the cylinder head as the engine runs.

**[0009]** The foregoing object 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.

**[0010]** 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

##### **[0011]**

Fig. 1 is a sectional view showing a local part of a water-cooling engine of the prior art.

Fig. 2 is a bird's eye view of a body of the cylinder of the present invention.

Fig. 3 is a sectional view showing a local part of an engine of the present invention.

Fig. 4 is an exploded view of a retainer and the spatial configuration of the cooling water passage in the cylinder head of the present invention.

Fig. 5 is a schematic view showing an assembly of the retainer and the spatial configuration of the cooling water passage in the cylinder head of the present invention.

Fig. 6 is an elevation view of the cylinder head of the present invention.

Fig. 7 is a schematic view showing an assembly of a spacer and the cylinder as taken from Section A-A from Fig. 6.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0012]** The following descriptions are of 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.

**[0013]** Referring to Fig. 2 for an elevation view of a cylinder 21 of a water-cooling engine of the present invention, a cooling water inlet 211 and a waterway 212 for circulation of the cooling water are provided to the cylinder 21. Now referring to Fig. 3 for a sectional view of an engine 2 of the present invention, the engine 2 includes the cylinder 21, and a cylinder head 22 on top of the cylinder 21. The cylinder head 22 contains an air inlet passage 221, an exhaust passage 222 to discharge the exhaust, a combustion chamber 23 where the air-fuel mixture is combusted, a piston 24 to engage in reciprocal motion inside the cylinder 21, and a valve mechanism seat 25 to accommodate multiple valves. A spacer 26 is provided between the cylinder 21 and the cylinder head of the engine 2, wherein a cooling-water outlet 223 (as illustrated in Fig. 7) to discharge the cooling water is provided to the cylinder head. The valve mechanism seat 25 is comprised of an air inlet valve seat 251 and an exhaust valve seat 252. A port 261 connecting through the cooling water is provided to the spacer 26 on the side of the exhaust passage 222.

**[0014]** Fig. 5 is a schematic view showing the spatial configuration of a cooling water passage B in the cylinder head 22 of the present invention. A retainer 224 related to a hollow pipe is provided to the water outlet 223 of the cooling water in relation to the cooling out water 223 and has one end provided with a gap a, and a limitation piece b in relation to the gap a.

**[0015]** As illustrated in Figs. 2 and 3, the cooling water flows from the water-cooling inlet 211 in the cylinder 21 into the waterway of the cylinder 21 when the engine 2 runs. The cooling water flowing into the waterway 212 flows upward to arrive at the spacer 26 where the cooling water will flow into the cylinder head 22 through the cooling water connection port 261 provided on the side of the exhaust passage 222 due to the packing status created between the cylinder 21 and the cylinder head 22 by the spacer 26. As illustrated in Fig. 5, whereas the retainer 224 is inserted to the cooling water outlet 223 of the cylinder head 22, the cooling water is frustrated by the limitation piece b extending from the retainer 224 when the cooling water flows from the cooling water connection port 261 into the cylinder head 22. Accordingly, the cooling water is forced to first pass through an exhaust passage side C at higher temperature before flowing through an air inlet passage side D to finally exit from the cooling water outlet 223.

**[0016]** As illustrated in Figs. 5, 6, and 7, the cooling water as separated by the retainer 224 upon flowing into the cylinder head 22 through the cooling water connection port 261 of the spacer 26 passes by the exhaust valve seat 252 on the exhaust passage side C at higher temperature before passing by the air inlet valve 251 on the air inlet passage side D at lower temperature before exiting from the pipe retainer 224 inserted to the

cooling water outlet 223 to complete the cooling cycle. The cooling water by cooling first the exhaust passage side C at higher temperature before cooling the air inlet passage side D at lower temperature consistently absorbs the heat at high temperature produced on the cylinder head 22 while the engine 2 is running to achieve the results of reducing the temperature of the cylinder head 22, thus the engine 2.

**[0017]** Furthermore, the retainer 224 may be forthwith cast to the cylinder head 22 during the casting process of the cylinder head 22 as illustrated in Fig. 7; or alternatively, the retainer 224 is fixed in the cooling water outlet 223 upon the completion of the casting process of the cylinder head 22.

**[0018]** The construction of a cooling water passage for the cylinder head of engine disclosed in the present invention corrects the flaw of failing to provide consistent temperature reduction of the prior art by providing the retainer 224 at the cooling water outlet 223 of the cylinder head 22, extending the flow route for the cooling water and for the cooling water to cool first the exhaust passage side C at a higher temperature before cooling the air inlet passage side D at a lower temperature to consistently absorb the heat at high temperature produced to the cylinder head while the engine is running, thus upgrading heat dissipation results for the cylinder head as a whole and avoiding deformation to mechanical parts due to inconsistent heat absorption.

**[0019]** 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.

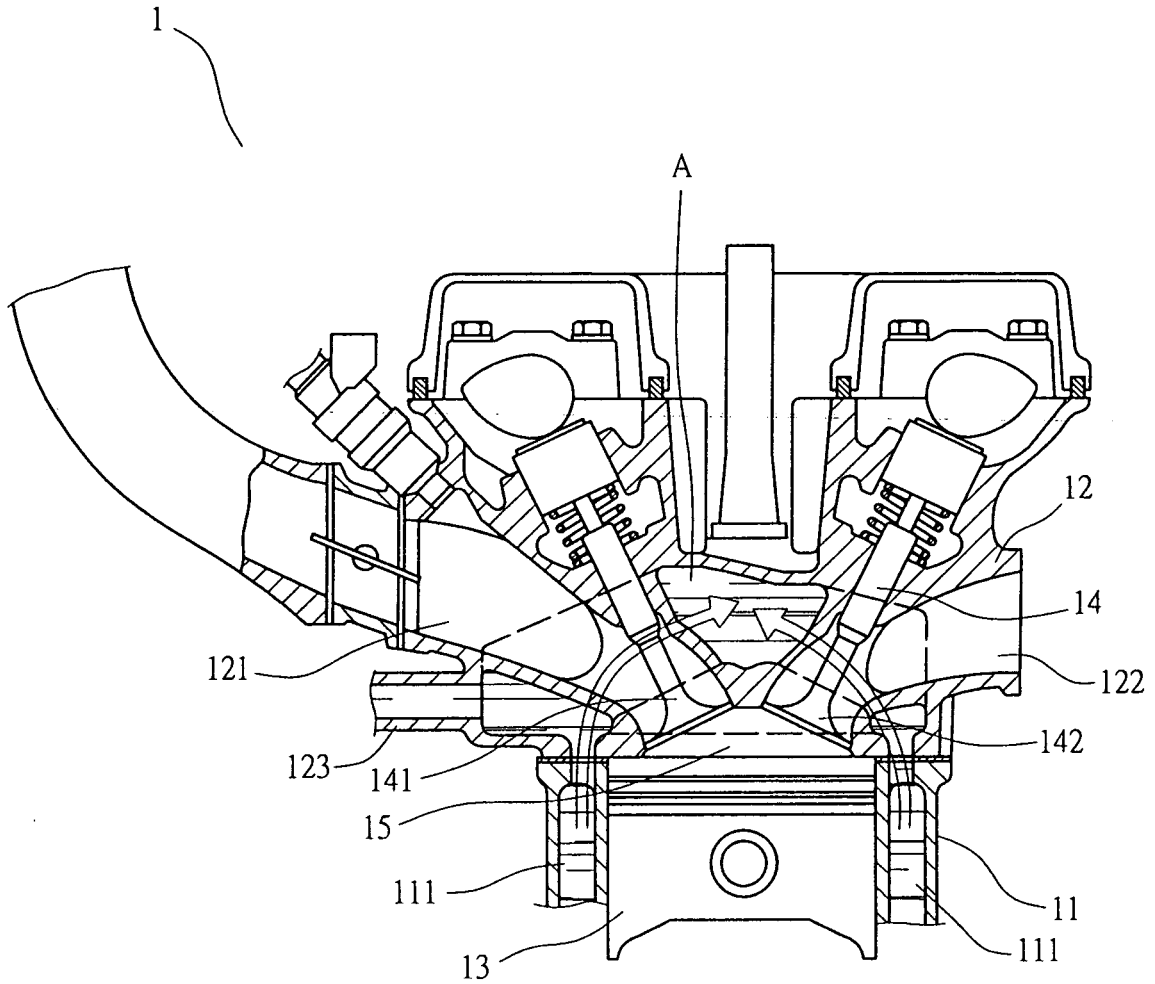
**[0020]** While certain novel features of this invention have been shown and described and are pointed out in the annexed claim, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details 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 cooling water passage in engine cylinder head comprised of an engine including a cylinder, a cylinder head on top of the cylinder, a spacer disposed between the cylinder and the cylinder head; the cylinder head including an air inlet passage, an exhaust passage, a combustion chamber **characterized in that** the cooling water passage is provided with a port to connect cooling water on the side of the exhaust passage side, cooling water flowing into through the cooling water connection port being limited by a retainer and force to flow first to pass by the side of the exhaust passage before passing through the air inlet passage side, and finally exiting

from the cooling water of the cylinder.

2. The cooling water passage in engine cylinder head of Claim 1, wherein, the retainer relates to a hollow pipe with one end formed with a gap and a limitation piece in relation to the gap.
3. The cooling water passage in engine cylinder head of Claim 1, wherein, the retainer is directly cast in the cylinder head.
4. The cooling water passage in engine cylinder head of Claim 1, wherein, the retainer is fixed in the cooling water outlet upon the cylinder head is cast.
5. The cooling water passage in engine cylinder head of Claim 1, wherein, the cooling water first passes by an exhaust valve seat located on the side of the exhaust passage before flowing to an air inlet valve seat located on the side of the air inlet passage.



PRIOR ART  
FIG.1

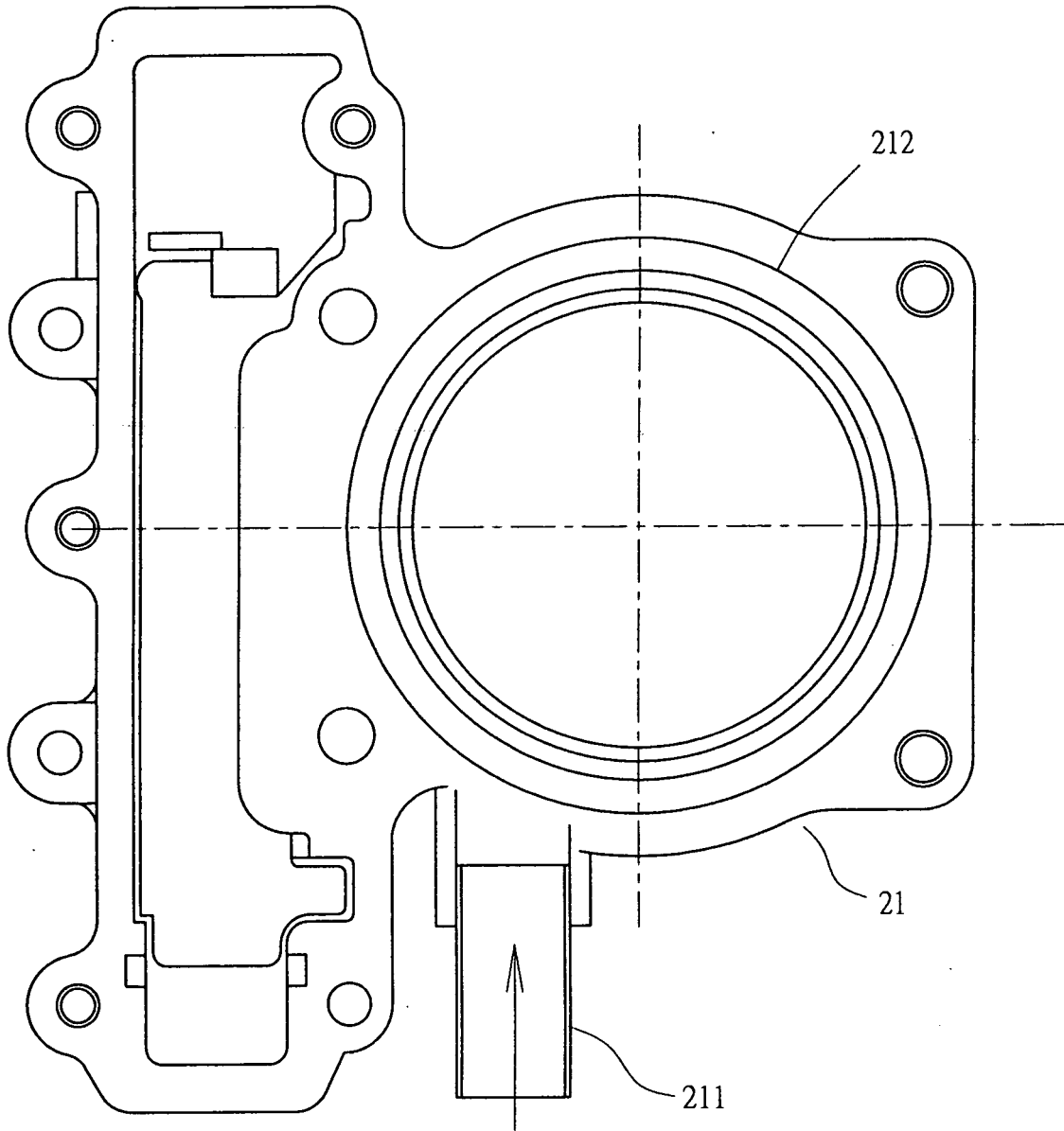


FIG.2

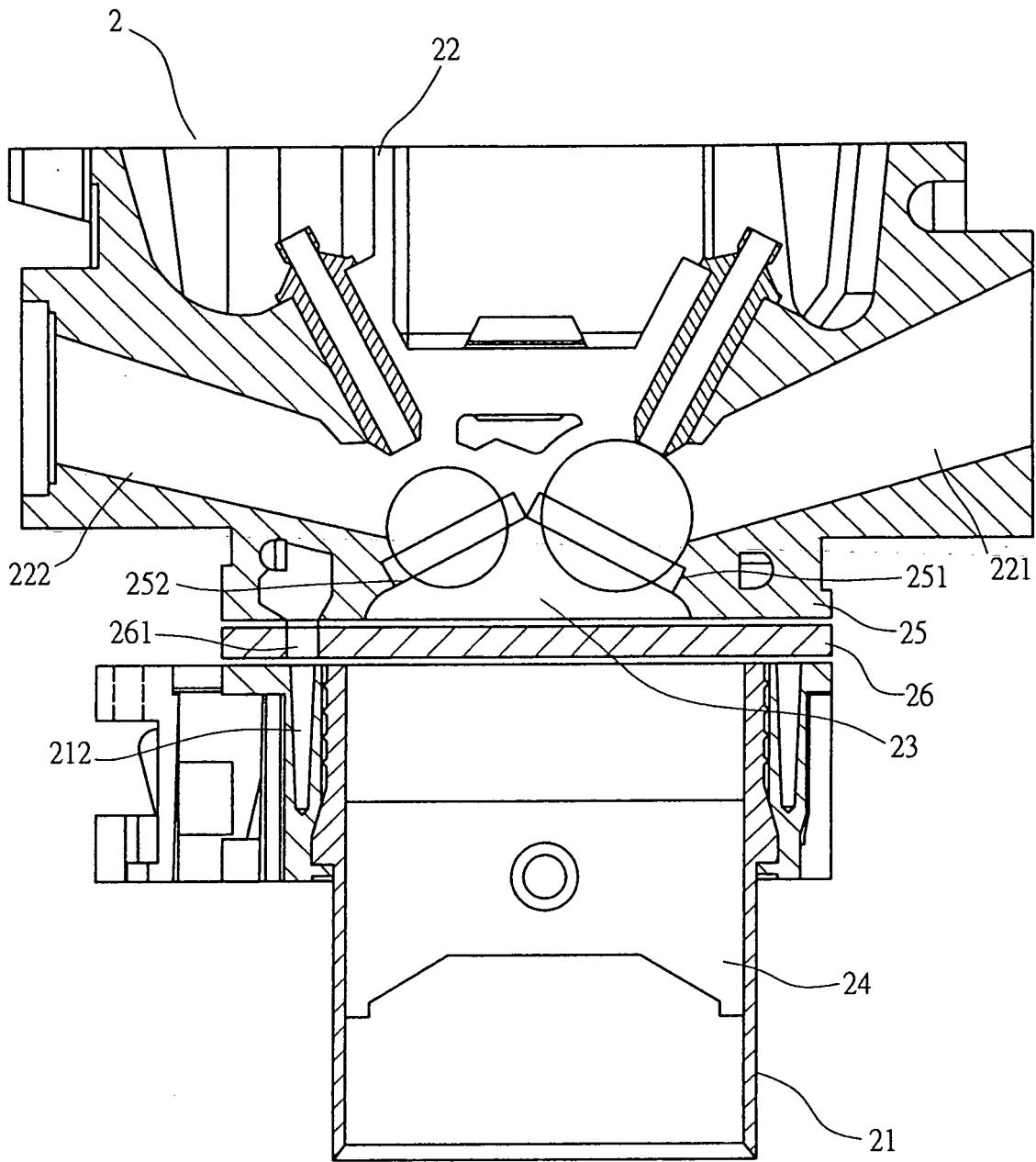
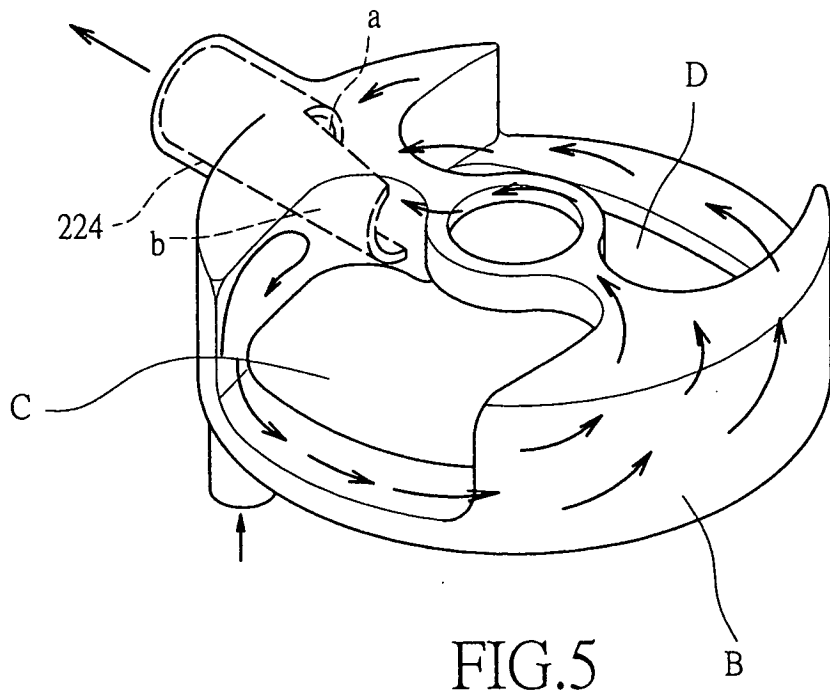
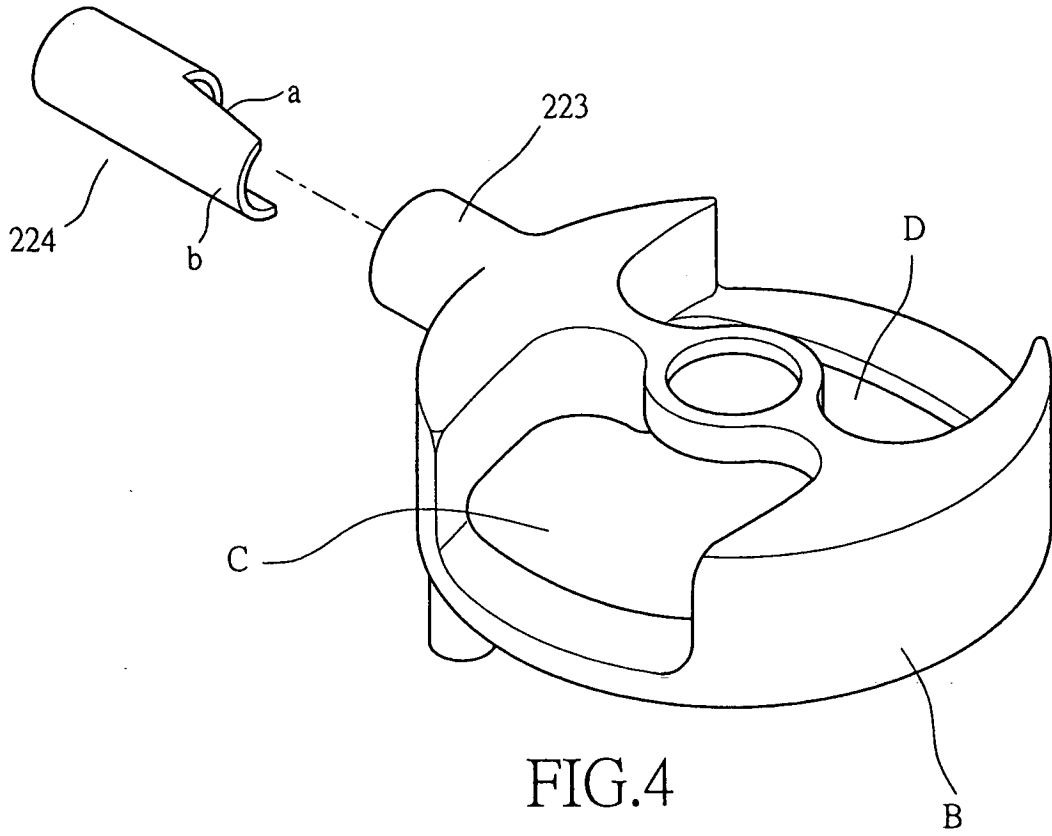


FIG.3



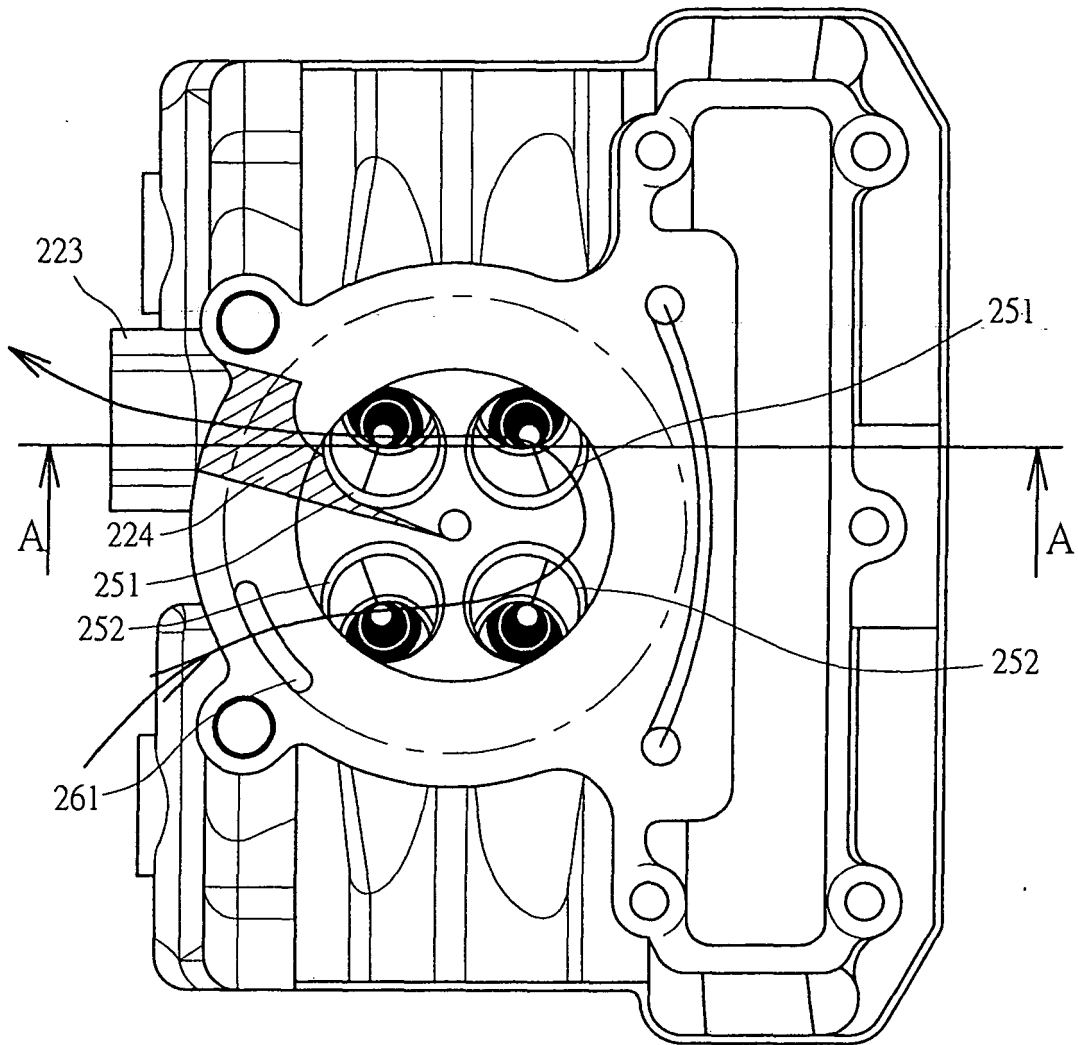
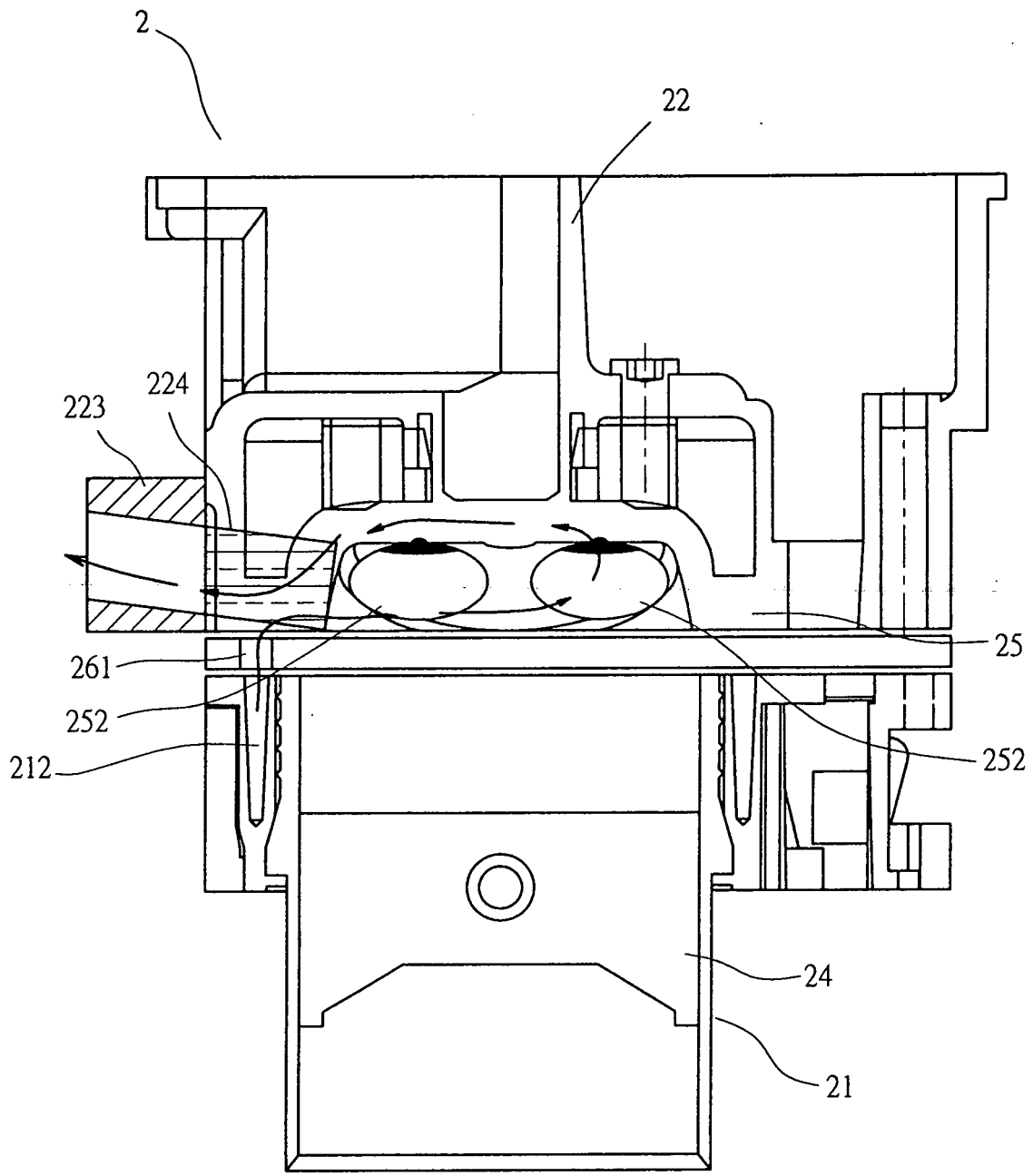


FIG.6



A-A

FIG.7



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 3 115 125 A (SPENCER CHARLES O ET AL) 24 December 1963 (1963-12-24) * column 1, lines 8-11 * * column 2, lines 14-29 * * column 2, lines 58-69 * * figures 1-3 *	1,3,5	F01L1/24 F02F1/38 F02F1/40
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 February 2005	Examiner Paquay, J
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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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 February 2005	Examiner Paquay, J
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  
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08-02-2005

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