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Crank chamber precompression spark ignition two-stroke internal combustion engine

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(56) Related Art
US 4899698
US 4598673
US 4034724

Crank Chamber Precompression Spark Ignition Two-Internal Combustion Engine

ABSTRACT

A crank chamber precompression spark ignition two-internal combustion engine (1) comprises a rich mixture intake passage (12) and a rick mixture scavenging passage (16) which is formed on an extension line of the rich mixture intake passage (12). Intake is introduced into a crank chamber (11) during the compression stroke of a piston (6) the intake being compressed during the downstroke of the piston (6). The intake is introduced into the combustion chamber (15) through the scavenging passage (16) utilising the compression pressure. The rich mixture intake passage (12) is located at the position where the direction of the rich mixture flow introduced from the rich mixture intake passage (12) into the crank chamber (11) coincides with the rotation direction of the large end (8) of a connecting rod (7).

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ORIGINAL

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Invention Title: Crank Chamber Precompression Spark Ignition Two-stroke Internal Combustion Engine

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

CRANK CHAMBER PRECOMPRESSION SPARK IGNITION TWO-STROKE INTERNAL COMBUSTION ENGINE

Detailed Description of the Invention

Technical Field of the Invention

This invention relates to a crank chamber precompression spark ignition two-stroke internal combustion engine in which rich mixture and lean mixture or air are scavenged in layer through individual scavenging passages into a combustion chamber and residual gas is scavenged mainly by lean mixture or air in order to reduce blow by of fuel, enhance the fuel consumption, and clean the exhaust gas.

Japanese Patent Laid-open No. Sho 55-14992 discloses a conventional chamber precompression spark ignition two-stroke internal combustion engine which supplies rich mixture and lean mixture in a combustion chamber in layer.

In the internal combustion engine described in the above-mentioned publication, shown in Fig. 4, a mixture intake passage is connected to a scavenging passage having an opening at the opposite side across the diameter of the cylinder from an exhaust outlet out of a plurality of scavenging passages which communicate between the combustion chamber and the lower portion of the crank chamber, a fuel supplying means such as a carburettor is provided to the mixture intake passage, and an air intake passage having an opening on the crank chamber is provided at the position immediately under the exhaust outlet.

Japanese Patent Laid-open No. Hei 2-45614, in addition to the above-mentioned Japanese Patent Laid-open No. Sho 55-14992, discloses also a crank chamber precompression spark ignition internal combustion engine (refer to Fig. 5) in which all parts are structured similarly though it is unclear that the bottom end of the scavenging passage the top end of which is opening on the opposite side from the exhaust outlet is connected what portion of the crank chamber.

Problem to be Solved by the Invention

In the conventional internal combustion engine shown in Fig. 4, it is guessed that the mixture concentration is differentiated for scavenging and residual gas is scavenged with only lean mixture in order to reduce fuel blow by, however, because the bottom end of the scavenging passage communicating to the mixture intake passage is opened to the bottom of the crank chamber, rich mixture which is mixed with fuel by the fuel supplying means goes down and flows into the crank chamber during crank chamber intake in the end half of up stroke, and goes up and flows into the combustion chamber during scavenging in the end half of down stroke, the moving direction of the above-mentioned mixture in the scavenging passage changes dependently on up or down stroke of a piston, and rich mixture diffuses in air in the crank case to result in the reduced fuel blow by preventing effect.

Means for Solving the Problem and Effect

The present invention relates to a crank chamber precompression spark two-stroke internal combustion engine without such problem, in which intake is introduced into a crank chamber during combustion chamber compression stroke of a piston, the intake is compressed during down stroke of the piston, and intake is introduced into the combustion chamber through a scavenging passage utilising the compression pressure, wherein a rich mixture intake passage for introducing rich mixture into the crank chamber and a lean mixture/air intake passage for introducing lean mixture or air into the crank chamber are provided, the line connecting the rich mixture intake passage and a fuel feeder is positioned so as to contact with the periphery of the crank web, the rich mixture intake passage is provided at the position where the direction of the rich mixture flow introduced from the fuel feeder into the crank chamber coincides with the rotation direction of the periphery of the crank web, and a rich mixture scavenging passage is formed on the extension line of the rich mixture intake passage.

The present invention is structured as described herein above, thereby, rich mixture introduced from the rich mixture intake passage into the crank chamber is introduced into the rich mixture scavenging passage with aid of viscose resisting force and intake inertial force driven by rotation of the crank end to result in reduced diffusion into air in the crank chamber. As the result, scavenging flow blasting by to the exhaust outlet contains little fuel, thus the fuel consumption is greatly improved and exhaust gas is cleaned.

The present invention is structured as described in the claim 2 herein above, thereby, the mixture in the above-mentioned combustion chamber is formed separately in layer of rich mixture and air, the rich mixture is smoothly ignited by the spark plug, as the result, irregular combustion is prevented, fuel consumption is reduced, and HC emission is reduced.

The present invention is structured as described in the claim 3, thereby, the rich mixture introduced from the above-mentioned rich mixture scavenging passage into the above-mentioned combustion chamber is sandwiched between lean mixture or air flow introduced from both lean mixture/air scavenging passages provided on both sides of the line connecting the opening of the rich mixture scavenging passage and the exhaust outlet to form a vertical vortex of rich mixture along the center line of the piston hole, thus the rich mixture stably contacts with the spark plug to further ensure ignition of mixture.

The present invention is structured as described in the claim 4, thereby, rich mixture in the crank chamber moving from the rich mixture intake passage to the rich mixture scavenging passage can be in contact with the periphery of the crank web in motion of up stroke, the contact promotes the flow of the fresh rich mixture with aid of motion blasting force along the rotation direction of the periphery of the crank web, the resultant sufficient supply of fresh rich mixture therefore ensures normal combustion, and the output is maintained at high level.

Preferred Embodiment

One embodiment of the present invention will be described hereinafter referring to Fig. 1 to Fig. 3.

A single cylinder crank chamber precompression spark ignition two-stroke internal combustion engine of the present invention is mounted on a motorcycle not shown in the figures in the configuration with the cylinder head in the front (left in the figure 1), and in the crank chamber precompression spark ignition two-stroke internal combustion engine 1, a cylinder block and cylinder head are overlapped in the front of the crank case 2 and combined each other solidity.

A piston 6 is engaged slidably in forward and backward direction in a cylinder hole 5 formed on the cylinder block 3, the piston 6 and crank web 9 are connected each other by a connecting rod 7, and the crank web 9 is rotated as the piston 6 slides.

A rich mixture intake passage 12 is provided at the rear lower position of the crank case 2 so that the extension of the rich mixture intake passage 12 is provided in contact with the rotation locus of the joint of the large end 8 of the connecting rod 7 with the crank pin 10 of the crank web 9 in the crank chamber 11, and the crank web 9 is rotatable in the clockwise direction in Fig. 1 so as the direction of rich mixture which had flowed into the crank chamber 11 from the rich mixture intake passage 12 coincides with the rotation direction of the crank pin 10 which contacts with the rich mixture flow.

A reed valve 13 is provided at the connection between the rich mixture intake passage 12 and crank chamber 11, and a carburettor 14 with a throttle valve (not shown in the figures) and lubricating oil supplying means not shown in the figures are provided in the upper stream of the rich mixture intake passage 12.

A rich mixture scavenging passage 16 communicating to the crank chamber 11 and combustion chamber 15 is formed through the crank case 2 and cylinder block 3 in a form of gradually curved shape at the position on the approximate extension line of the rich mixture intake passage 12, a scavenging opening 17 of the rich mixture

scavenging passage 16, an exhaust outlet 18 located at the opposite side with respect to the diameter, and an exhaust passage 19 communicated to the exhaust outlet are formed, and an exhaust valve 20 is provided on the exhaust passage 19.

A lean mixture/air intake passage 21 communicates to the upper portion of the crank chamber 11 near the connection of the crank case 2 with the cylinder block 3, a reed valve is provided in the downstream of the lean mixture/air intake passage 21, and a throttle valve 23 is provided in the upper stream, and a throttle value not shown in the figures of the carburettor 14 and the exhaust valve 20 are connected each other through a link 24, when the throttle valve of a carburettor 14 is operated, the throttle valve 23 and exhaust valve 20 are operated in linking.

A spark plug 25 is provided on the cylinder head 4 positioned on a plane along the scavenging opening 17 and exhaust outlet 18 through the center line of the cylinder hole 5, and on both sides of a plane which connects the scavenging opening 17 and exhaust outlet 18 and passes the center line of the cylinder hole 5, scavenging openings 26 are provided on the approximately same vertical line as the scavenging opening 17, the scavenging openings 26 communicate to the crank chamber 11 through air scavenging passages not shown in the figures.

Because the embodiment shown in Fig. 1 to Fig. 3 is structured as described herein above, in the operational condition, fuel supplied to the rich mixture intake passage 12 by the carburettor 14 is mixed with air which is passing through the rich mixture intake passage 12 to become rich mixture, lubricating oil supplied from the lubricating oil supplying means not shown in the figures is homogeneously mixed with rich mixture in the rich mixture intake passage 12 and inhaled into the crank chamber 11 which is negatively pressurized during up stroke.

Fresh taken in the crank chamber is compressed during down stroke, and the compressed fresh is supplied into the combustion chamber 15 from scavenging opening 17 and scavenging openings 26 through the rich mixture scavenging passage 16 and a scavenging passage not shown in the figure when the scavenging opening 17 and

scavenging openings 26 are opened during down stroke of the piston 6, burnt gas in the combustion chamber 15 is partially exhausted from the exhaust outlet 18 to the exhaust passage 19 by the compressed fresh, and the scavenging opening 17, scavenging openings 26, and then the exhaust outlet 18 are closed as the piston 6 moves upward, the mixture in the combustion chamber 15 is compressed by the upward motion of the piston 6, ignition by the spark plug 25 or self-ignition by thermal energy of residual gas of the prior cycle occurs near the top dead center.

Because the intake quantity of fresh rich mixture taken in the crank chamber 11 from the rich mixture intake passage 12 during up stroke is largest around the middle of the time period in which the piston 6 moves from the bottom dead center, closes the scavenging opening 17 and scavenging openings 26, and reaches the top dead center, the motion of the joint toward the rich mixture scavenging passage 16 causes blasting force at the above-mentioned middle of the time period when the joint between the large end 8 of the connecting rod 7 and the crank pin 10 of the crank web 9 is positioned around the lower center of the crank chamber 11, the blasting force promotes fresh rich mixture to flow from the rich mixture intake passage 12 to the rich mixture scavenging passage 16 through the crank chamber 11 to result in sufficient supply of fresh rich mixture and normal combustion, thus significant output reduction can be prevented.

Lean mixture containing scarce fuel or fresh air containing only air is introduced from the scavenging openings 26 on both sides of the line connecting the scavenging opening 17 and exhaust outlet 18 into the combustion chamber 15, the fresh rich mixture introduced from the scavenging opening 17 into the combustion chamber 15 is sandwiched between the above-mentioned lean mixture or fresh air containing only air on both sides and then flows from the exhaust outlet 18 to the exhaust passage 19, burnt gas is therefore excluded smoothly to the exhaust passage 19 by the lean mixture or fresh air containing only air, as the result, the charging efficiency and fuel consumption are improved. Fresh rich mixture and lean mixture or fresh air containing

only air are layered separately and a vertical vortex of fresh rich mixture is formed along the vertical plane which passes the center line of the cylinder hole 5 connecting the scavenging opening 17 and exhaust outlet 18 to ensure the contact with the spark plug 25, thus even when the average air-fuel ratio of the total mixture taken in the combustion chamber 15 is increased, ignition by the spark plug is ensured and irregular combustion are prevented to lead improved fuel consumption and reduced HC emission.

Because the carburettor 14, throttle valve 23, and exhaust valve 20 are linked by the link 24, the opening of the throttle valve 23 and exhaust valve 20 can be adjusted in response to the changing of fuel supply of the carburettor 14 to result in the air-fuel ratio ranging within the optimum range, the emission of exhaust gas during low speed or low load operation is suppressed, active thermal environment combustion (Activated Radical Combustion) is promoted, the control system for the carburettor 14, throttle valve 23, and exhaust valve 2- is simplified to result in reduced cost.

Brief Description of the Drawings

Fig. 1 is a vertical cross-sectional view at the bottom dead point of a crank chamber precompression spark ignition two-stroke internal combustion engine in accordance with the present invention.

Fig. 2 is a vertical cross-sectional view around the middle of an up stroke of the crank chamber precompression spark plug two-stroke internal combustion engine.

Fig. 3 is a horizontal cross-sectional view of the crank chamber precompression spark plug ignition two-stroke internal combustion engine along the III-III of Fig. 2.

Fig. 4 is a vertical cross-sectional view of the conventional crank chamber precompression spark ignition two-stroke internal combustion engine described in Japanese Patent Laid-open No. Sho 55-14992.

Fig. 5 is a vertical cross-sectional view of the crank chamber precompression spark ignition two-stroke internal combustion engine described in Japanese Patent Laid-open No. Hei 2-45614.

Description of Reference Numerals

1 ... CRANK CHAMBER PRECOMPRESSION SPARK IGNITION TWO-STROKE INTERNAL COMBUSTION ENGINE

2 ... CRANK CASE

3 ... CYLINDER BLOCK

4 ... CYLINDER HEAD

5 ... CYLINDER HOLE

6 ... PISTON

7 ... CONNECTING ROD

8 ... LARGE END

9 ... CRANK WEB

10 ... CRANK PIN

11 ... CRANK CHAMBER

12 ... RICH MIXTURE INTAKE PASSAGE

13 ... READ VALUE

14 ... CARBURETTOR

15 ... COMBUSTION CHAMBER

16 ... RICH MIXTURE SCAVENGING PASSAGE

17 ... SCAVENGING OPENING

18 ... EXHAUST OUTLET

19 ... EXHAUST PASSAGE

20 ... EXHAUST VALUE

21 ... LEAN MIXTURE/AIR INTAKE PASSAGE

22 ... REED VALUE

23 ... THROTTLE VALVE

24 ... LINK

25 ... SPARK PLUG

26 ... SCAVENGING OPENING

The claims defining the invention are as follows:

1. A crank chamber precompression spark ignition two-stroke internal combustion engine in which intake is introduced into a crank chamber during combustion chamber compression stroke of a piston, the intake is compressed during down stroke of the piston, and intake is introduced into the combustion chamber through a scavenging passage utilizing said compression pressure, wherein a rich mixture intake passage for introducing rich mixture into the crank chamber and a lean mixture/air intake passage for introducing lean mixture or air into the crank chamber are provided, the line connecting the rich mixture intake passage and a fuel feeder is positioned so as to contact the periphery of the crank web, the rich mixture intake passage is provided at the position where the direction of the rich mixture flow introduced from the fuel feeder into the crank chamber coincides with the rotation direction of the periphery of the crank web, and a rich mixture scavenging passage is formed on the extension line of said rich mixture intake passage.

2. The crank chamber precompression spark ignition two-stroke internal combustion engine as claimed in claim 1, wherein mainly air taken in from an inlet port is supplied to said lean mixture/air intake passage.

3. The crank chamber precompression spark ignition two-stroke internal combustion engine as claimed in claim 1 or claim 2, wherein the inlet opening of said rich mixture scavenging passage is provided at the position farthest from the exhaust outlet, inlet openings of other scavenging passages are provided on both sides of the line connecting said exhaust outlet and the inlet opening of said rich mixture scavenging passage on the cylinder wall.

4. The crank chamber precompression spark ignition two-stroke internal combustion engine as claimed in any claim of claim 1 to claim 3, wherein the large end of the periphery of said crank web is provided in contact with the extension line of said rich mixture intake passage.

5. A crank chamber precompression spark ignition two-stroke internal combustion engine substantially as hereinbefore described with reference to figures 1 to 3 of the accompanying drawings.

Dated 7 March, 1997

Honda Giken Kogyo Kabushiki Kaisha

Patent Attorneys for the Applicant/Nominated Person

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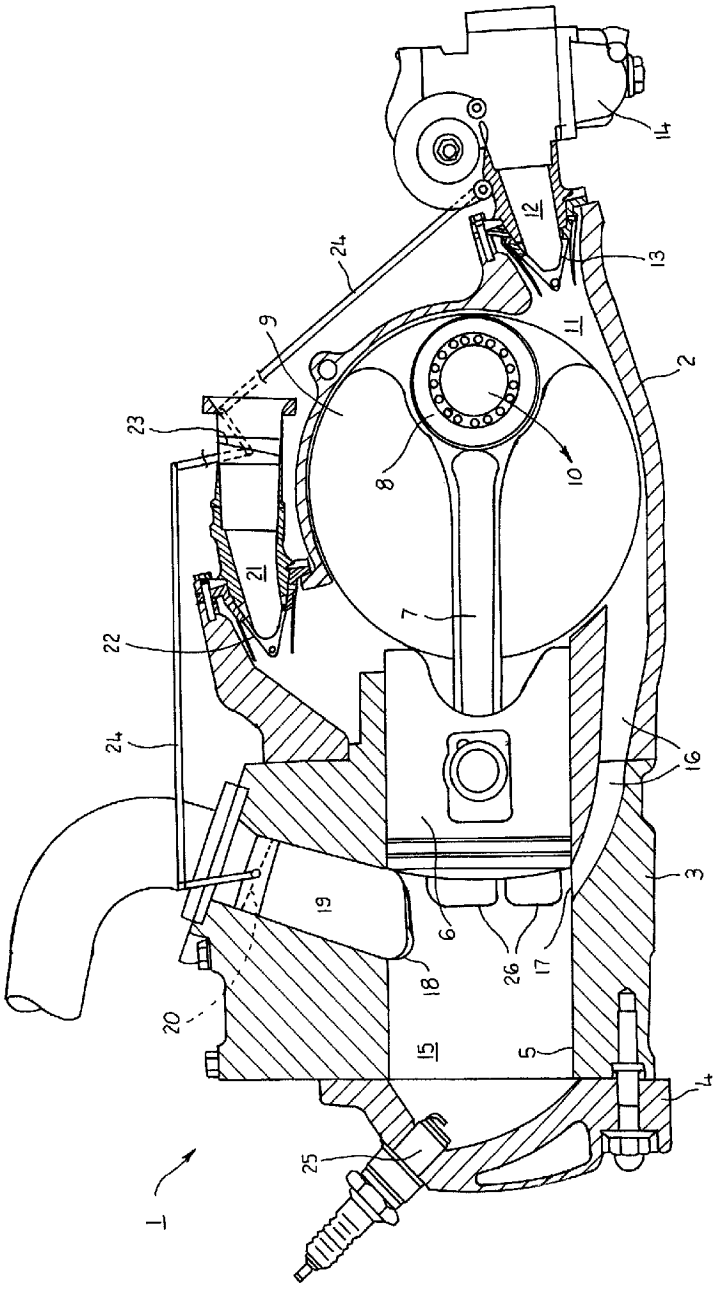

FIG. 1

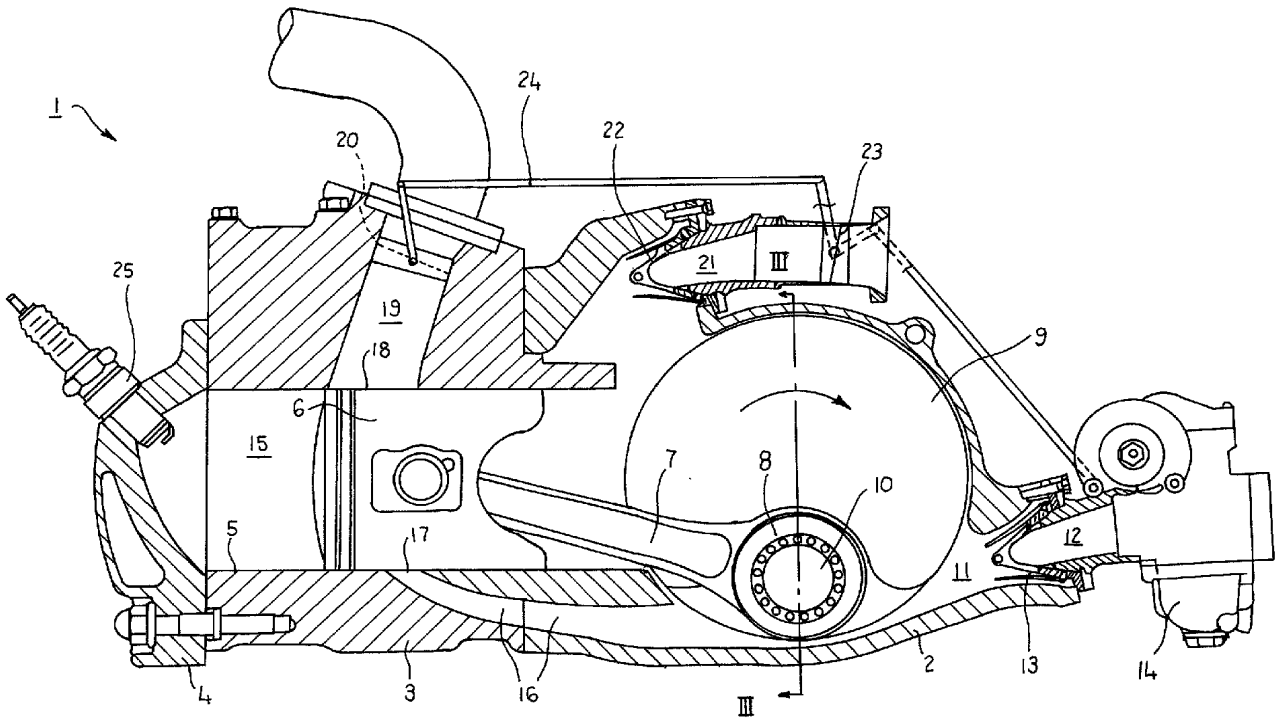

FIG. 2

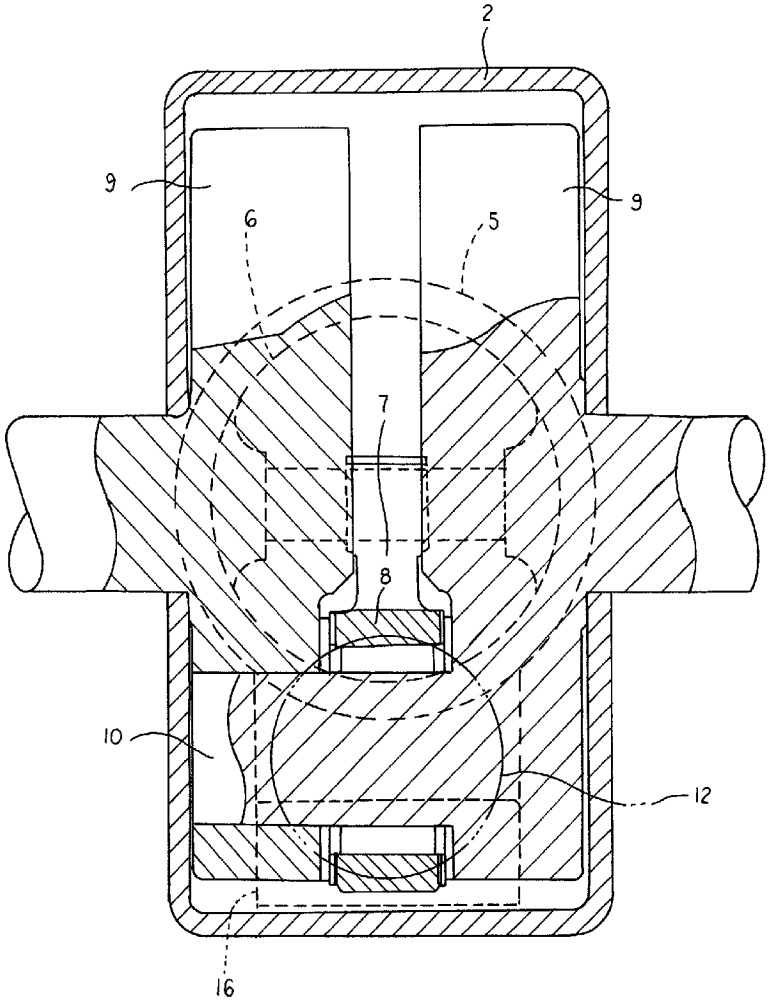

FIG. 3

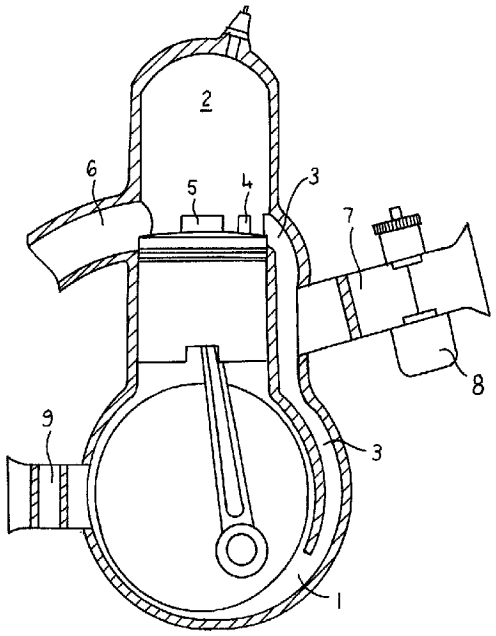

FIG. 4

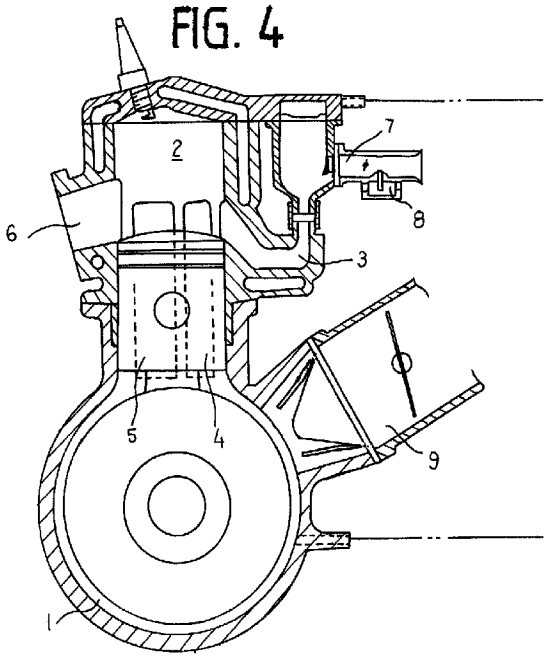

FIG. 5