(12) UK Patent Application (19) GB (11) 2 206 379 (13) A

(43) Application published 5 Jan 1989

(21) Application No 8815054

(22) Date of filing 24 Jun 1988

(30) Priority data
(31) 8714989 (32) 26 Jun 1987 (33) GB

(71) Applicant
Harold Bell Mottershaw
Winsley, 15 Avon Avenue, Avon Castle, Ringwood, Hants

(72) Inventor
Harold Bell Mottershaw

(74) Agent and/or Address for Service
Paul M Turner
Urquhart-Dykes & Lord
8 Lindsay Road, Poole, Dorset, BH13 6AR

(51) INT CL⁴
F01L 7/02

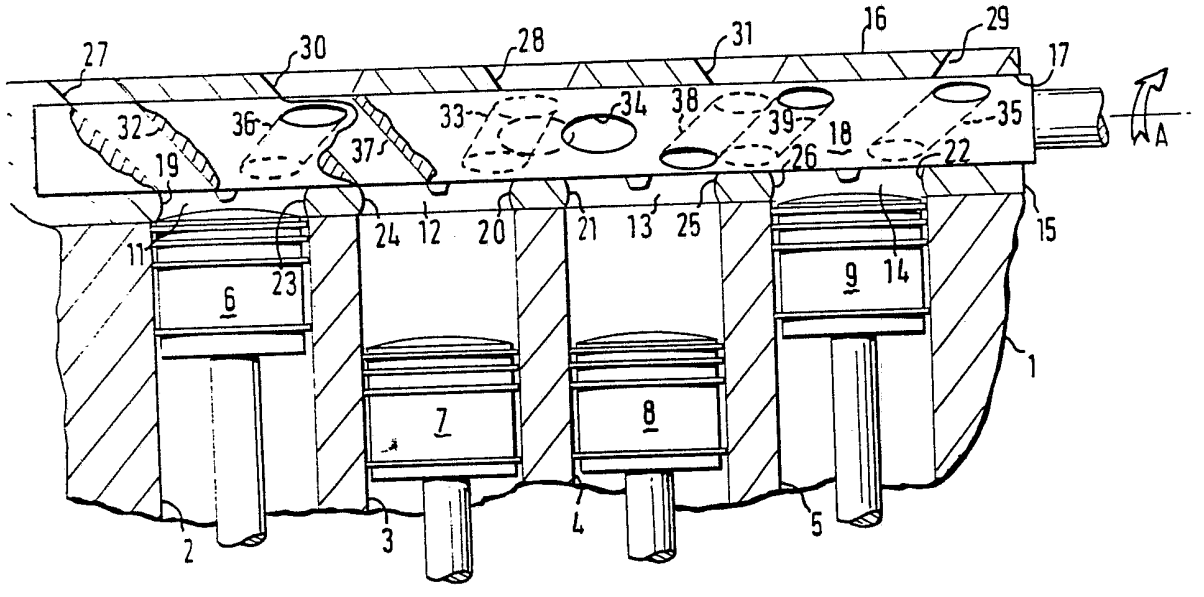
(52) Domestic classification (Edition J):
F1B 2Q5B

(56) Documents cited
GB A 2088472 GB 0471080 GB 0393130
GB 0295537 GB 0275557 GB 0138919
GB 0113228 EP A1 0071478

(58) Field of search
F1B
Selected US specifications from IPC sub-class F01L

(54) I.C. engine rotary valve

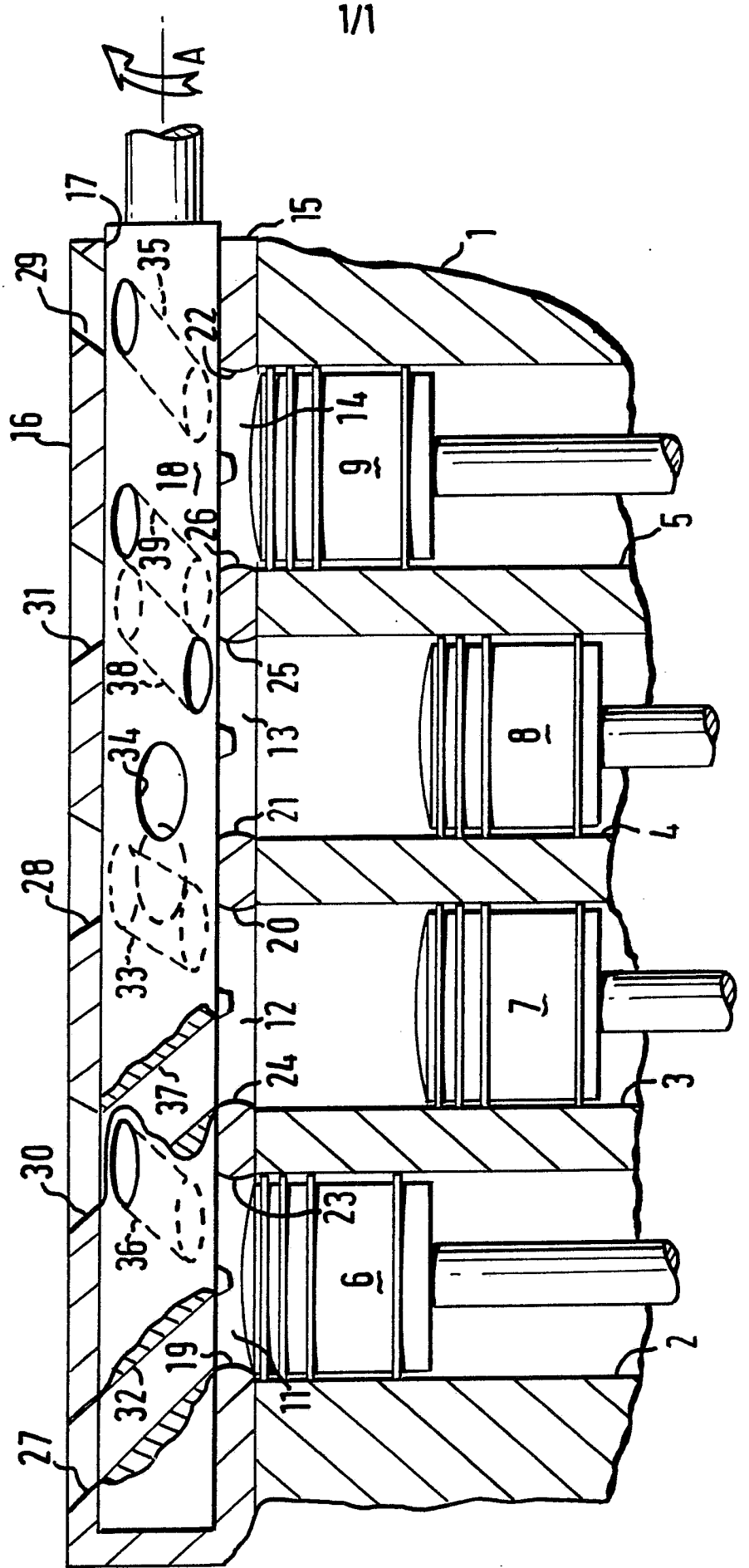
(57) Exhaust passages 32 to 35 and inlet passages 36 to 39 in the valve rotor 18 provide communication between cylinder exhaust ports 19 to 23 and inlet ports 23 to 26 and exhaust ports 27 to 29 and inlet ports 30 and 31 associated with an intake and exhaust manifold.



GB 2 206 379 A

The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

2206379


A
17
15
1
29
35
22
16
9
14
18
26
39
5
31
38
25
8
34
13
21
4
28
33
20
7
12
24
3
37
30
36
23
6
2
19
32
11
27

RECIPROCATING INTERNAL COMBUSTION ENGINE

The present invention relates to reciprocating internal combustion engines engines in which the flow of or fuel and exhaust, into and out of the engine cylinders is controlled by a rotary valve.

Engines having rotary valves for the fuel and air inlets and exhaust outlets are known, see for example GB 221,245 [Symonds] and GB 471,080 [Sprowl]. Symonds discloses an engine having a single rotary valve in which passages extending through a rotor are rotated to communicate between, either one of a single manifold fuel inlet port or exhaust port, and a single cylinder head port communicating with a combustion chamber. Sprowl discloses a rotary valve engine in which each cylinder head is served by a single port which acts as both the cylinder head induction and exhaust ports. Passages in the rotor are rotated with the rotor to communicate between either a manifold inlet port and the cylinder head port, or a manifold exhaust port and the cylinder head port.

It is an object of the present invention to attempt to provide a reciprocating internal combustion engine with an improved rotary valve to enhance the flow of fuel and exhaust, through the engine and thereby improve its efficiency.

According to the present invention there is provided a reciprocating internal combustion engine comprising, a cylinder head and at least one combustion chamber; at least one inlet port and one exhaust port being provided in the cylinder head for each of said combustion chambers; a

rotary valve gear, comprising a sleeve in which a rotor is sealingly received for synchronous rotation with the engine; a manifold having inlet ports and exhaust ports; inlet passages and exhaust passages extending through said rotor and arranged so that rotation of the rotor sequentially and cyclically causes said inlet passages to communicate between the manifold inlet ports and cylinder head inlet ports to permit the induction of fuel mixture into the combustion chamber, and the exhaust passages to communicate between the cylinder head exhaust ports and the manifold exhaust ports for the expulsion of exhaust products from the combustion chamber.

The engine may be single cylinder or multi-cylinder and each combustion chamber is served by separate exhaust and inlet ports, which are served by separate inlet and exhaust passages in the rotor. The engine may be a petrol engine or a diesel engine.

When the engine is a multi-cylinder engine, it is preferred that two or more of the inlet passages are arranged to align with a single manifold inlet port and in a similar way, two or more of the exhaust passages are arranged to align with a single manifold exhaust port. Thus a single manifold inlet port may serve a plurality of cylinder head inlet ports and a single manifold exhaust port may serve a plurality of cylinder head exhaust ports. In order to achieve this the passages may extend transversely through the rotor and be included to the axis. To simplify manufacture it is preferred that the passages be straight, and to this end the centres of the passages may be radialy displaced from the rotor axis to avoid interference between the passages.

Preferably the rotor is an elongated rotor and is preferably mounted in a sleeve formed integrally with the manifold and at least part of the cylinder head containing the cylinder head ports. The cylinder head may be cooled by passing oil and/or water through cooling passages and/or a cooling jacket provided in and around the cylinder head. The rotor may be lubricated by oil, supplied to bearing surfaces by way of passages extending through the rotor or the cylinder head.

The use of separate inlet and exhaust ports for each combustion chamber reduces the resistance presented to the flow of fuel and exhaust through the inlet and exhaust passages and ports respectively, and thereby enhances the performance of an engine using this form of rotary valve over that of similar engines using conventional rotary valve arrangements.

One embodiment of a reciprocating internal combustion engine constructed in accordance with the present invention will now be described, by way of example only, with reference to the accompanying illustrative drawing which show an elevated sectional view through an engine block, cylinder head, manifold and rotor of a four cylinder internal combustion engine incorporating the invention.

The illustration shows an engine having a main block 1 with four cylinders 2 to 5 wherein are slidably received pistons 6 to 9 respectively so that combustion chambers 11 to 14 are contained in each cylinder, between the piston 6 to 9 and an overlying cylinder head 15. The cylinder head 15, is integrally formed with an overlying manifold 16, and a cylindrical bore extends axialy between the cylinder head 15 and the manifold 16 to form an elongate sleeve 17

wherein is rotatably received a closely fitting elongate rotor 18. The rotor 18 is driven by substantialy conventional transmission means such as a belt, chain, or gears [not shown] arranged to rotate the rotor 18 at a speed synchronised with the engine speed.

Each combustion chamber 11 to 14 is served by one of four exhaust ports 19 to 22, and by one of four inlet ports 23 to 26 formed in the cylinder head 15. Exhaust ports 27, 28 and 29 and inlet ports 30 and 31 are formed through the manifold 16. Exhaust passages 32 to 35 and inlet passages 36 to 39 are formed to extend through the axis of the rotor and are inclinded at an angle of approximately 40^{o} to the axis. The exhaust passages 32 to 35 and inlet passages 36 to 39 are radialy and axialy disposed through the rotor 18 so that rotation of the rotor 18, will bring the open ends of the passages 32 to 39 into communication with the ports 19 to 31. As shown in the illustration, the manifold and cylinder head exhaust ports 19 and 27 are in communication by way of the exhaust passage 32 allowing any products of combustion to be exhausted from the combustion chamber 11. The inlet passage 36 associated with the combustion chamber 11 extends through the axis of the rotor 18 so that at this stage in the engine cycle thre is no communication between the cylinder head fuel inlet ports 23 and the manifold fuel inlet port 30. However, the fuel inlet passage 37 associated with the combustion chamber 12, is arranged to communicate with the manifold fuel inlet port 30 and the cylinder head fuel inlet port 24 to allow the passage of fuel into the cylinder head 12. It will be realised that further rotation of the rotor 18, in the direction indicated by arrow A will disconnect passage 37 from ports 24 and 30 and progressively bring fuel inlet passage 36 into communications with combustion chamber fuel inlet port

23 and manifold fuel inlet port 30. Thus a single manifold inlet port 30 serves to supply two cylinder head inlet ports 23 and 24. The exhaust passages 33 and 34 are similarly arranged so that manifold exhaust port 28 sequentially communicates by way of the passages with ports 20 and 21. And inlet passages 38 and 39 serve to sequentialy communicate between manifold inlet port 31 and cylinder head inlet ports 25 and 26. The timing of opening and closing of the manifold and cylinder head ports is determined by the circumferential positioning of the openings of the passages in the rotor and the ports in the sleeve.

CLAIMS

1. A reciprocating internal combustion engine comprising a cylinder head and at least one combustion chamber; at least one inlet port and one exhaust port to be provided in the cylinder head for each of said combustion chambers; a rotary value gear, comprising a sleeve in which a rotor is sealingly received for synchronous rotation with the engine; a manifold having inlet ports and exhaust ports; inlet passages and exhaust passages extending through said rotor and arranged so that rotation of the rotor sequentialy and cyclically cases said inlet passages to communicaste between the manifold inlet ports and cylinder head inlet ports to permit the induction of fuel misture into the combustion chamber and cyclically causes the exhaust passages to communicate between the cylinder head exhaust ports and the manifold exhaust ports for the expulsion of exhaust products from the combustion chamber.

2. A reciprocating internal combustion engine as claimed in claim 1 wherein the rotor is an elongated rotor.

3. A reciprocating internal combustion engine as claimed in claim 1 or claim 2 wherein two or more of the inlet passages are arranged to align with a single manifold inlet port and two or more of the exhaust passages are arranged to align with a single manifold exhaust port, the engine being a multi-cylinder engine.

4. A reciprocating internal combustion engine as claimed in claim 3 wherein the inlet passages and the exhaust passages each extend through the axis of the rotor and are inclined thereto at an angle of approximately 40^{o}

5. A reciprocating internal combustion engine which is a petrol engine.

6. A reciprocating internal combustion engine as claimed in claim 1 substantially as hereinbefore described with reference to and as illustrataed in the accompanying drawings.

Published 1988 at The Patent Office, State House, 66-71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office, Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Multiplex techniques ltd, St Mary Cray, Kent. Con. 1/87.