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(54) Rotary valve IC engines

(57) Inlet and exhaust valves (24,25) each include a rotatable shaft (30,40), Fig. 2, with a bearing portion (31,41) which co-operates with a seat (32,42) formed in a cylinder head (12), each seat (32,42) being apertured and each bearing portion (31,41) having a cut-out (31A, 41A) to enable gases to flow into or out of the combustion chamber. The angular position of the cut-out is controlled in relation to piston travel by a belt drive arrangement (35,45). The cut-out may be bounded by one straight line (Fig. 1) or two intersecting straight lines (Figs. 3,4) to increase turbulence.

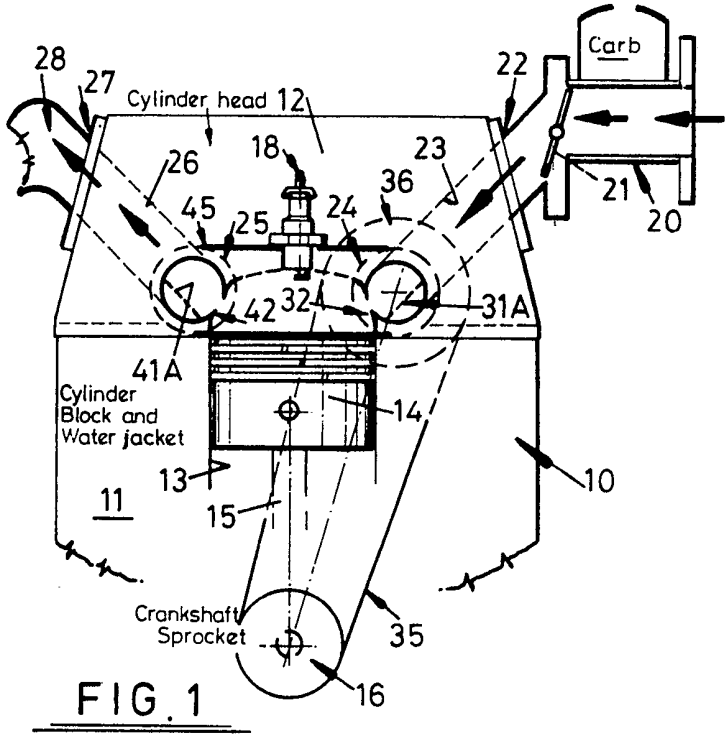

FIG. 1

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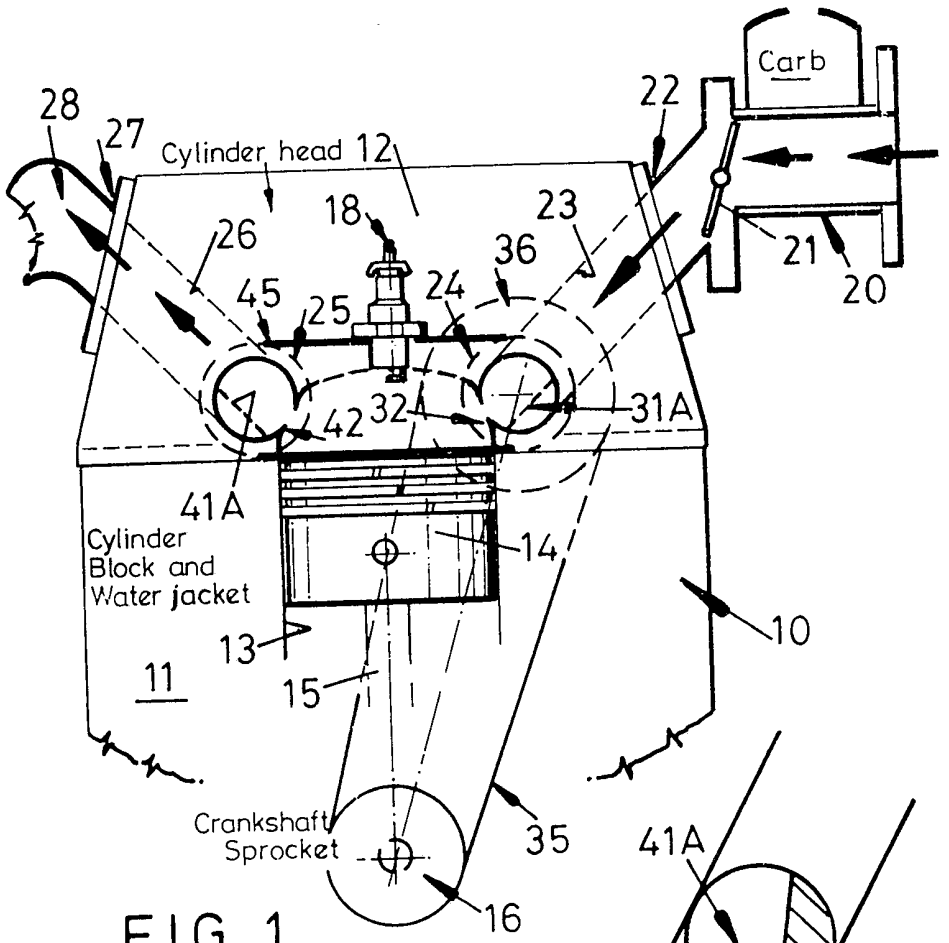

FIG. 1

FIG. 3

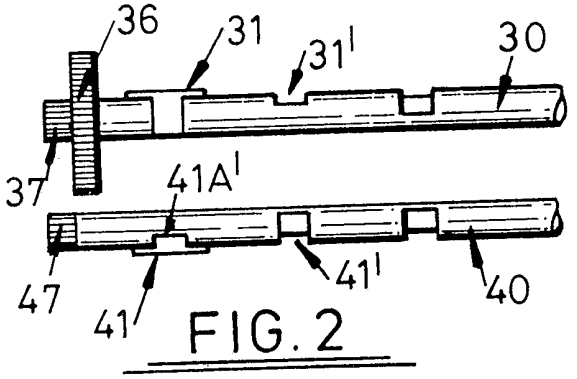

FIG. 2

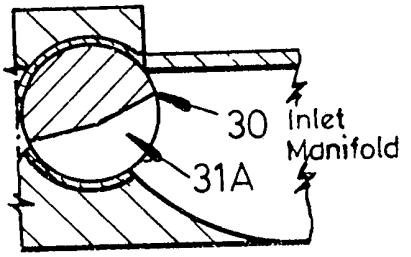

FIG. 4

SPECIFICATION

Internal combustion engines

This invention relates to internal combustion engines of the spark ignition and compression ignition types.

A known form of internal combustion engine is provided with one or more combustion chambers each having a valve arrangement for entry and exit of the combustible fuel. The arrangement usually comprises individual inlet and outlet valves of the spring-loaded poppet type which are opened by way of camshafts in timed relationship to the travel of a piston in each chamber.

This known form of engine suffers from a number of disadvantages. For example, it is noisy in operation; it is complicated to produce; it is inefficient in combustion of the fuel due to a lack of turbulence in the chamber; it has many moving components which each suffer from the effects of friction.

It is an object of the present invention to provide an improved form of internal combustion engine in which the foregoing disadvantages are obviated or mitigated.

According to the present invention there is provided an internal combustion engine comprising at least one combustion chamber having a piston reciprocally movable therein and a valve arrangement for entry and exit of the combustible fuel, characterised in that the valve arrangement comprises first and second rotatably mounted top shafts each having a bearing portion intermediate its ends co-operating with a sector-shaped seat formed in the wall of said chamber, each seat being apertured and each bearing portion of said top-shafts incorporating a cut-out whereby fluid flow into and out of the chamber is determined by the angular position of said top shafts, timing means being provided for controlling rotary motion of said top shafts in co-operation with the travel of said piston.

Preferably said first top shaft and said second top shaft have mutually parallel axes extending perpendicularly to the direction of reciprocal movement of said piston, the respective seats being diametrically opposed with respect to the chamber.

An embodiment of the present invention will now be described by way of example with reference to Figs. 1–4 of the accompanying diagrammatic drawing.

Figs. 1 and 2 illustrate an internal combustion engine 10 comprising a cylinder block 11 and cylinder head 12 containing a combustion chamber 13 with a piston 14 mounted therein for reciprocal movement and connected by connecting rod 15 to a crankshaft 16. The engine 10 is of the spark ignition type, the necessary spark being generated by means of spark plug 18 mounted in the cylinder head 12 and penetrating into the chamber 13 above the piston. Fuel is delivered to chamber 13 by means of a carburreter 20 incorporating butterfly valve 21 and enters the engine 10 at inlet port 22 being thereafter confined within passageway 23 within cylinder head 12. Passageway 23 and compression chamber 13 are interfaced by an inlet valve arrangement 24. Exhaust gases emitted from chamber 13 are ejected via an outlet valve arrangement 25 which interfaces chamber 13 and an exhaust gas passageway 26 which forms a port 27 at the surface of the cylinder head 12 to which an exhaust manifold system 28 is connected.

The valve arrangement 24 comprises a rotatably mounted top shaft 30 which is provided with a bearing portion 31 intermediate the ends of the shaft the bearing portion 31 co-operating with a sector shaped seat 32 formed in the cylinder head 12, seat 32 being apertured and bearing portion 31 incorporating a cutout 31A so that fuel fluid is enabled to flow into the chamber 13 when the angular position of top shaft 30 is such that cutout 31A co-operates with the aperture in seat 32. This angular position is controlled in relation to travel of piston 14 by a belt drive 35 extending between a sprocket on crankshaft 16 and a sprocket 36 on shaft 30.

In similar manner valve arrangement 25 comprises a top shaft 40 having a bearing portion 41 which co-operates with a seat 42 formed in the cylinder head 12 and apertured so as to communicate with the chamber 13. Bearing portion 41 is also provided with a cutout 41A whereby exhaust gas fluid flow between chamber 13 and passageway 26 is permitted when cutout 41A co-operates with the aperture in seat 42. Timing of the rotary motion of top shaft 40 relative to movement of piston 14 is effected by a belt drive 45 extending between sprockets 47 and 37 on the respective top shafts 40,30.

It will be appreciated that by virtue of the present invention the engine 10 is free of poppet valves, springs and valve operating camshafts so that friction is reduced. Furthermore because top shafts 30,40 extend parallel to each other in a direction which is perpendicular to the direction of reciprocal movement of the piston 14 and seats 32,42 are diametrically opposed with respect to the chamber 13 a desirable degree of fluid turbulence is created within chamber 13 enhancing the cross flow effect which results in greater combustion efficiency and scavenging exhaust gases from the chamber 13. The engine 10 is easier to produce than conventional engines and is quieter running.

It will be appreciated that the majority of modern day engines incorporate a plurality of aligned chambers 13 in the cylinder block 11 and by virtue of the present invention only a single shaft 30 need be provided with appropriate bearing portions 31, 31′ etc. spaced along its length. Similarly shaft 40 would be

provided with corresponding bearing portions 41, in this case, as is shown in Fig. 2.

The cut-outs 31A, 41A, may be of a linear nature as depicted in Fig. 2 or may be dual slope as depicted in Figs. 3 and 4 for the purpose of increasing turbulence.

The arrangement of the present invention provides the hidden benefit that because conventional engine valves are omitted the height of the engine, or at least that of the cylinder head, can be reduced by up to five inches and the currently existing problem of lean burning is mitigated or obviated.

CLAIMS

1. An internal combustion engine comprising at least one combustion chamber having a piston reciprocally movable therein and a valve arrangement for entry and exit of the combustible fuel, characterised in that the valve arrangement comprises first and second rotatably mounted top shafts each having a bearing portion intermediate its ends co-operating with a sector-shaped seat formed in the wall of said chamber, each seat being apertured and each bearing portion of said topshafts incorporating a cut-out whereby fluid flow into and out of the chamber is determined by the angular position of said top shafts, timing means being provided for controlling rotary motion of said top shafts in co-operation with the travel of said piston.

2. An engine as claimed in claim 1, wherein said first top shaft and said second top shaft have mutually parallel axes extending perpendicularly to the direction of reciprocal movement of said piston, the respective seats being diametrically opposed with respect to the chamber.

3. An engine as claimed in either preceding claim, wherein each cut-out extends linearly through the pertaining top shaft.

4. An engine as claimed in either of claims 1 or 2, wherein each said cut-out extends through the pertaining top shaft with a dual slope.

5. An internal combustion engine as claimed in claim 1, and substantially as hereinbefore described with reference to the accompanying drawings.

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