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(71) Applicant
John Leonard Bailey,
3 Dog Cottages, Peppard Common, Nr. Henley-on-Thames, Oxon RG9 5JX
(72) Inventor
John Leonard Bailey
(74) Agent and/or Address for Service
F. J. Cleveland and Company,
40—43 Chancery Lane,
London WC2A 1JQ

(54) A rotary valve mechanism for an internal combustion engine

(57) A housing (11) has an elongate cavity (12), inlet and outlet passageways (14, 15) and a rotatable member (16) having recesses (17) therein in the cavity. The housing (11) is located in sealed contact with an engine block (21) such that the cavity (12) is in communication with a combustion chamber (22) of the block (21). The arrangement is such that, during rotation, the rotary member (16) sequentially occludes the inlet and passageways (14, 15), effects communication of a passageway (14 or 15) and the chamber (22) through a recess (17) and subsequently occludes the passageway (14 or 15).

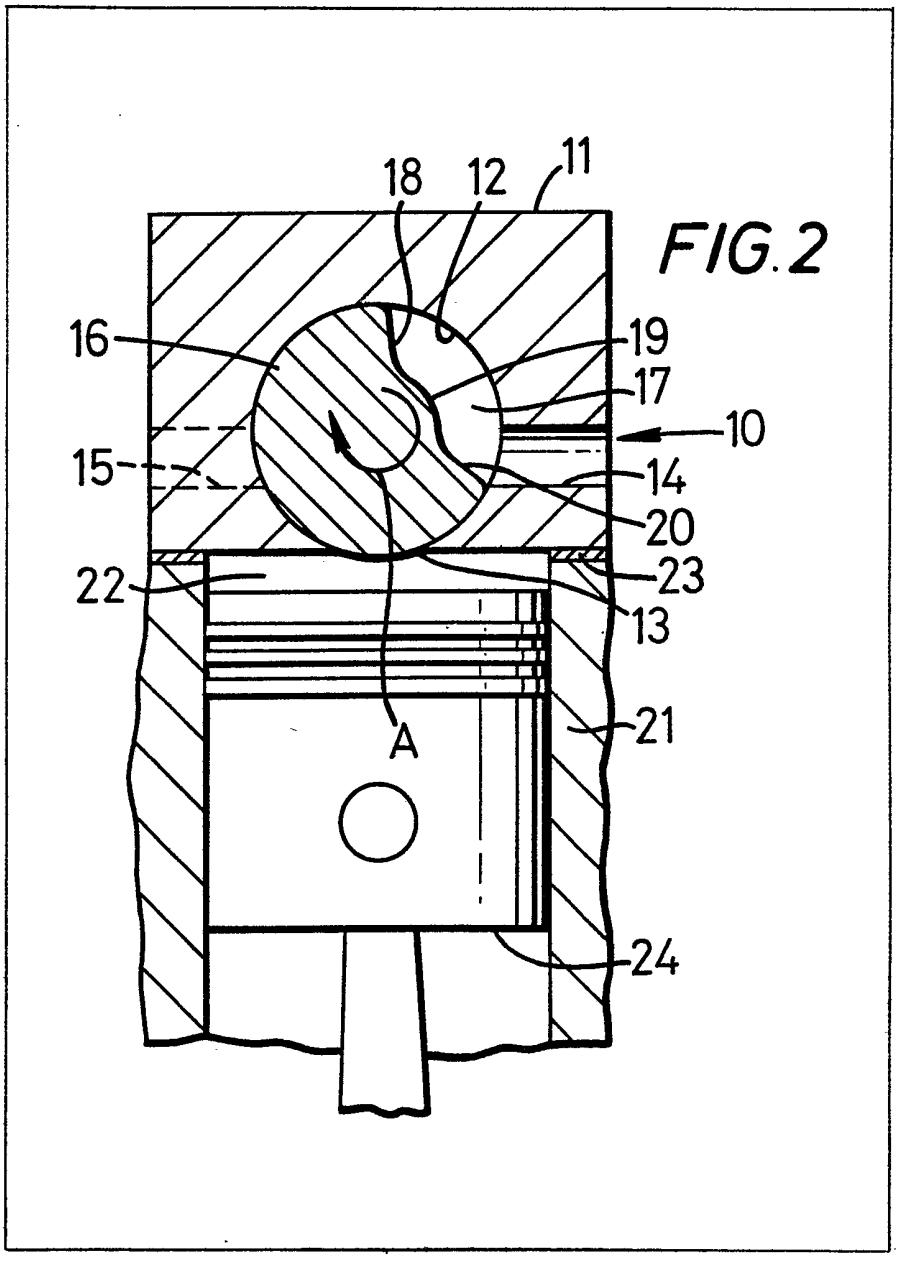

FIG.2

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

FIG.1

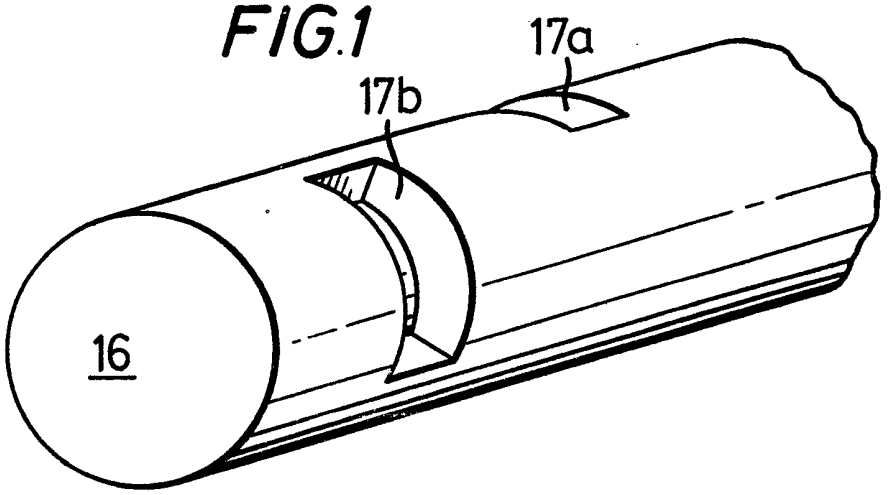
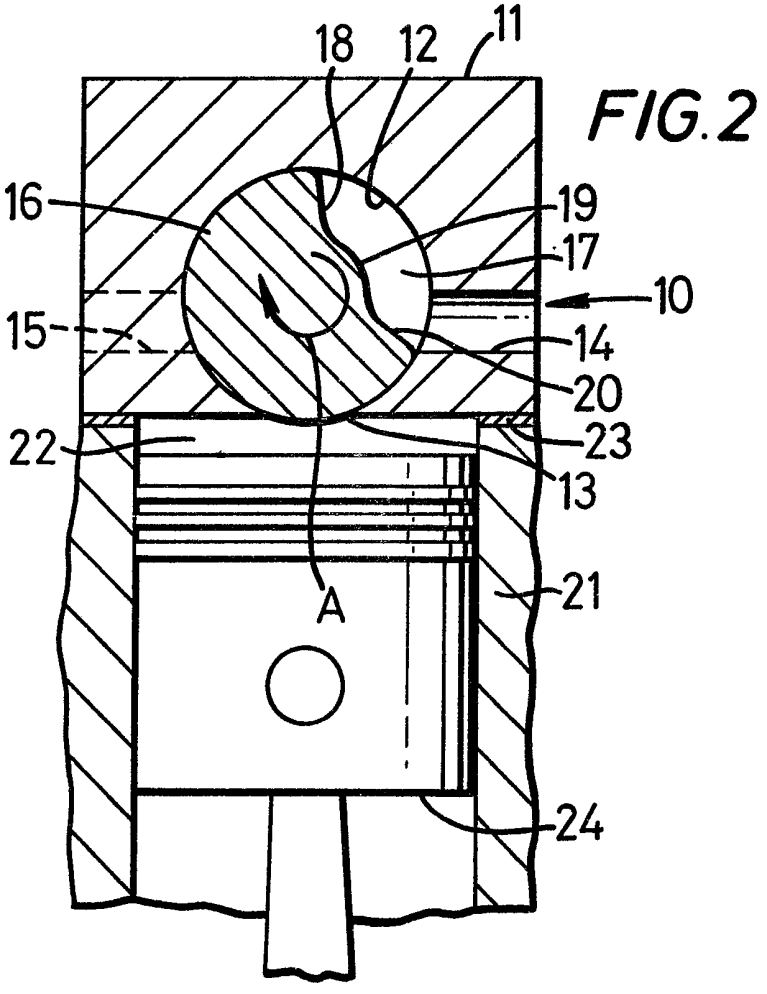


FIG.2



SPECIFICATION

A rotary valve mechanism for an internal combustion engine

This invention relates to a rotary valve mechanism for an internal combustion engine.

In spark ignition reciprocatory piston internal combustion engines control of gas entering and leaving combustion chambers of the engines is effected by reciprocatory valves. Operation of the valves is effected by means of cams on a cam shaft which engage rocker members on rotation of the cam shaft. Each rocker member oscillates on an axis such that an end of the rocker member engages a stem of a valve thereby moving the valve in a longitudinal direction of the stem against the bias of a valve spring.

The provision for each engine of a cam shaft, cams for the cam shaft, rocker members, valves and valve springs represents a considerable portion of the cost of manufacture of an engine.

It is desirable, therefore, to eliminate such components of an engine and thereby considerably reduce manufacturing costs and increase efficiency of the engine.

According to the present invention, there is provided a rotary valve mechanism for an internal combustion engine comprising a housing having a cavity and a passageway communicating with the cavity, the housing being adapted to co-operate with a combustion chamber of the engine so that the cavity is in communication with the chamber, and a member rotatable in the housing, the rotatable member having a recess extending radially inwardly from an outer surface of the rotatable member towards an axis of rotation thereof so that, during rotation, the rotary member sequentially occludes the passageway, effects communication of the passageway and the chamber through the recess and subsequently occludes the passageway.

The housing may be provided with a plurality of passageways each for communicating with a corresponding one of a plurality of combustion chambers of the engine and the rotary member may be provided with a plurality of recesses each for communicating a corresponding one of the passageways with a corresponding one of the chambers on rotation of the rotary member in the housing.

The recesses may be angularly spaced from one another relative to the said axis.

Each recess may comprise a radially inwardly extending first wall contiguous with a convex base, the base being contiguous with a radially outwardly extending second wall.

Following is a description, by way of example only and with reference to the accompanying drawings, of one method of carrying the invention into effect.

In the drawings:—

FIGURE 1 is a diagrammatic perspective view of a rotary member of a rotary valve in accordance with the present invention, and

FIGURE 2 is a diagrammatic cross-section of the valve shown co-operating with a combustion chamber of an internal combustion engine.

Referring now to the drawings, a rotary valve mechanism 10 comprises a housing 11 having an elongate cavity 12. The housing 11 is provided with a plurality of apertures, one of which is shown at 13, spaced longitudinally of the cavity 12 one from another, a plurality of parallel inlet passageways, one of which is shown at 14, spaced longitudinally of the cavity 12 one from another and a plurality of parallel outlet passageways one of which is shown at 15 spaced longitudinally of the cavity 12 one from another. The central longitudinal axes of the inlet passageways 14 and the outlet passageways 15 extend substantially radially of the cavity 12 and in the same plane, which plane extends at 90° to a plane containing central longitudinal axes of the apertures 13. The central longitudinal axes of the outlet passageways 15 are spaced longitudinally of the cavity 12 relative to adjacent central longitudinal axes of the inlet passageways 14 and the outlet passageways 15 are located on an opposite side of a central longitudinal axis of the cavity 12 from the outlet passageways 14 and are located alternately with the inlet passageways 14 longitudinally of the cavity 12.

The cavity 12 has located therein an elongate cylindrical member 16, a central longitudinal axis of which is co-axial with the central longitudinal axis of the cavity 12. The cylindrical member 16 is rotatable in the cavity 12 on the central longitudinal axis thereof and is driven from a drive source (not shown). The rotary member 16 is provided with a plurality of recesses spaced one from another longitudinally of the rotary member 16, the recesses being grouped in pairs each pair comprising an 'induction' recess 17a and an 'exhaust' recess 17b and each induction recess 17a being spaced angularly from the exhaust recess 17b of each pair relative to the axis of rotation of the rotary member 16. Each recess 17a, 17b comprises a radially inwardly extending first wall 18, a convex base 19 contiguous with the first wall 18 and a radially outwardly extending second wall 20 contiguous with the base 19. The apertures 13 also are grouped in pairs each pair comprising an 'induction' aperture 13 and an 'exhaust' aperture 13 and the arrangement is such that the induction recesses 17a correspond with the inlet passageways 14 respectively and the induction apertures 13 respectively and the exhaust recesses 17b correspond with the outlet passageways 15 respectively and the exhaust apertures 13 respectively.

The valve mechanism 10 is located on a block 21 of an internal combustion engine and arranged such that each pair of the induction and exhaust apertures 13 is located juxtaposed a corresponding one of the combustion chambers 22 of the block 21. The housing 11 seats on a gasket 23 located on top of the block 21 whereby the housing 11 and the block 21 are maintained in hermetically sealed contact one with another. Each combustion chamber 22 is provided with a

piston, one of which is shown at 24.

Drive to the rotary member 16 is synchronised with rotation of a crank shaft (not shown) of the engine such that rotation of the rotary member 16 in the cavity 12 is synchronised with reciprocatory motion of the pistons 24. Considering the combustion chamber 22 shown in Figure 2, the arrangement is such that, as the piston 24 moves downwardly during an induction stroke, the second wall 20 of the induction recess 17a sweeps past the corresponding induction aperture 13 and the inlet passageway 14 therefore is in communication with the combustion chamber 22 through the induction recess 17a while the corresponding exhaust aperture 13 remains occluded by the rotary member 16. In consequence, fuel/air mixture is drawn into the combustion chamber 22 through the inlet passageway 14, the induction recess 17a and the induction aperture 13 due to negative pressure caused by downward movement of the piston 24.

As the piston 24 commences a return upward compression stroke, the first wall 18 of the induction recess 17a has moved past the inner end of the inlet passageway 14 thereby occluding the inlet passageway 14. During the compression stroke, therefore, each of the passageways 14 and 15 and the induction and exhaust apertures 13 is occluded by the rotary member 16.

Although not shown in the drawings, the combustion chamber 22 is provided with a spark device which ignites the compressed gas in the combustion chamber 22 with a result that the piston 24 is driven downwardly in a power stroke subsequent to the upward compression stroke.

During the subsequent upward exhaust stroke of the piston 24, the second wall 20 of the exhaust recess 17b moves towards the inner end of the outlet passageway 15 and as the piston 24 moves upwardly of the combustion chamber 22 in effecting an exhaust stroke, the second wall 20 of the exhaust recess 17b passes beyond the inner end of the outlet passageway 15 while the first wall 18 of the exhaust recess 17b continues to move towards the exhaust aperture 13. The outlet passageway 15 therefore is in communication with the combustion chamber 22 and the exhaust gases are driven from the combustion chamber 22 through the exhaust recess 17b and outwardly through the outlet passageway 15.

The process continues while the engine continues to operate.

It will be appreciated that the degree of angular displacement of one pair of recesses 17a and 17b relative to an adjacent pair is determined by the firing order of the engine.

It will also be appreciated that a rotary valve mechanism in accordance with the present invention may be adapted for use with apparatus other than an internal combustion engine for example, a pump mechanism or a compressor.

CLAIMS

1. A rotary valve mechanism for an internal combustion engine comprising a housing having a cavity and a passageway communicating with the cavity, the housing being adapted to co-operate with a combustion chamber of the engine so that the cavity is in communication with the chamber, and a member rotatable in the housing, the rotatable member having a recess extending radially inwardly from an outer surface of the rotatable member towards an axis of rotation thereof so that, during rotation, the rotary member sequentially occludes the passageway, effects communication of the passageway and the chamber through the recess and subsequently occludes the passageway.

2. A rotary valve mechanism as claimed in Claim 1 wherein the housing is provided with a plurality of passageways each for communicating with a corresponding one of a plurality of combustion chambers of the engine and the rotary member is provided with a plurality of recesses each for communicating a corresponding one of the passageways with a corresponding one of the chambers on rotation of the rotary member of the housing.

3. A rotary valve mechanism as claimed in Claim 2 wherein the recesses are angularly spaced from one another relative to the said axis.

4. A rotary valve mechanism as claimed in Claim 2 or Claim 3 wherein each recess comprises a radially inwardly extending first wall contiguous with a convex base, the base being contiguous with a radially outwardly extending second wall.

5. A rotary valve mechanism for an internal combustion engine substantially as hereinbefore described and as illustrated in the accompanying drawing.

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