

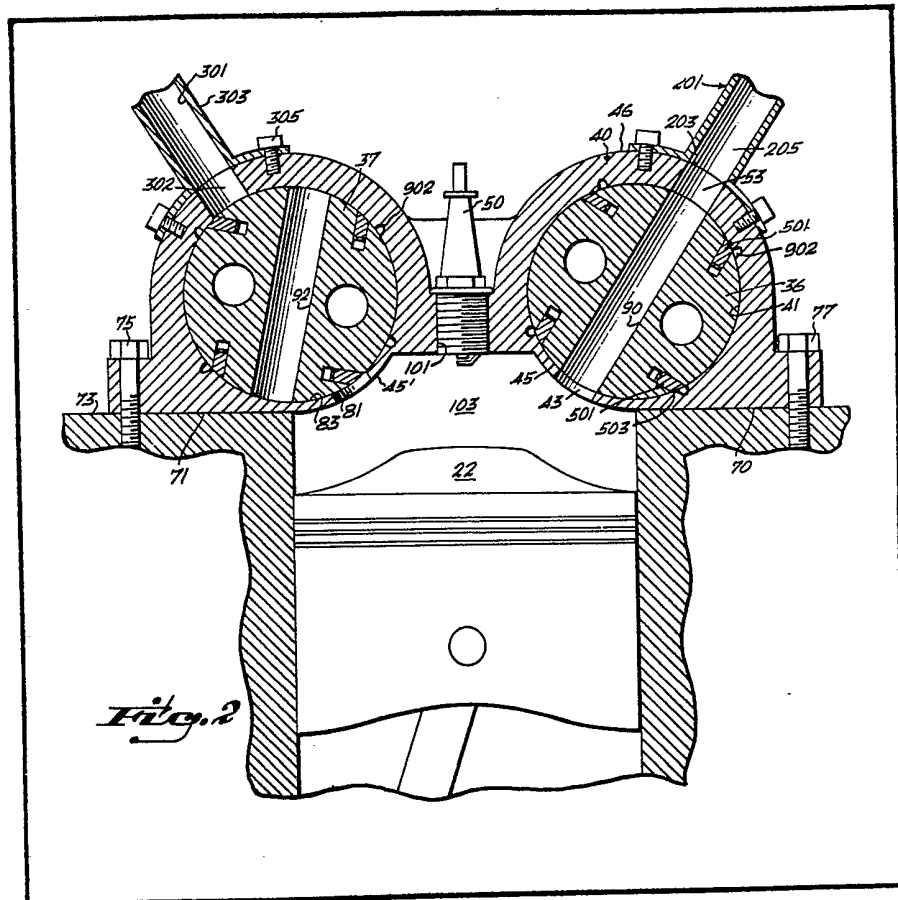
(12) UK Patent Application (19) GB (11) 2 028 920 A

- (21) Application No 7929009
- (22) Date of filing 21 Aug 1979
- (23) Claims filed 21 Aug 1979
- (30) Priority data
- (31) 937147
- (32) 28 Aug 1978
- (33) United States of America (US)
- (43) Application published 12 Mar 1980
- (51) INT CL³ F01L 7/02
- (52) Domestic classification F1B 2Q1C 2Q5B 2Q9
- (56) Documents cited GB 1496282 GB 966657 GB 673560 GB 483726 GB 456610
- (58) Field of search F1B
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(54) Rotary Engine Valve

(57) The valve shaft has a diametrical passageway (90) of a cross-sectional area slope which, in the direction of

the shaft axis, is at least as great as the radius of the engine cylinder, and circumferentially is a distance substantially equal to one-sixteenth of the circumference of the shaft.



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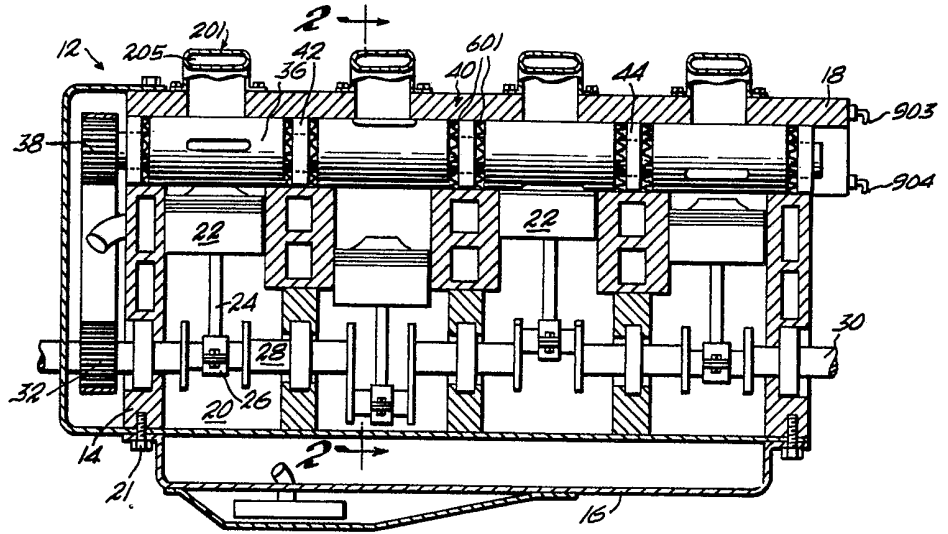


Fig. 1

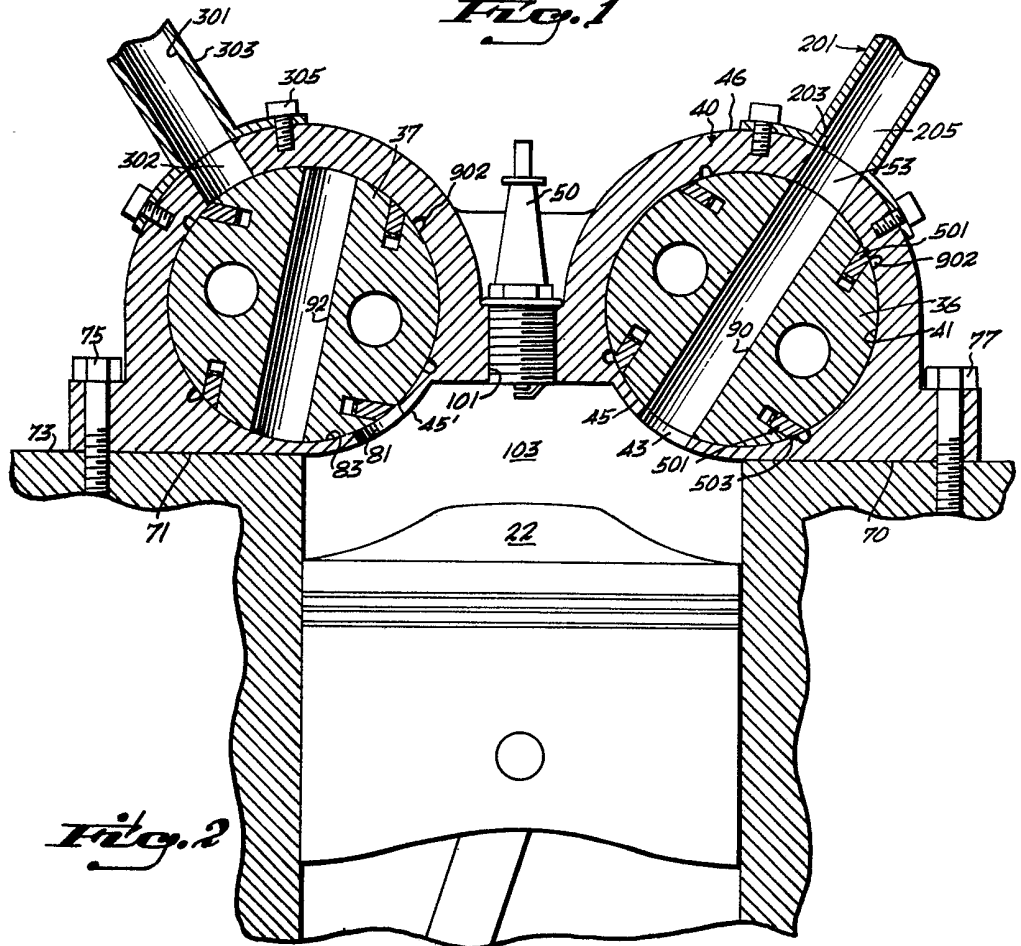


Fig. 2

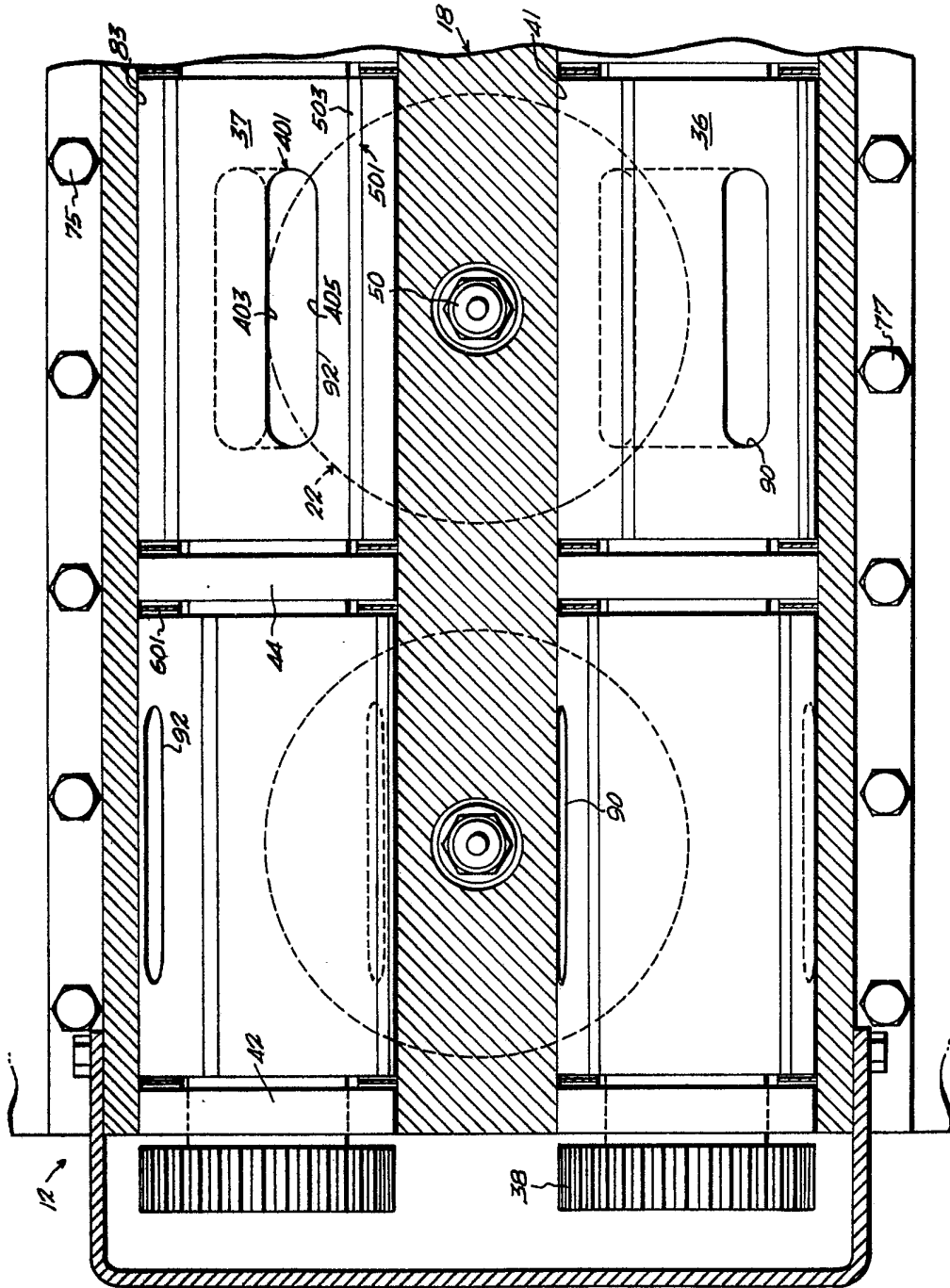


Fig. 5

SPECIFICATION Rotary Engine Valve

This invention relates to an improved valve means for internal combustion engines.

5 In the past there have been numerous types of valving arrangements for internal combustion engines. This invention is of a shaft-type valve wherein there are diametrical passageways arranged in the shaft which spans the cylinder
10 and through which intake and exhaust takes place and wherein the openings or holes in the shaft are of predetermined size and this size in the circumferential distance is substantially equal to 1/16 of the circumference of the shaft, as is set
15 forth more fully hereinafter.

The rotary valve is different from prior art valves in that a direct travel of intake and exhaust is through the shaft which allows a continuous rotary motion of the shaft with correct timing for a
20 four cycle piston engine. The timing is possible because the width circumferentially of the opening is substantially 1/16 of the circumference of the shaft. The problems of prior art rotary valves are primarily that they do not seal an
25 explosive mixture and allow gas to escape. The shaft of the instant invention has both longitudinal and circular seals to prevent gas from escaping.

The advantages of the instant invention are the
30 elimination of valve springs and poppet type valves that currently require in the order of about 10% or more of the delivered or produced horse power of the engine. There is a direct and unobstructed intake and exhaust flow and no
35 valve face in the path of the mixture as in current engines. The components are of a structure which permits them to be very strong and there is a reduction in the number of working parts by reason of the utilization of the instant invention.
40 The system is adaptable for virtually all four cycle piston engines and is adapted to work well with fuel injection and stratified charge heads. It is also useful for diesel fuel where very high compression ratios are required. The shafts and seal of the
45 instant invention replace a large number of parts, estimated to be in the range of about 80, which are normally utilized to accomplish the same effect in a normal V8 engine reducing the expense of such engines. Because of the rotary movement
50 and because of the elimination of valve springs, the engine is capable of turning at increased rpm's with a resultant higher horse power from the same displacement. Also, when used with the stratified charge type engine, the rich charge
55 chamber can be shaped more efficiently than with normal engines which yields a greater degree of horse power for less polluting gases since the same are combusted more thoroughly.

It is an object of this invention to provide a
60 device of the type described hereinafter which is simple and inexpensive to manufacture, highly useful in operation, efficient, and calculated to reduce pollution.

In order that the invention may be more readily

65 understood, one embodiment thereof will now be described with reference to the accompanying drawings in which:

Figure 1 is a side elevation view in cross section of an internal combustion engine of the
70 four cycle type;

Figure 2 is a partial view taken on the plane indicated by the line 2—2 of Figure 1 and looking in the direction of the arrows;

Figure 3 is a plan view in cross section of the
75 upper zone of Figure 1.

Referring to Figure 1, there is shown an internal combustion engine generally designated by the numeral 12. It is composed of a block 14 having a lower end spanned by an oil pan 16 in
80 open communication with the lower end of cylinders, such as that designated by the numeral 20 with the oil pan being secured to the block by suitable means, such as the bolt 21. The upper end of the block is provided with a head 18.

85 Within the block, pistons 22 are reciprocal in the cylinder 20, for example, being connected by a rod, such as that designated by the numeral 24 to a crank shaft 28 as at 26, and, specifically, to an eccentric portion thereof. The end 30 of the crank shaft is connected by a suitable means to a power takeoff and, at the other end, 32, a gear or other drive means is provided for engaging a belt, chain, or other type of force transmission means to the gear 38 on the end of a shaft 36 supported in
90 spanning relation of the side of the upper end zone of the cylinders and being supported such as by bearings 42 and 44 captivated between the upper portion 40 of the head 18 and the block. With respect to Figure 2, the shaft 36 is rotatable
95 within a tunnel through the head, generally designated by the numeral 41 and wherein there is an opening on the opposite sides in diametrical relation as at 43 and 53. As is clearly shown in Figure 2 in the preferred embodiment, the head is provided with a pair of coplanar surfaces 70 and
100 71 which abut the upper surface 73 of the block and are suitably secured thereto as by the bolts 75 and 77. The upper portion 40 of the head which spans the piston cylinders is elevated, as at 46 in the central longitudinally extending zone and curves downwardly and outwardly to the portions 70 and 71 on the block 73 as designated by the numerals 45 and 45' and through which
105 the opening 43 is located in the case of the shaft 36. On the opposite side of the cylinder there is also an opening in the head as at 81 and a tunnel 83 is defined in the head and a shaft 37 is rotatable therein in a manner similar to that referred to above in connection with the shaft 36.
110 Each of the shafts has a through bore as at 90 and 92 which is diametrical and extends completely across it and is of a diameter which is substantially one-sixteenth of the circumference of the shaft, one of which will be referred to as the intake shaft and one of which will be referred to as the output shaft. Through the central portion of the head a bore 101 is provided for a spark plug 50 which will be utilized to ignite a fuel mixture which will be introduced and exhausted into the
125

chamber 103 in a manner which will now be described.

Referring to the shaft 36, the one on the right in Figure 2, this will be referred to as the intake shaft and it serves as an intake valve. A fuel and air mixture is introduced into the hood 201 having the opening 203 leading into the tunnel so that when fuel and air are introduced through the opening 205, and the shaft is lined up with the opening 53, fuel will pass through and out the opening 43 and into the chamber 103. As the shaft rotates, however, this passageway will be closed; and at that time a spark will be ignited as at 50 which will cause an explosion driving the piston 22 downwardly and, on its uptake stroke, the hole 92 in the shaft 37 will have rotated into alignment with the hole 302 in the hood 303 which is bolted as at 305 to the upper end of the head and the upwardly moving piston will cause the gases to exhaust through the opening 81 and diametrical passageway 92 through the shaft 37 to exit through the hole 301. Referring now to Figure 3, it is seen that the passageways 90 and 92 of the cylinder 20 are elongated, that is, each has a substantial axially extending mouth to mate with the diametrical size of the cylinder.

Referring further to Figure 3, and particularly to the opening designated by the numeral 401 for convenience, it is seen that this opening in the shaft is one-sixteenth of the circumference of the shafts 36 and 37, which are equal in the preferred embodiment, i.e., the distance between the relatively long sides 403 and 405, and these are sized to cover approximately 80% of the diameter of the cylinder and piston and preferably at least as great as the radius of the cylinder. This is true with respect to each of the diametrical passageways through the shafts comprising the rotary valves. Seal means are provided on each of the shafts. These seal means are of two types: As shown in Figure 2, circumferential slots which extend in the cord direction are provided; and in each there is received a seal member 501 comprising a bar having an outer surface 503 in engagement with the inner surface of the head at all times in rotation and this provides a sweeping action against the inner surface of the head providing seal means to prevent blow by. Additional seal means are provided between each of the cylinders and between the bearings, as shown in Figure 1, 42 and the enlarged portion of the shaft 36, this seal means being designated by the numeral 601 and resisting any type of blow by axially. These seal means may resemble conventional piston rings and are seated in

grooves located appropriately in the shafts.

In the preferred embodiment longitudinally extending passageways are provided in the groove for lubrication between the exterior surface of the shaft and the interior surface of the tunnel through the head, as indicated by the numeral 902, which are suitably fed as by oil lines 903, 904.

This invention finds use in four cycle (Otto cycle) internal combustion engines.

Suitable openings, shown through the shafts, and in the engine block are provided for water cooling of the same.

Claims

1. For an internal combustion engine of the type having a block defining at least one cylinder and including a head spanning the cylinder and a piston recipricable with respect to the head in the cylinder, valve means in the head comprising, a shaft journaled in the head and having a shaft portion spanning a portion of the cylinder and said shaft having a diametrical passageway characterized by a cross sectional area parallel to the centerline of the shaft which is at least as great as the radius of the cylinder and circumferentially is of a distance substantially equal to one-sixteenth of the circumference of the shaft and seal means between said shaft and the head, and a crank shaft connected to the piston and force transmission means interconnecting the crank shaft, the shaft comprising said improved valve means.

2. The device as claimed in claim 1, wherein said seal means comprise radially extending seal members longitudinally arranged in recesses in said shaft.

3. The device as claimed in claim 1 or 2, wherein a pair of said shafts are provided in combination with an internal combustion engine and said shafts span a cylinder.

4. A rotary shaft for an internal combustion engine having a diametrical through hole of a cross sectional area circumferentially equal to 1/16 of the circumference of the shaft.

5. The device as claimed in claim 1, 2 or 3, wherein longitudinally extending slots are provided depthwise in said shaft and seal means are arranged in said recesses.

6. A rotary engine valve substantially as hereinbefore described.

7. An internal combustion engine provided with one or more valve means, devices or shafts as claimed in any preceding claim.