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ROTARY VALVE CONSTRUCTION

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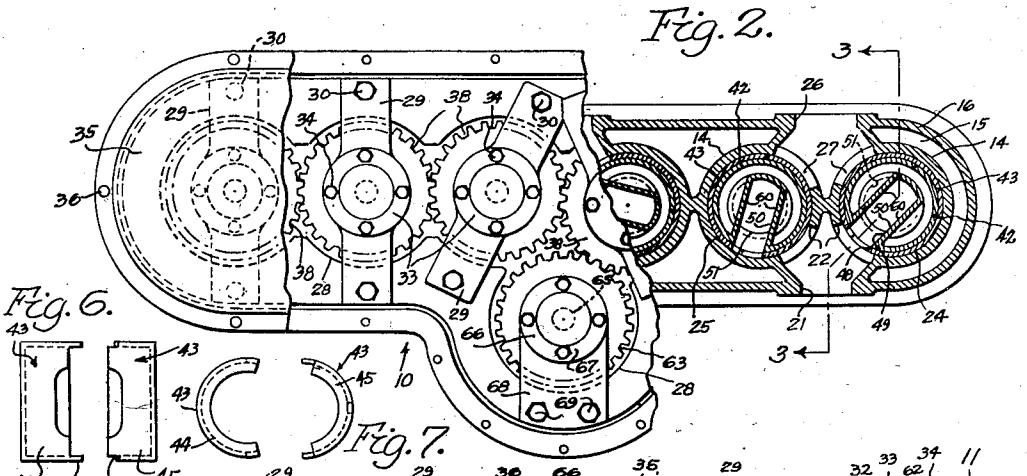

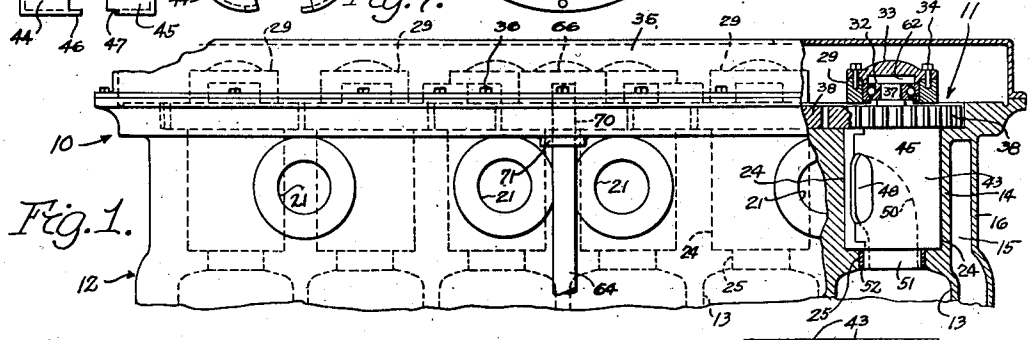

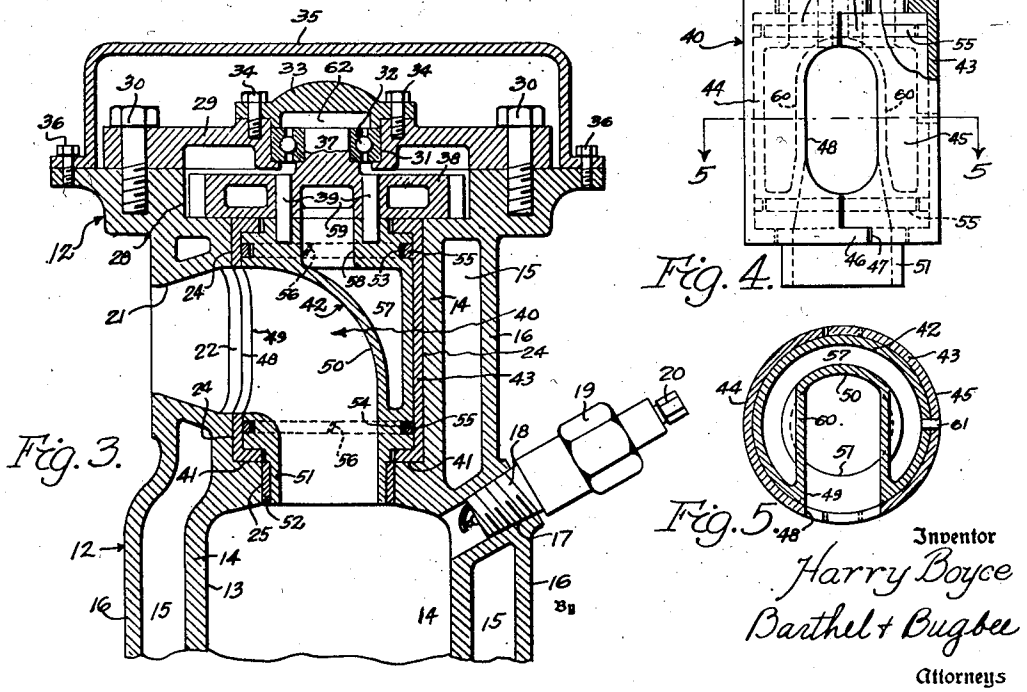

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ROTARY VALVE CONSTRUCTION

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2 Claims. (Cl. 123—80)

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This invention relates to internal combustion engines and, in particular, to rotary valve mechanisms for such engines.

One object of this invention is to provide an improved rotary valve construction for an internal combustion engine which is of superior gas tightness yet which operates with a minimum of friction or noise.

Another object is to provide a rotary valve construction for an internal combustion engine wherein the rotary valve member is surrounded by a split bearing and packing sleeve which is urged against its surrounding bore by resilient rings, thereby centering the valve member at top and bottom and causing only a light pressure to be exerted against the valve bearing.

Another object is to provide a rotary valve construction for such engines wherein centrifugal force arising during the operation of the rotary valve member assists in keeping its split bearing sleeve in contact with the walls of the valve bore in which it rotates.

In the drawings:

Figure 1 is a fragmentary side elevation of the upper portion of an internal combustion engine equipped with a rotary valve mechanism, according to a preferred form of the invention, partly broken away to disclose the rotary valve member and its bearing sleeve in side elevation within the valve bore;

Figure 2 is a top plan view of the rotary valve engine shown in Figure 1, partly broken away to show the valve rotating gearing, and still further broken away to show the ports within the rotary valve mechanisms;

Figure 3 is a vertical section along the broken line 3—3 in Figure 2 showing the rotary valve member in communication with the intake port;

Figure 4 is a side elevation of the rotary valve member and bearing sleeve, partly in section, to disclose the internal construction thereof;

Figure 5 is a horizontal section through the rotary valve member and bearing sleeve, taken along the line 5—5 in Figure 4;

Figure 6 is a side elevation of the bearing sleeve employed in the rotary valve mechanism of this invention, with the parts slightly separated; and

Figure 7 is a top plan view of the split bearing sleeve shown in Figure 6.

The present invention is an improvement upon the rotary valve construction shown in my United States Patent No. 1,208,468 issued December 12, 1916, for Valve construction, in that it accomplishes a greater degree of gas tightness and also facilitates the rotation of the rotary

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valve member. The present invention provides a split bearing and packing sleeve for the rotary valve member which is resiliently urged against contact with the walls and centrifugal force also assists in keeping the sleeve in the valve bore. The present invention centers the rotary valve member at top and bottom so that only a light pressure is exerted against the valve bearing, thus eliminating the squeaks of previous rotary valves.

Referring to the drawings in detail, Figures 1 and 2 show the upper portion of an internal combustion engine, generally designated 10, equipped with a rotary valve mechanism generally designated 11, according to a preferred form of the invention. The internal combustion engine 10 includes a cylinder block generally designated 12, only the upper portion of which is shown, having a cylinder bore 13, the inner wall 14 of which is surrounded by a cooling chamber or water jacket 15 having an outer wall 16 (Figure 3). Extending through the walls 15 and 16 is a threaded bore 17 for the reception of the threaded end 18 of a conventional spark plug 19, the central terminal 20 of which is connected to the usual spark timing mechanism (not shown).

The cylinder block 12 for each pair of cylinders is provided with twin-branched intake passageway 21 communicating with a pair of intake ports 22 (Figure 2) leading to a pair of valve bores 24. Each valve bore 24 extends downward and has a counterbore 25 communicating with each respective cylinder bore 13. Each pair of cylinders is also provided with similar twin-branched exhaust passageway 26 communicating with a pair of exhaust ports 27 leading to the opposite sides of the same valve bores 24 (Figure 2). Each valve bore 24 at its upper end opens into a gear chamber 28 which is closed by a bridge member 29 bolted as at 30 to the cylinder block 12. The central portion of each bridge member 29 is bored as at 31 to receive the outer race of an anti-friction bearing 32 held in place by a cap 33 bolted as at 34 to the bridge member 29. The entire assembly of bridge members 29 and their associated parts are closed by cover 35 bolted as at 36.

Journaled in the anti-friction bearing 32 is the hub 37 of a gear 38 (Figure 3) which is pinned or otherwise secured as at 39 to a rotary valve and bearing unit generally designated 40 (Figure 4). The unit 40 snugly fits the valve bore 24 so as to be rotatable therein, and also engages the annular shoulder 41 between the valve bore 40 and counterbore 25.

The rotary valve and bearing unit 40 consists of a central approximately cylindrical tubular valve member 42 surrounded by a split bearing and packing sleeve 43 consisting of mating halves 44 and 45 having overlapping tongues 46 and recesses 47 (Figure 6 and 7). The bearing sleeve 43 and the valve member 42 are provided with aligned openings 48 and 49 (Figure 5), the latter opening into an elbow-shaped valve passageway 50 leading downward into the upper end of the cylinder bore 13. Above its junction with the cylinder bore 13, the valve member 42 is provided with a reduced diameter portion 51 which extends downward through the counterbore 25 and is separated therefrom by a bearing sleeve 52 (Figure 3).

The valve member 42 is provided above and below the openings 48 and 49 with annular grooves 53 and 54 respectively adapted to receive split expanding rings 55 with gaps 56 therein. The valve member 42 is also provided with a chamber 57 which leads upward through a passageway 58 to a chamber 59 in the gear 38. Between the chamber 57 and the passageway 50 the valve member 42 is provided with internal side walls 60 (Figure 5). The split bearing sleeve 43 and valve member 42 are bored to receive a locating pin 61 (Figure 5) which prevents the parts from turning relatively to one another. The cap 33 is provided with a lubricant chamber 62 above the anti-friction bearing 32 and leading through it into the gear chamber 28, so that a supply of lubricant placed in the chamber 62 by removing the cap 33 works its way downward through the anti-friction bearing 32 into the gear chamber 28.

The gears 38 mesh with one another (Figure 2) so as to be driven simultaneously up on the application of power to one of them. In order to facilitate driving the gears 38, the three left-hand cylinders in Figure 2 are slightly offset relatively to the three right-hand cylinders, and a main driving gear 63 is provided meshing with the nearest gear 38 of the three right-hand cylinders. The gear 63 is mounted near the upper end of a vertical shaft 64, the upper end of which is journaled in a bore 65 (Figure 2) in a cap 66 bolted as at 67 to a bearing bracket 68 which in turn is bolted as at 69 to the cylinder block 12. Immediately below the gear 63 the shaft 64 is journaled in a bore 70 (Figure 1) part of which extends through a bearing boss 71. The lower end of the shaft 64 is connected through suitable and conventional gearing to the crankshaft of the engine so as to be rotated in timed relationship therewith. The cylinder bores 13 are provided with conventional pistons and connecting rods (not shown) connected to the crankshaft in the usual way.

The intake and exhaust passageways 21 and 26 are connected respectively to conventional intake and exhaust manifolds (not shown). The intake manifolds are in turn connected to a suitable carburetor or other fuel mixing or atomizing device of any suitable conventional pattern, the details of which form no part of the present invention.

In the operation of the invention, fuel, such as gasoline, mixed with air by the carburetor, is drawn into the intake passageway 21 and thence through the ports 22 and passageway 50 into the upper end of each cylinder in response to the suction created by the descent of each piston in each cylinder bore 13. The valve units 40 are so arranged in the valve bores 24 in conjunction with the gears 38 and 63 that the ports or openings 48 and 49 in the valve member 42 and sleeve 43 respectively arrive opposite their ports 22 to draw in a fuel gas charge at the proper point in the operating cycle. As the piston rises to compress the charge, the valve unit 40 rotates to close the ports 22 of certain of the cylinders during the remainder of the upstroke of the piston.

When the piston nears the top of its stroke, the spark timing mechanism energizes the spark plug terminal 20 with high tension electricity, causing a spark to jump between its electrodes and igniting the compressed charge in the upper end of the cylinder bore 13. The charge thereupon explodes and forces the piston downward, causing the crankshaft and shaft 64 to rotate until the valve unit openings 49 and 48 arrive opposite the exhaust ports 27 as the piston reaches the bottom of its stroke. As the piston moves upward, it forces the burnt gases out through the exhaust ports 27 and exhaust passageways 26 into the exhaust manifold and thence to the conventional muffler, if used. This cycle repeats itself indefinitely as long as fuel and electricity are supplied to the motor.

Thus, the invention provides a four cycle motor with a rotary valve mechanism which is efficient and dependable. The split spring rings 56 are urged outward by their resilience and in turn urge the opposed halves 44 and 45 of the split bearing sleeve 43 in opposite directions into sealing contact with the valve bore 24. Centrifugal force generated during the operation of the engine by the rotation of the valve unit 40 also urges the sleeve halves 44 and 45 outward away from one another, enhancing the resilience of the split rings 56.

What I claim is:

1. A rotary valve construction for an internal combustion engine having a rotary shaft and a cylinder with a valve bore and spaced intake and exhaust ports, said valve construction comprising a rotary valve member rotatably mounted in said valve bore and having a passageway therein selectively connecting said cylinder to said ports in response to the rotation of said valve member, mechanism operatively connecting said valve member with said shaft for rotation in timed relationship therewith, a split sleeve having complementary separable halves with overlapping stepped end portions disposed between said valve bore and said valve member and encircling said valve member, and a resilient sleeve expander disposed between said valve member and said sleeve, said sleeve expander comprising an annular spring member encircling said valve member and engaging and urging said sleeve outward.

2. A rotary valve construction for an internal combustion engine having a rotary shaft and a cylinder with a valve bore and spaced intake and exhaust ports, said valve construction comprising a rotary valve member rotatably mounted in said valve bore and having a passageway therein selectively connecting said cylinder to said ports in response to the rotation of said valve member, mechanism operatively connecting said valve member with said shaft for rotation in timed relationship therewith, a split sleeve having complementary separable halves with overlapping stepped end portions disposed between said valve bore and said valve member and encircling said valve member, and a resilient sleeve expander disposed between said valve member and said sleeve, said sleeve expander comprising a pair of longitu-

dinally-spaced annular spring members encircling said valve member and engaging and urging said sleeve outward.

HARRY BOYCE.

REFERENCES CITED

The following references are of record in the file of this patent:

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