

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in Rotary Valve Internal Combustion Engines

We, ROLAND CLAUDE CROSS, a British Subject, and CROSS MANUFACTURING COMPANY (1938) LIMITED, a British Company, both of the Company's address at 33, Midford Road, Combe Down, Bath, Somerset, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to internal combustion engines of the type in which one or each of a series of parallel cylinders is adapted to be displaced axially in relation to the crank-shaft, particularly during the explosive stage of the working cycle, by the rise of pressure of the gaseous combustion charge within the cylinder, into close sealing contact with the exterior surface of a rotary cylindrical distributing valve disposed at right angles to the cylinder axis.

Engines of this type have generally been provided with a rotary cylindrical valve accommodated in a longitudinally split housing which surmounts the cylinder, with the lower part of the housing made rigid with the cylinder so as to have with the cylinder a certain amount of resilient movement in relation to the upper part of the housing, hereinafter referred to as the cap. Examples of engines having these characteristic features are described in the Specifications of our United Kingdom Patents Nos. 448,368, 451,917 and 467,620.

The reaction to the thrust imposed on the rotary distributing valve when the cylinder is forced into sealing contact therewith has, in general, been provided by the cap of the split valve housing, this being attached to the crank-case or other relatively immovable structure and thus has constituted a bearing cap for the valve extending over the whole of its length, although in certain cases, such as in the aforesaid Patent No. 451,917 there has also been a mechanical connection between the cap and the movable cylinder.

The object of the present invention is to

provide an improved construction of engine of the type specified which does not rely upon the cap of the split valve housing to take the thrust imposed on the valve by the pressure of the cylinder. More particularly it is an object of the invention to provide an engine of the specified type in which the said cap is free to yield resiliently in relation to the displaceable cylinder so that said cap rides lightly on the valve at all times. These objects are achieved by employing a construction of engine which is of a simple yet robust character and capable of production economically, as will now be described.

According to this invention we provide a rotary valve internal combustion engine comprising a main structure having pockets serving to support rigidly journal bearings for opposite ends of a rotary cylindrical distributing valve which is enclosed within a housing consisting of one or more lower parts rigidly formed one with each cylinder, which latter is axially displaceable to bring the said lower part of the valve housing into sealing contact with the valve, and of an upper part or cap for each cylinder or common to a plurality of cylinders, the upper and lower housing parts being yieldingly interconnected so that the upper half of the housing floats on the end-supported rotary valve.

In order that the invention may be more readily understood an embodiment thereof will now be described with the aid of the accompanying diagrammatic drawings wherein:—

Figure 1 is a sectional elevation of the upper part of a multi-cylinder engine; and Figure 2 is a cross section on line II—II of Figure 1.

In the example illustrated the rotary cylindrical distributing valve 1 is supported at its opposite ends by tubular trunnions 2, 3 which permit of a circulated flow of cooling water through the hollow interior of the valve 1 and which are rotatably journalled in axially aligned ball or roller bearings 4. The bearings 4 are solidly supported in pockets 5

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provided in brackets 6, 7 formed as rigid parts of a main supporting structure, in this case, the main crankcase of the engine (not shown). The bracket 7 may be made
 5 hollowed or channelled, as shown, to form a sheath or housing for a driving chain 8 which rotates the valve 1 at an appropriate speed, in relation to engine speed, for instance, at a quarter of the engine speed.
 10 The chain 8 is driven from the engine crankshaft through a sprocket wheel 9 mounted on the valve trunnion 3. Fluid-tightness is secured at the valve ends and around the trunnions 3 by oil and water
 15 sealing devices 10, 11 respectively of suitable form.

Beneath the valve 1 (which, by the above arrangement is supported firmly in the fashion of an end-supported beam, and
 20 is accordingly made of a sturdy and rigid nature) and between the valve bearing brackets 6, 7 a plurality of cylinders 12 are disposed side by side. Each cylinder 12 is mounted, with its central axis at
 25 right angles to the axis of rotation of the valve, so as to be capable of an axial slidable movement in the cylinder block. This movement is brought about automatically by the rise of pressure due to
 30 explosion of a gaseous combustion charge in the cylinder in known manner. As a result of this movable mounting of the cylinder 12 the upper cradle-like cylinder extension 13 (see Figure 2) is brought into
 35 close sealing contact with the lower half of the periphery of the valve 1. The cylinder compression space is provided within a long narrow slot-like aperture 14 formed above the space swept by the piston
 40 15 by transversely narrowing and longitudinally widening the upper part of the bore of the cylinder 12. The longitudinally widening of the upper part of the cylinder bore brings the opposite ends of
 45 adjacent cylinder slots 14 close together so that the greatest possible proportion of the length of the valve 1 is made available for paired inlet and exhaust ports 16, 17 which pass diametrically through the
 50 valve and may be of substantial size in cross section. The laterally adjacent cradle-like cylinder extensions 13 together constitute the lower half of a longitudinally split valve housing. The upper half
 55 of this valve housing may be composed of a plurality of saddle-like caps, equal in number to the number of cylinders 12, or preferably as shown, of a single unitary saddle-like cap 18 common to all cylinders.
 60 The cylinder cradles 13 and the common cap 18, which together constitute the complete longitudinally split valve housing are yieldingly interconnected by bolts 19 and compression springs 20 passing
 65 through and bearing upon apertured lugs

21, 22 provided on the cradles 13 and cap 18 respectively. By reason of the resilient inter-connection of the valve housing parts each cylinder 12 may be displaced
 70 independently of all others, while the cap 18 is maintained at all times with a floating action, riding on the top half of the valve 1. The cap 18 is formed with a seating surface 23 on to which is bolted a casting consisting of integral inlet and exhaust
 75 manifolds 24, 25 having branch ducts 26, 27 respectively which register with inlet and exhaust ports 28, 29 respectively in the valve housing cap 18, the joint between cap and casting having suitable
 80 interposed packing or other arrangement to allow for the "give" of the cap.

The cylinders 12 with their integral cradles 13 and the cap 18 are preferably of
 85 double wall construction, as shown, for water cooling purposes.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we
 90 claim is:—

1. A rotary valve internal combustion engine of the type specified, comprising a main structure having pockets serving to support rigidly journal bearings for
 95 opposite ends of a rotary cylindrical distributing valve, and a split housing for said valve consisting of one or more lower parts formed one with each cylinder, which latter is axially displaceable to
 100 bring the said lower part of the valve housing into sealing contact with the valve and of an upper part or cap for each cylinder or common to a plurality of cylinders, said upper and lower housing
 105 parts being yieldingly interconnected so that the upper half of the housing floats on the end-supported rotary valve.

2. A multi-cylinder engine as claimed in claim 1 wherein the rigid supporting
 110 structure incorporates a pair of brackets between which the cylinders, disposed side by side are capable of independent axial displacement to bring the cradle-like extensions of the cylinders into close seal-
 115 ing contact with one half of the periphery of the valve which is journalled at its opposite ends in the axially aligned bores of bearing assemblies carried rigidly by the brackets, the other half of the valve
 120 periphery being embraced by capping which is yieldingly attached to the cylinder cradle extensions.

3. An engine as claimed in claim 2, characterized in that the compression
 125 space of each cylinder narrows transversely and widens longitudinally in relation to the direction of length of the valve to form a slot in the base of the cylinder cradle extension which registers with
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laterally paired inlet and exhaust ducts extending close together side by side and diametrically through the valve to communicate sequentially with ports in the valve housing capping.

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4. An engine as claimed in claim 2 or claim 3, in which the valve housing capping comprises a single saddle member having a seating face into which there
10 open inlet and exhaust ports which are adapted to communicate respectively with

inlet and exhaust manifolds mounted on the said capping.

5. A rotary valve multi-cylinder internal combustion engine constructed
15 substantially as herein described with reference to the accompanying drawings.

Dated this 28th day of February, 1946.

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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

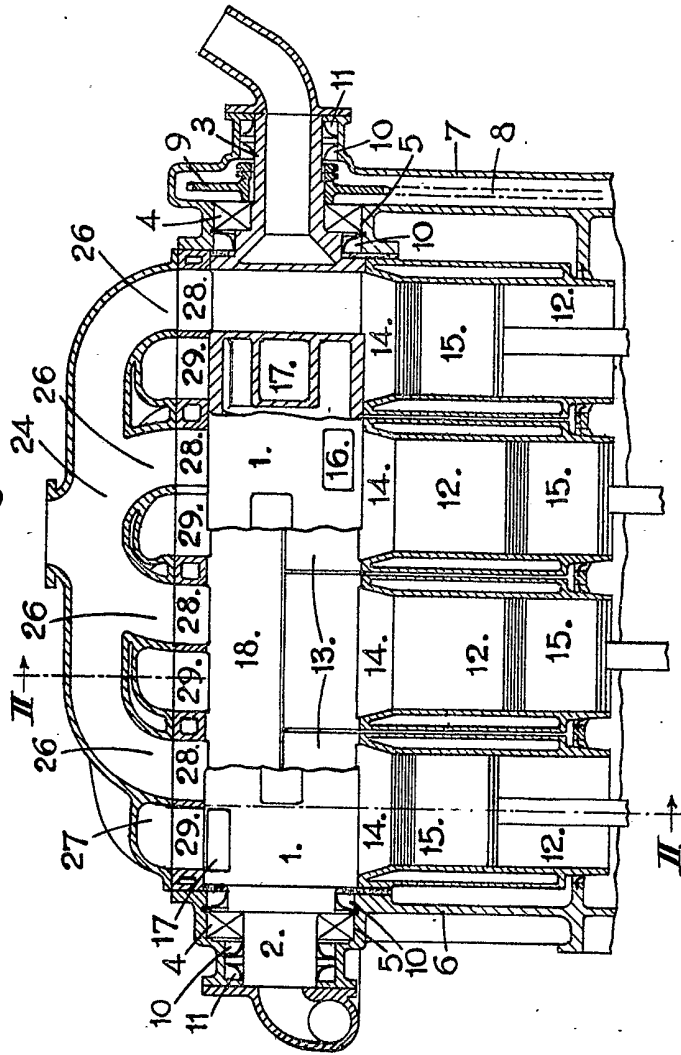


Fig. 2.

