# PATENT SPECIFICATION

637,362

Date of filing Complete Specification: March 18, 1946.

Application Date: March 17, 1945. No. 6787/45.

Complete Specification Published: May 17, 1950.

Index at acceptance:—Classes 7(ii), B4h; and 7(vi), B2q5(a: b).

PROVISIONAL SPECIFICATION

## Improvements in or relating to Rotary Valve Assemblies for Internal Combustion Engines

I, FRANK METCALF ASPIN, a British subject, of 149, Walmersley Road, Bury, Lancashire, do hereby declare the nature of this invention to be as follows:—

This invention relates to rotary valve assemblies for internal combustion engines of the kind embodying a rotary valve member located at the end of the cylinder and of tapered form with its base at the end of the cylinder and arranged co-axially therewith. A rotary valve assembly of such kind is described in the Specification of my co-pending Application for Patent No. 562,933.

It has been established that wear, in an internal combustion engine is disproportionately high when the engine is first started and after having stood for some time and this is believed to be due to the fact that the lubricating oil or at least a large part of it, will have drained away from the cylinder walls and other bearing surfaces.

The object of the present invention is to adapt the lubrication of the rotary valve member so that it may assist in reducing such initial wear. The invention also has for its object an improved construction of rotary valve assembly.

According to the invention the rotary valve assembly is characterised by its construction so as to form an oil-holding groove at the end of the cylinder in such a position that it may serve to hold a reserve supply of lubricant which will normally tend to maintain lubrication of the upper end of the cylinder by gravitational flow while the engine is stationary and/or will release lubricant for the initial movement of the engine.

In a preferred embodiment of the invention, the rotary valve member is of tapered shape with its base at the end of the cylinder and partly extending into the cylinder.

In one example of the invention, the rotary valve assembly comprises a rotary valve member mounted in a housing, the rotary member and housing having complementary conical sealing and bearing surfaces. At the base end of the cone the rotary valve member has a short cylindrical portion in which is located a sealing ring. Below such sealing ring is an extension of slightly less diameter than the cylindrical part, the angle between the cylindrical portion and the extension being a concave radius. The extension is adapted to fit in the end of the engine cylinder or its liner and is fitted with a pair of rings in a common groove. The corner of the cylinder or liner, adjacent to the radiused angle of the rotary valve member is chamfered. The housing is adapted to be secured to the end of the engine cylinder, with an annular pressure-jointing ring located in a groove set back from the bore of the cylinder or where there is a liner it may be in a groove immediately adjacent to the head of the liner. The housing has a cylindrical portion, complementary to that of the rotary valve member and adapted to be engaged by the ring in the latter. Also, the housing has a concave radius, complementary to the radius of the rotary valve member. Thus, there is formed an annular oil-holding space which in cross section is semicircular with an additional wedge shaped part at the bevel on the cylinder or liner.

In operation, the fit of the extension of the rotary valve member and its two sealing rings protects the pressure jointing and also confines the pressure area of the rotary valve member to the smaller area of the extension to the exclusion of the annular area of the concave area under the cylindrical portion of the valve. During normal operation some of the lubricating oil supplied to the rotary valve member by any suitable means will be driven by centrifugal force into the oil-holding groove, and/or oil

will work up from the cylinder, so that when the engine stops, such oil-holding groove will be full of lubricant which will tend, by slow gravitational action, to flow into the cylinder. Thus, after for example a normal non-working period, there will be enough oil at the lower end of the rotary valve member and at the upper end of the cylinder or cylinder liner to lubricate such parts when the engine is restarted and until the normal pump lubrication is working. During normal running the gaseous pressures in the cylinder will prevent any excess of oil from flowing from the oil-holding groove into the cylinder bore.

Obviously the tapered shape above described for the rotary valve member assists, by centrifugal action, in filling the oil-holding groove and the location of the rotary valve member so that its lower end actually rotates within the cylinder bore and enables such lubricant from the oil-holding groove to reach the cylinder bore direct, but the invention is not necessarily limited to such features as other constructions could be evolved without departing from the nature of the invention which would provide an oil-holding formation between the rotary member, housing and/or cylinder so that its contents may slowly reach the cylinder bore when the engine is not running.

Dated this 9th day of March, 1945.

For the Applicant,
WILSON, GUNN & ELLIS,
Chartered Patent Agents,
54/56, Market Street, Manchester, 1.

COMPLETE SPECIFICATION

## Improvements in or relating to Rotary Valve Assemblies for Internal Combustion Engines

I, FRANK METCALF ASPIN, a British subject, of "Westray," Horseshoe Lane, Alderley Edge, Cheshire, formerly of 149, Walmersley Road, Bury, Lancashire, 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 rotary valve assemblies for internal combustion engines of the kind embodying a rotary valve member located at the end of the cylinder and having a conical sealing surface with its base at the end of the cylinder and arranged co-axially therewith. A rotary valve assembly of such kind is described in the Specification of my Patent No. 562,933.

It has been established that wear, in an internal combustion engine is disproportionately high when the engine is first started after having stood for some time and this is believed to be due to the fact that the lubricating oil or at least a large part of it, will have drained away from the cylinder walls and other bearing surfaces.

The object of the present invention is to adapt the lubrication of the rotary valve member so that it may assist in reducing such initial wear.

According to the invention the rotary valve assembly for an internal combustion engine is characterised in that the rotary valve member has an extension at the base of the conical gas sealing surface, of smaller diameter than such base which extension is located in a socket at the end of the cylinder, and in that an oil holding space is provided between such extension and the base of the gas sealing portion of the rotary valve member so as to be adapted to receive and hold lubricant from the bearing surface of the valve or from the engine cylinder during normal running of the engine.

In a preferred embodiment of the invention, the rotary valve member is of tapered shape with its base at the end of the cylinder and partly extending into the cylinder, which acts as the sockets to receive the extension of the rotary valve member.

The accompanying drawing is a section showing one example of a rotary valve assembly made in accordance with the invention.

In the example of the invention shown in the drawing, the rotary valve assembly comprises a rotary valve member $a$ mounted in a housing $b$, the rotary member and housing having complementary conical bearing surfaces. Below the base of its conical bearing surface, the rotary valve member has a cylindrical extension $a^1$ of reduced diameter, the angle $a^2$ between such cylindrical extension and the conical portion being a concave radius. The extension is adapted to fit in the end of the engine cylinder liner $d$ and is fitted with a piston ring $e$; the end of the cylinder liner thus acts as a socket to receive the said extension. The corner $d^1$

of the cylinder liner, adjacent to the radiused angle $a^2$ of the rotary valve member is chamfered. The housing $b$ is adapted to be secured to the end of the engine cylinder, with an annular pressure-jointing ring $f$ located in a groove immediately adjacent to the head of the liner. Thus, there is formed an annular oil-holding space between the end of the liner and the rotary valve member bounded by the surfaces of the radiused angle $a^2$ and the chamfered corner $d^1$ of the receiving socket formed by the top end of the cylinder liner.

In operation, the close fit of the extension of the rotary valve member and its sealing ring protects the pressure jointing from the combustion gases and also confines the area of the rotary valve member on which gaseous pressure is exerted to the smaller area of the extension, to the exclusion of the annular area of the concave radiused area at the angle $a^2$ at the base of the conical portion of the valve. During normal operation, some of the lubricating oil, supplied to the tapered bearing surface of the rotary valve member by any suitable means, will be driven by centrifugal force into the oil-holding groove, and/or oil will work up from the cylinder, so that when the engine stops, such oil-holding groove will be full of lubricant which will tend, to flow by gravitational action into the cylinder, the flow being slowed down by the holding action of the ring $e$. Thus, after for example a normal non-working period, there will be enough oil at the lower end of the rotary valve member and at the upper end of the cylinder or cylinder liner to lubricate such parts when the engine is restarted and until the normal pump lubrication is working. During normal running the gaseous pressures in the cylinder will, combined with the retaining action of the ring, prevent any excess of oil from flowing from the oil-holding groove into the cylinder bore.

Obviously the tapered shape above described for the rotary valve member assists, by centrifugal action, in filling the oil-holding groove, and the location of the rotary valve member so that its lower end actually rotates within the cylinder bore, enables such lubricant from the oil-holding groove to reach the cylinder bore direct, but the invention is not necessarily limited to such features as other constructions could be evolved, without departing from the nature of the invention, which would provide an oil-holding space at the upper end of the cylinder and defined between the rotary member, and the upper end of the cylinder so that its contents may slowly reach the cylinder bore when the engine is not running.

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

1. A rotary valve assembly for an internal combustion engine of the kind referred to, characterised in that the rotary valve member has an extension at the base of the gas sealing surface, of smaller diameter than such base which extension is located in a socket at the end of the cylinder, and in that an oil holding space is provided between such extension and the base of the gas sealing portion of the rotary valve member so as to be adapted to receive and hold lubricant from the bearing surface of the valve or from the engine cylinder during normal running of the engine.

2. A rotary valve assembly according to Claim 1 further characterised by a gas sealing ring located between the extension and its socket so as to seal off the oil-holding space from the cylinder.

3. A rotary valve assembly according to Claim 1 or 2 further characterised in that the oil-holding space is in part bounded by a radiused shoulder at the angle between such extension and the base of the gas sealing surface and by a bevel formed at the adjacent end of the cylinder.

4. A rotary valve assembly for an internal combustion engine constructed and arranged substantially as herein described with reference to and as illustrated in the accompanying drawing.

Dated this 16th day of March, 1946.

For the Applicant.

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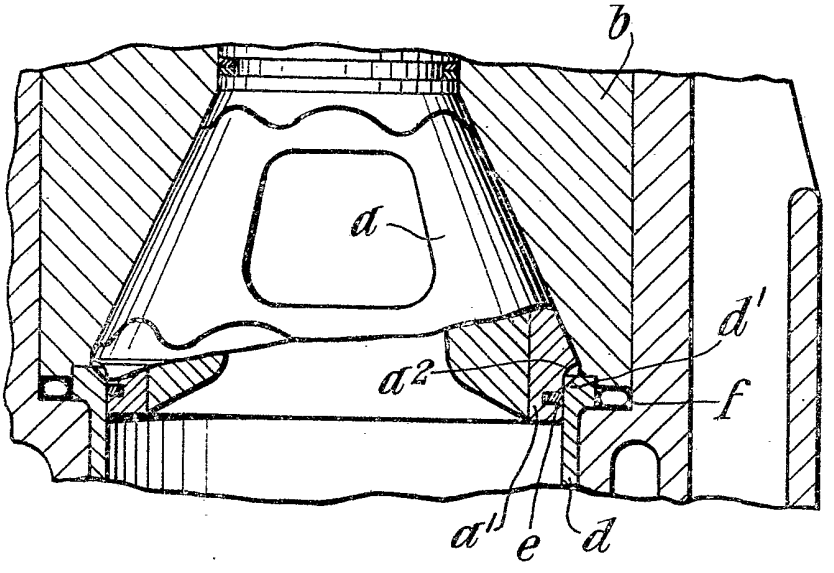
Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1950.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. 0d. each (inland) 2s. 1d. (abroad) may be obtained.




H.M.S.O.(Ty.P.)