

# PATENT SPECIFICATION

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570,354

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## PROVISIONAL SPECIFICATION

### Improvements in or relating to Rotary Valve Assemblies for Liquid Cooled Internal Combustion Engines or the like

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

This invention relates to a rotary valve construction for a liquid cooled internal combustion engine, compressor or the like, of the kind having the rotary valve member mounted in a plug-like housing adapted to be secured in the end of the cylinder or of an extension thereof. The invention is particularly though not exclusively, applicable to internal combustion engines having the rotary valve construction forming the subject of my earlier Applications for Patent, for example Nos. 557,564 and 557,565.

It is obviously desirable, in a liquid cooled internal combustion engine of the above kind, to provide liquid cooling for the plug-like housing, and the object of the present invention is to provide for such cooling whilst retaining the obvious advantages of the plug-like construction.

According to the invention a rotary valve construction for a liquid cooled internal combustion engine of the kind having the rotary valve member mounted in a plug-like housing adapted to be secured in the end of the cylinder or in an extension thereof, is characterised in that the said cylinder or cylinder extension and the plug-like member are cored for liquid cooling and their cored spaces connected through registering holes in the two parts with resilient jointing means therein, permitting a tolerance of alignment, and securing means therefor accessible through the outer wall of the cylinder or extension.

The invention may be further characterised in that the registering holes are tapered and the resilient jointing means comprises a rubber sleeve located on and secured by a conical ended tube and that the conical ended tube is located and secured by a screwed plug fitting into the outer wall of the cylinder or extension.

The accompanying drawing is a section of one example of an internal combustion

engine with a rotary valve construction made in accordance with the invention, and is shown applied to the rotary valve construction forming the subject of my co-pending Application for Patent No. 20455/43 (Serial No. 570,286).

As shown in the drawing, the rotary valve member 10 is located in a plug-like housing 11 secured in an extension part 12 attached to the end of the cylinder 13, having a liner 13a. The lower part of the extension 12 constitutes a pressure plate or baffle, a construction which forms the subject of my earlier Patent No. 564,850, and also the complementary flat and conical faces for the end of the rotary valve member with the sealing ring 14, the subject of my co-pending Application for Patent No. 20455/43 (Serial No. 570,286).

A sealing ring 15 is also provided in an outer angle at the end of the plug-like member.

The extension part 12 is cored at 12a and the plug-like housing 11 is cored at 11a for liquid cooling, and communication between such cored spaces is provided by two registering tapered holes, one at the upper end and the other at the lower part of the space 11a, in which are located respectively tubes 16 and 17, the inner ends of which are conical and carry a rubber sleeve 16a and 17a respectively, which may be intimately bonded thereto. Each tube has a closed head and lateral openings respectively 16b, 16c, 17b and 17c and is adapted to be forced into and secured in position by a screwed plug 18 and 19 respectively, screwing into the outer wall of the extension, the inner ends of such plugs being recessed to receive and locate the head ends of the tubes. One duct 20 of the cooling fluid circulation is also shown, communicating with the cored space 12a of the extension 12.

In the assembly of the plug-like housing 11 in the extension 12, the tapered holes are brought into register and the tubes 16 and 17 inserted through the plug holes in the outer wall of the extension. The plugs 18 and 19 are then fitted and

screwed in until the conical rubber sleeves on the end of the tubes are forced firmly into sealing contact with their tapered holes. Cooling fluid can therefore be circulated through the plug-like housing for the valve from the cylinder extension. The resilience of the rubber provides a tolerance for misalignment of the tapered holes sufficient, not only to allow for manufacturing tolerances but also to ensure that the plug-like housing may be tightened down in its position in the cylinder extension without interference from or with the effective sealing of the tapered holes.

For the purpose of facilitating extraction of the tubes 16 and 17, the heads thereof may be formed with a screw-threaded hole or screw-threaded projecting plug, to which an extractor tool may

be fitted. In a modification the tapered holes may be countersunk at their opposed faces to reduce shear effect on the rubber.

In an alternative construction, instead of a tapered hole, sleeve and tube for sealed intercommunication between the cored spaces of the plug-like housing and the cylinder extension, may be countersunk at their opposed faces, either as conical counter-sinking, or flat ended, and the sealing may be provided by an endless rubber ring of round or other section adapted to be expanded and forced into sealing contact by an axially movable tubular member.

Dated this 15th day of November, 1943.

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

#### COMPLETE SPECIFICATION

### Improvements in or relating to Rotary Valve Assemblies for Liquid Cooled Internal Combustion Engines or the like

I, FRANK METCALF ASPIN, a British subject, of Walmer Place, 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 a rotary valve assembly for a liquid cooled internal combustion engine or the like such as compressors of the kind having the rotary valve member mounted in a plug-like housing adapted to be secured in the end of the cylinder or an extension thereof. The invention is particularly though not exclusively, applicable to internal combustion engines having the rotary valve construction forming the subject of my earlier Patents Nos. 557,564 and 557,565.

It is obviously desirable, in a liquid cooled internal combustion engine of the above kind, to provide liquid cooling for the plug-like housing, and the object of the present invention is to provide for such cooling whilst retaining the obvious advantages of the plug-like construction.

According to the invention a rotary valve assembly for a liquid-cooled internal combustion engine of the kind having the rotary valve member mounted in a plug-like housing adapted to be secured in the end of the cylinder or in an extension thereof, is characterised in that the said cylinder, or cylinder extension, and the plug-like member are cored for liquid cooling and their cored spaces connected

through registering holes in the two parts with resilient jointing means therein, permitting a tolerance of alignment, said jointing means including an axially movable plug-like member adapted by axial movement to load a resilient jointing element, and securing means for said plug-like member accessible through the outer wall of the cylinder or extension.

The invention may be further characterised in that the registering holes are tapered and the resilient jointing means comprises a rubber sleeve located on and secured by a conical ended tube and that the conical ended tube is located and secured by a screwed plug fitting into the outer wall of the cylinder or extension.

The drawing filed with the provisional specification is a section of one example of an internal combustion engine with a rotary valve construction made in accordance with the invention, and is shown applied to the rotary valve construction forming the subject of my Patent No. 564,850.

As shown in the drawing filed with the Provisional Specification, the rotary valve member 10 is located in a plug-like housing 11 secured in an extension part 12 attached to the end of the cylinder 13, the latter having a line 13a. The lower part of the extension 12 constitutes a pressure plate or baffle, a construction which forms the subject of my earlier Patent No. 564,850 and also the complementary flat and conical faces for the end of the rotary valve member with the sealing

ring 14, the subject of my co-pending Application for Patent No. 20455/43 (Serial No. 570,286).

A sealing ring 15 is also provided in an outer angle at the end of the plug-like member.

The extension part 12 is cored at 12a and the plug-like housing 11 is cored at 11a for liquid cooling, and communication between such cored spaces is provided by two registering tapered holes, one at the upper end and the other at the lower part of the space 11a, in which are located respectively tubes 16 and 17, the inner ends of which are conical and carry a rubber sleeve 16a and 17a respectively, which may be intimately bonded thereto. Each tube has a closed head and lateral openings respectively 16b, 16c, 17b and 17c and is adapted to be forced into and secured in position by a screwed plug 18 and 19 respectively, screwing into the outer wall of the extension, the inner ends of such plugs being recessed to receive and locate the head ends of the tubes. One duct 20 of the cooling fluid circulation is also shown, communicating with the cored space 12a of the extension 12.

In the assembly of the plug-like housing 11 in the extension 12, the tapered holes are brought into register and the tubes 16 and 17 inserted through the plug holes in the outer wall of the extension. The plugs 18 and 19 are then fitted and screwed in until the conical rubber sleeves on the end of the tubes are forced firmly into sealing contact with their tapered holes. Cooling fluid can therefore be circulated through the plug-like housing for the valve from the cylinder extension. The resilience of the rubber provides a tolerance for misalignment of the tapered holes sufficient, not only to allow for manufacturing tolerances but also to ensure that the plug-like housing may be tightened down in its position in the cylinder extension without interference from or with the effective sealing of the tapered holes.

For the purpose of facilitating extraction of the tubes 16 and 17, the heads thereof may be formed with a screw-threaded hole or screw-threaded projecting plug, to which an extractor tool may be fitted. In a modification the tapered holes may be countersunk at their opposed faces to reduce shear effect on the rubber.

In an alternative construction, instead of a tapered hole, sleeve and tube for sealed intercommunication between the

core spaces of the plug-like housing and cylinder extension, the housing and cylinder extension may be countersunk at their opposed faces, either as conical counter-sinking, or flat ended, and the sealing may be provided by an endless rubber ring of round or other section adapted to be expanded and forced into sealing contact by an axially movable member.

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 a liquid cooled internal combustion engine or the like of the kind having the rotary valve member mounted in a plug-like housing adapted to be secured in the end of the cylinder or in an extension thereof, characterised in that the said cylinder or cylinder extension and the plug-like member are cored for liquid cooling and their cored spaces connected through registering holes in the outer and inner walls respectively of the two parts with resilient jointing means therein permitting a tolerance of alignment, said jointing means including an axially movable plug-like member adapted by axial movement to load a resilient jointing element, and securing means for said plug-like member accessible through the outer wall of the cylinder or extension.

2. A rotary valve assembly for a liquid cooled internal combustion engine or the like according to Claim 1, further characterised in that the registering holes are tapered and the resilient jointing means comprises a rubber sleeve located on and secured by a conical ended tube.

3. A rotary valve construction for a liquid cooled internal combustion engine or the like according to Claim 2, further characterised in that the conical-ended tube is located and secured by a screwed plug fitting into the outer wall of the cylinder or extension.

4. A rotary valve construction for a liquid cooled internal combustion engine of the kind referred to having interconnected cored spaces for liquid cooling, constructed substantially as herein described with reference to and as illustrated in the drawing filed with the Provisional Specification.

Dated this 16th day of November, 1944.

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

