

## PATENT SPECIFICATION



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## PROVISIONAL SPECIFICATION

Improvements in or relating to Driving Means for Rotary Valves  
of Internal Combustion Engines and 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 driving means for rotary valves of internal combustion engines and the like such as compressors and is particularly, but not exclusively applicable to rotary valves of the kind described in the Specification of my earlier Patent No. 463,412 in which the complementary gas-sealing and bearing surfaces of the rotary valve member and its housing are of tapered shape, preferably conical.

In the construction of such rotary valve mechanism as described and illustrated in the specifications of my earlier Patent aforesaid, the rotary valve is driven by a gear wheel, secured to the stem of the valve.

The object of the invention is an improved construction of driving mechanism for a rotary valve.

According to the invention driving means are provided for the rotary valve member comprising a driving member substantially co-axially arranged relative to the rotary valve member, bearing means for such driving member separate from the rotary valve member, and complementary slidably inter-engaging driving parts on the driving member and rotary valve member permitting some freedom of self-alignment and axial displacement of the rotary valve member relative to the driving member and *vice-versa*.

The accompanying drawing illustrates the upper end of an internal combustion engine having driving means for the rotary valve member in accordance with one example of the invention, in which

Fig. 1 is a sectional elevation and

Figs. 2 and 3 are part sectional detail views.

As shown in the drawing, the internal combustion engine comprises a piston 10, cylinder 11, valve housing 12 and rotary valve member 13, the complementary bearing and gas sealing surfaces of the valve member and housing being conical and the rotary valve member being substantially

as described in my prior Patent No. 463,412 aforesaid.

The valve housing includes bearings at one side for a driving shaft mounted in bearings 14a carrying, for each rotary valve, a helical multi-start driving wheel 15. Located by spigot on and secured to the housing is a bearing assembly carrying a complementary gear wheel 16 and comprising an upper plain bearing including a bush 17 secured in the gear wheel 16 and a lower anti-friction ball bearing 18. The gear wheel 16 is of two-part construction so that different and most suitable materials may be used for their respective functions, the hub part 19 having splines 20 to engage complementary splines on the stem of the valve. These splines are made with some clearance to permit relative movement.

The gear wheel housing is shown in detail in Figs. 2 and 3 and comprises a lower part 21, adapted to be located by a spigot 22a and secured by bolts (see Fig. 1) to the valve housing 12, and an upper part 23 adapted to be located on and secured to pillars 24 of the lower part by bolts 25. The upper part 23 includes a hub 26 which is formed with grooves 27 to hold rubber sealing rings 28 adapted to engage a flange in a cover plate 29. Internally, the hub 26 is adapted to form a guide and seal for the upper end of the valve stem.

In use, owing to the provision of the bearings 17 and 18 and the clearance at driving splines all thrust and lateral stresses at the driving wheel 16 are taken on such bearings and are not transmitted to the stem of the rotary valve member. Also some error of alignment is possible so that the valve member is permitted relative freedom of movement for self-alignment on its bearing surfaces, which freedom of movement is of great value in maintaining the efficiency of the complementary conical gas-sealing and bearing surfaces of the rotary valve member and housing. Obviously the splines forming the inter-engaging driving parts between the driving member (gear 16) and the rotary valve member also permit relative axial

movement of the rotary valve member.

The invention is obviously not limited to all the details of construction of the example above described. For instance, 5 different types of bearings may be used in place of the combination of plain and anti-friction bearings above described.

Dated this 4th day of March 1943.

For the Applicant,

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

## COMPLETE SPECIFICATION

### Improvements in or relating to Driving Means for Rotary Valves of Internal Combustion Engines and the like

I, FRANK METCALF ASPIN, a British subject, of Walmer Place, 149, Walmersley Road, Bury, Lancashire, do hereby 10 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:—

15 This invention relates to driving means for rotary valves of internal combustion engines, and the like such as compressors and is particularly, but not exclusively applicable to rotary valves of the kind described in the specification of my earlier Patent No. 463,412 in which the complementary gas-sealing and bearing surfaces of the rotary valve member and its housing 20 are of tapered shape, preferably conical.

25 In the construction of such rotary valve mechanism as described and illustrated in the specification, of my earlier Patent aforesaid, the rotary valve is driven by a gear wheel, secured to the stem of the 30 valve.

The object of the invention is an improved construction of driving mechanism for a rotary valve.

35 According to the invention the rotary valve assembly for internal combustion engines and the like comprises a valve housing adapted to be secured to the engine cylinder, a rotary valve member having a conical valve portion located in a conical seating in said housing, said rotary valve member having a stem, a driving member arranged co-axially over the stem of the rotary valve member, said stem of the 45 rotary valve member and said driving member having complementary inter-engaging driving formations permitting some freedom of self-alignment and relative axial displacement, a bearing housing located by spigot on and adapted 50 to be secured to the said valve housing and bearing means in said bearing housing for the said driving member.

55 The drawing filed with the Provisional Specification illustrates the upper end of an internal combustion engine having driving means for the rotary valve member

in accordance with one example of the invention, in which Fig. 1 is a sectional elevation and Figs. 2 and 3 are part 60 sectional detail views.

As shown in the drawing, the internal combustion engine comprises a piston 10, cylinder 11, valve housing 12 and rotary valve member 13, the complementary 65 valve member and housing being conical and the rotary valve member being substantially as described in my prior patent No. 463,412 aforesaid.

70 The valve housing includes bearings at one side for a driving shaft 14 mounted in bearings 14a carrying, for each rotary valve, a helical multi-start driving wheel 15. Located by spigot on and secured to the housing is a bearing assembly carry- 75 ing a complementary gear wheel 16 and comprising an upper plain bearing including a bush 17 secured in the gear wheel 16 and a lower anti-friction ball bearing 18. The gear wheel 16, which forms the 80 driving member for the rotary valve member, is of two-part construction so that different and most suitable materials may be used for their respective functions, the hub part 19 having splines 20 to engage 85 complementary splines on the stem of the valve. These splines are made with some clearance to permit relative movement sufficient to compensate for manufacturing errors of alignment. 90

The gear wheel 16 is located in a bearing housing which is shown in detail in Figs. 2 and 3 and comprises a lower part 21, adapted to be located by a spigot 22a and secured by bolts 22 (see Fig. 1) to the valve 95 housing 12, and an upper part 23 adapted to be located on and secured to pillars 24 of the lower part by bolts 25. The upper part 23 includes a hub 26 which is formed with grooves 27 to hold rubber sealing 100 rings 28 adapted to engage a flange in a cover plate 29. Internally, the hub 26 is adapted at 30 to form a guide and seal for the upper end of the valve stem.

105 In use, owing to the provision of the bearings 17 and 18 and the clearance at the driving splines all thrust and lateral

stresses at the driving wheel 16 are taken on such bearings and are not transmitted to the stem of the rotary valve member. Also some error of alignment is possible so that the valve member is permitted relative freedom of movement for self-alignment on its bearing surfaces, which freedom of movement is of great value in maintaining the efficiency of the complementary conical gas-sealing and bearing surfaces of the rotary valve member and housing. Obviously the splines forming the inter-engaging driving parts between the driving member (gear 16) and the rotary valve member also permit relative axial movement of the rotary valve member.

The two parts 21 and 23 of the bearing housing are adapted to be assembled as a unit with the bearings and gear wheel *in situ* so that it may be fitted to the engine as a unit, and if necessary removed and replaced by a new unit, and if necessary replaced by a new unit by means only of the screws 22.

The invention is obviously not limited to all the details of construction of the example above described. For instance, different types of bearings may be used in place of the combination of plain and anti-friction bearings above described.

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 internal combustion engines, and the like comprising a valve housing adapted to be secured to the engine cylinder, a rotary valve member having a conical valve portion located in a conical seating in said housing, said rotary valve member having a stem, a driving member arranged co-axially over the stem of the rotary valve member, said stem of the rotary valve member and said driving member having complementary inter-engaging driving formations permitting some freedom of self-alignment and relative axial displacement, a bearing housing located by spigot on and adapted to be secured to the said valve housing and bearing means in said bearing housing for the said driving member.

2. A rotary valve assembly for internal combustion engines and the like according to Claim 1, characterised in that the said bearing housing incorporates two separate bearings for the driving member.

3. A rotary valve assembly for internal combustion engines, and the like according to Claim 1 or 3 characterised in that the said bearing housing comprises two parts adapted to be assembled as a unit with the driving member in position, as and for the purpose set forth.

4. A rotary valve assembly for internal combustion engines and the like according to any of the preceding Claims characterised in that the driving member comprises a helical toothed pinion wheel which is in engagement with a complementary multi-start driving wheel carried by a shaft mounted in bearings in the valve housing.

5. A rotary valve assembly for internal combustion engines and the like comprising a valve housing adapted to be secured to the engine cylinder, a rotary valve member having a conical valve portion located in a conical seating in the said housing, said rotary valve member having a stem, a driving unit comprising a bearing housing, located by spigot on and secured to the said valve housing over the said stem with bearings and a driving pinion mounted therein so as to be co-axial with the stem of the said rotary valve member, free fitting complementary splines on the stem of the rotary valve member and in the driving pinion, a driving shaft and bearings therefor mounted in the valve housing and a complementary gear wheel on said shaft meshing with the said driving pinion.

6. A rotary valve assembly constructed and arranged substantially as herein described with reference to and as illustrated in the drawings filed with the Provisional Specification.

7. An internal combustion engine having a rotary valve assembly constructed according to any of the preceding claims.

Dated this 23rd day of March, 1944.

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

