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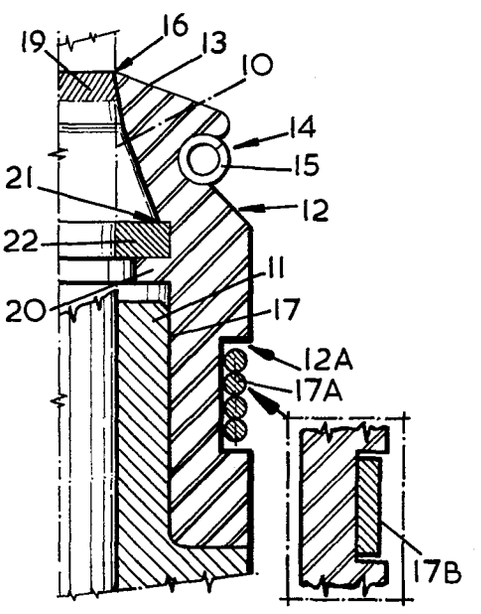
(54) Valve stem seals.

(57) A valve stem seal comprises an elastomeric moulding adapted to lip seal against a valve stem and, at its lip sealing region, is helically ribbed on its stem-adjacent surface to define lubricant control passages. The elastomeric moulding also provides downstream of its lip seal, in terms of lubricant flow, a control collar adapted to contact the valve stem to provide both a compensation for lateral loading of the valve stem resulting from rocker action and a secondary seal.

The control collar may be integral with the elastomeric moulding but it is preferred that it be constituted by a plastics ring, preferably but not exclusively formed of PTFE, held within the elastomeric moulding in non-bonded relationship.



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VALVE STEM SEALS

This invention relates to valve stem seals for use especially but not exclusively on inlet and exhaust valves.

The valve stem seals according to this invention are developments of the valve stem seals which are disclosed in our copending Patent Application No: 82 17285 filed 15th June 1982 (Publication No: 2 105 403).

Our aforesaid Patent Application discloses a valve stem seal incorporating a lubricant metering collar for contact with a valve stem and constituted by a film of polytetrafluoroethylene (PTFE) of frusto-conical shape and having on its stem-adjacent surface a series of ribs, preferably helical, defining lubricant control passages.

The valve stem seals which are disclosed in our aforesaid Patent Application can be considered to be fabricated seals which are relatively expensive to produce and which, in production, require the employment of manual labour in assembly.

It is an object of the present invention to provide a valve stem seal which satisfies the object of our aforesaid Patent Application while simplifying manufacture and reducing the cost of production.

In our aforesaid Patent Application the valve

stem seal has, as aforesaid, a frusto-conical shaped metering collar of PTFE film and the object of the present invention is achieved by providing a valve stem seal comprising an elastomeric moulding adapted to lip seal against a valve stem and at its lip sealing region to be helically ribbed on its stem-adjacent surface to define lubricant control passages, the elastic moulding also providing downstream of its lip seal, in terms of lubricant flow, a control collar adapted to contact the valve stem to provide both a compensation for lateral loading of the valve stem resulting from rocker action and a secondary seal.

The collar may be integral with the elastomeric moulding.

Preferably, however, the collar is a plastics ring, preferably but not exclusively formed of PTFE, held within the elastomeric moulding in non-bonded relationship.

The elastomeric moulding preferably has at its outer or upper end, when assembled on a valve stem, a frusto-conical portion engaging the valve stem to make the lip seal or contact.

The ribbing is cut, moulded or otherwise formed on the elastomeric moulding.

The plastics control ring is preferably located in an annular recess of the elastomeric moulding on a supporting integral annular ledge of the latter.

The bore configuration of control collar of whatever construction is preferably determined by the pulsating negative or positive operating pressure conditions of the valve.

For example, negative pulsating operating pressure can be down to -25 hg., while positive pulsating operating pressure can be up to 15 lbs. per square inch.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawing, in which:-

Figs. 1 to 4 are half-sectional views of three different forms of valve stem seal according to the invention.

A valve stem seal according to the invention engages a valve stem 10 and valve stem guide 11.

Referring to Fig. 1 of the drawing, the valve stem seal comprises a synthetic rubber moulding 12 having an upper frusto-conical portion 13 externally grooved as indicated at 14 to accommodate a garter spring 15 which urges the frusto-conical portion 13 into lip contact or sealing with the valve stem 10 as indicated at 16 (see Fig. 3). The synthetic rubber moulding 12 also closely embraces the valve stem guide 11 as indicated at 17, and said embrace is maintained either by a closed coil spring 17A or a circlip 17B engaging in a circumferential recess 12A of the synthetic rubber moulding 12.

The inner surface of the moulding 12 at its lip

contact region 16 is helically ribbed at 19 for its whole circumference to provide lubricant control passages which serve to meter sufficient oil to control the amount of wear on the valve stem 11.

The inner surface of the synthetic rubber moulding 12 has an inwardly-directed flange 20 which with the frusto-conical portion 13 defines a groove 21.

Into this groove 21 is received a plastics, preferably PTFE, control ring 22. This ring 22 is not bonded in position but is merely retained in the groove 21 by the inherent elasticity of the synthetic rubber moulding 13 or is scarf jointed for fitment into the groove 21.

This control ring 22 serves the dual function of compensating for the lateral loading on the valve stem 11 resulting from the rocker action and of providing a secondary seal resisting back-flow of lubricant.

Fig. 1 illustrates a straight bore configuration at control ring 22 and flange 20 used with comparatively balanced upstream and downstream operating pressure conditions.

Fig. 2 is a modification of the valve stem seal of Fig. 1 wherein the separate control ring 22 is omitted and the elastomeric flange indicated at 20A in this Figure is extended into engagement with the valve stem 11 to act as the control ring.

Figs. 3 and 4 illustrate valve stem seals substantially identical to that disclosed with reference to Fig. 1.

In the case of Fig. 3, the bore configuration at the control ring 22B and flange 20B and generally indicated at 23 is suitable for pressure operating conditions where pressure downstream of the seal exceeds pressure external of the seal.

In the case of Fig. 4, the bore configuration 24 at control ring 22C and flange 20C is suitable for conditions where negative pressure prevails downstream of the seal.

Again in the case of Fig. 4 the internal flange 20C is of greater length than flanges 20 to 20B and it defines a bore defining an angle α of between 25° and 30° with the central axis of the valve stem 10. This ensures a superior passage (compared with the other embodiments) of each metered quantity of lubricant on the downstroke of the valve stem 10.

Where lubricant pressure arises in the reverse direction of the valve stem 10 in consequence of supercharging the air intake, the angled flange 20C pressurises in the direction of the valve stem 10 ; and prevents lubricant being forced back, i.e. it assists the one-way downward flow of lubricant.

With all of these valve stem seals the frusto-conical portion 13 above the centreline of the garter spring 15 provides sufficient flexibility to

accommodate any lateral movement arising from any worn condition of the valve stem 10 and guide 11.

The shape factor at 16 remains truly circular as no sealing force is exerted at this location, the frusto-conical portion 13 being cantilevered from the centreline of the garter spring 15.

CLAIMS:

1. A valve stem seal comprising an elastomeric moulding adapted to lip seal against a valve stem and at its lip sealing region to be helically ribbed on its stem-adjacent surface to define lubricant control passages, the elastic moulding also providing downstream of its lip seal, in terms of lubricant flow, a control collar adapted to contact the valve stem to provide both a compensation for lateral loading of the valve stem resulting from rocker action and a secondary seal.

2. A valve stem seal as claimed in claim 1, in which the control collar is an inwardly-directed flange of the elastomeric moulding.

3. A valve stem seal as claimed in claim 1, in which the control collar is a plastics ring held within the elastomeric moulding in non-bonded relationship.

4. A valve stem seal as claimed in any one of claims 1 to 3, in which the elastomeric moulding has at its outer or upper end, when assembled on a valve stem, a frusto-conical portion engaging the valve stem to make the lip seal or contact.

5. A valve stem seal as claimed in any one of claims 1 to 4, in which the helical ribbing is cut or moulded on the elastomeric moulding.

6. A valve stem seal as claimed in any one of claims 3 to 5, in which the plastics control ring is

located in an annular recess of the elastomeric moulding on a supporting integral annular ledge of the latter.

7. A valve stem seal as claimed in any one of claims 3 to 6 in which the plastics control ring is formed of PTFE.

8. A valve stem seal as claimed in claim 6 or 7, in which the plastics control ring and the supporting elastomeric ledge or flange define a straight bore configuration suitable for comparatively balanced upstream and downstream operating pressure conditions.

9. A valve stem seal as claimed in claim 6 or 7 in which the plastics control extends inboard of the supporting elastomeric flange or ledge and presents an inwardly tapering bore configuration, in terms of lubricant flow, while the flange or ledge presents a straight bore configuration, which bore configuration combination is suitable for pressure operating conditions where pressure downstream of the seal exceeds pressure external of the seal.

10. A valve stem seal as claimed in claim 6 or 7, in which the supporting ledge or flange defines an angle of between 25° and 30° with the central axis of a valve stem to which the seal is fitted to ensure a more efficient passage of each metered quantity of lubricant on valve stem downstroke.

11. A valve stem seal, substantially as herein-before described with reference to Fig. 1 or Fig. 2 or

Fig. 3 or Fig. 4 of the accompanying drawing.

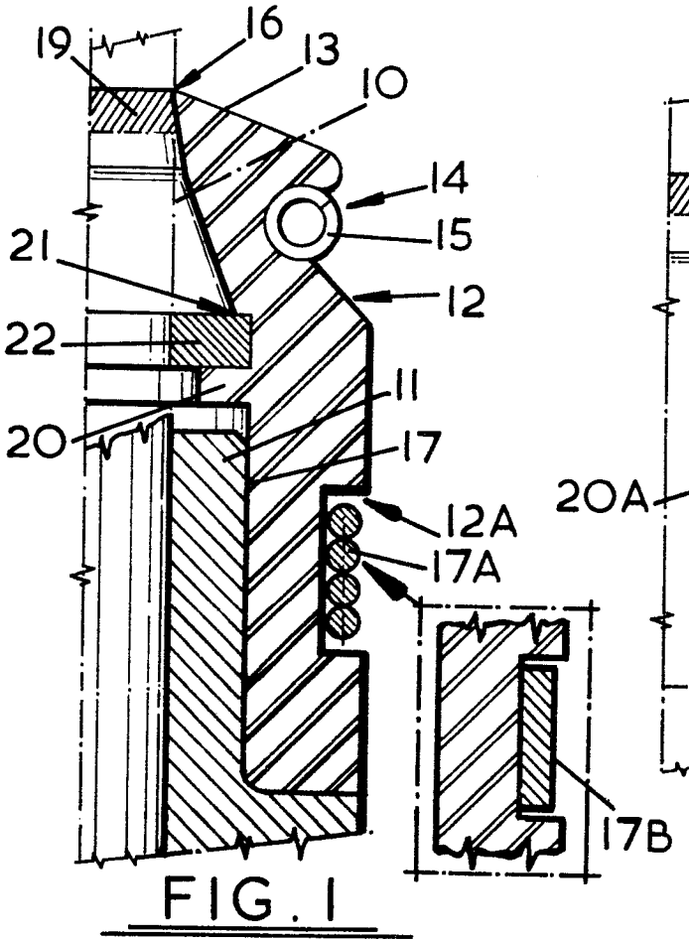

FIG. 1

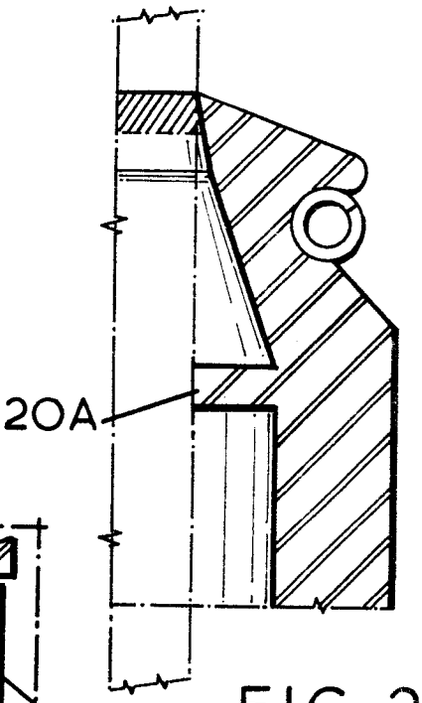

FIG. 2

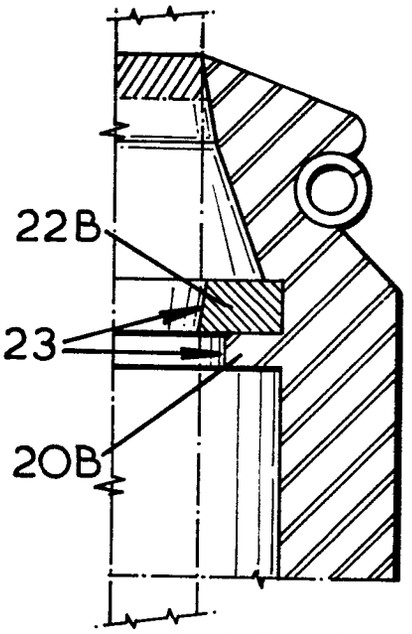

FIG. 3

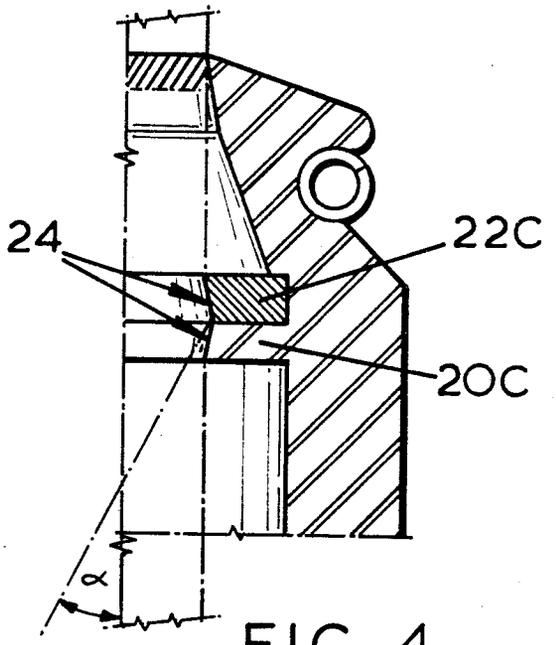

FIG. 4