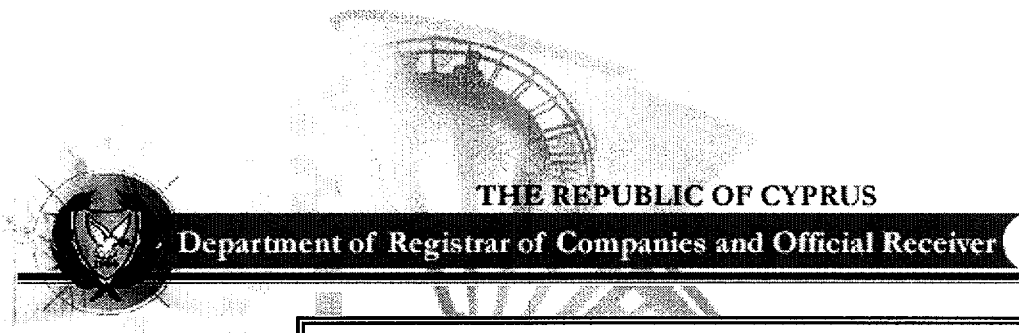




THE REPUBLIC OF CYPRUS

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**ΚΥΠΡΙΑΚΟ ΓΡΑΦΕΙΟ ΔΙΠΛΩΜΑΤΩΝ
ΕΥΡΕΣΙΤΕΧΝΙΑΣ
THE PATENT OFFICE OF CYPRUS**

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None

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**F2B
Selected US specifications from IPC sub-class F16J**

(54) Sealing rings

(57) A sealing ring (10) includes a plurality of circumferentially spaced axially directed projections (20) on one radial face thereof. In use, the sealing ring is located within a seating groove which is wider than the spacing between the radial faces (11, 12) of the sealing ring, the projections (20) holding the ring against axial movement within the groove whilst allowing the ring to swell in the axial direction inbetween the projections so as to maintain the dimensional stability of the outer face (14) of the ring. The sealing ring is particularly useful in uni-directionally operative hydraulic dampers and door closers incorporating such dampers.

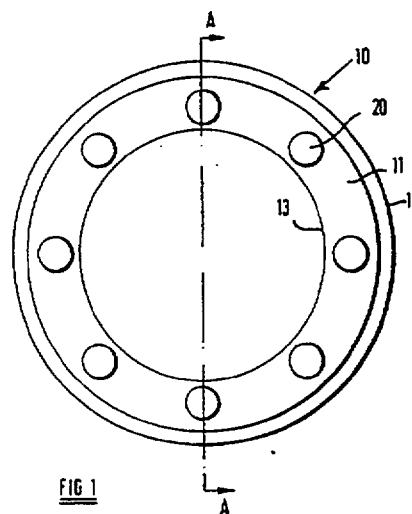


FIG 1

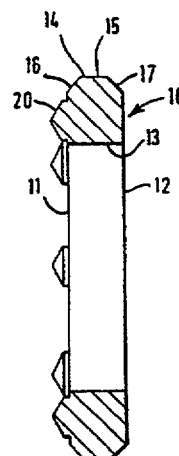
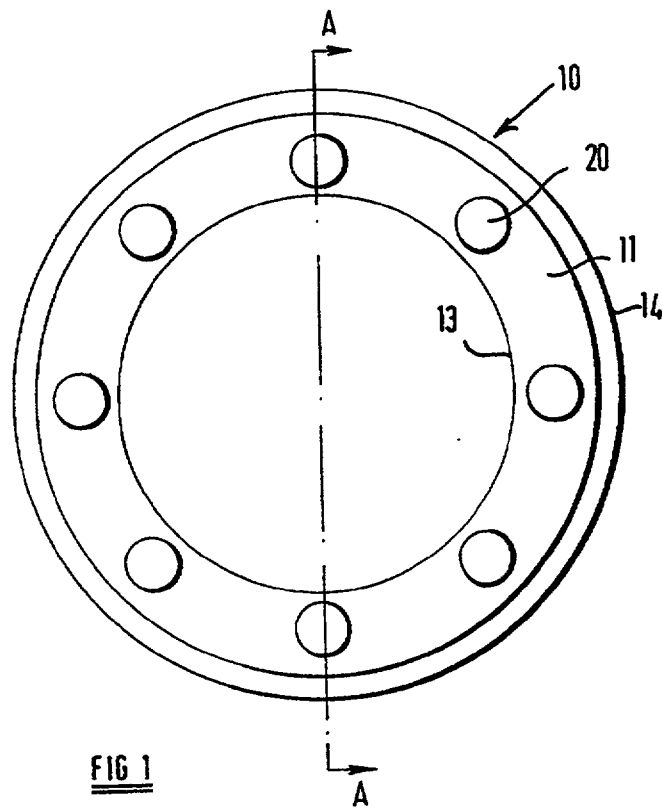
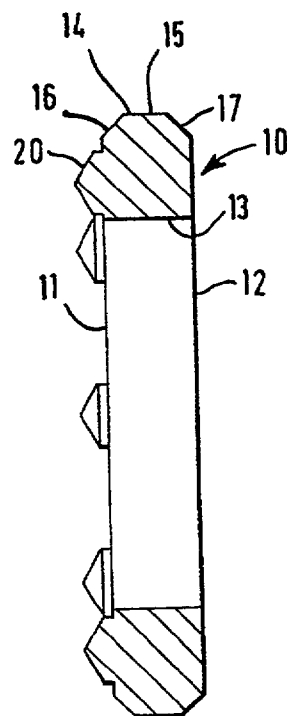


FIG 2

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

FIG 1FIG 2

SPECIFICATION

Sealing rings

DESCRIPTION OF THE INVENTION

5 This invention relates to sealing rings of the kind used to establish a peripheral seal between a piston and a cylinder in which the piston slides. More particularly, the invention is concerned with a sealing ring in or for an hydraulic damper, especially
10 but not exclusively in or for use in a door closer.

Such sealing rings are commonly of circular shape in radial section (i.e. O-rings) but often other sectional shapes are employed. However, it is usual for the axial dimension of the sealing ring to be
15 rather less than the corresponding dimension of the seating groove of the piston in which the ring is located. This enables swelling of the ring which tends to take place on prolonged exposure to hydraulic fluid to be accommodated without radial
20 expansion.

In an hydraulic damper, the use of a sealing ring which has a degree of axial clearance in this way can give rise to an undesirable deviation from the intended damping characteristic at the point where
25 the direction of movement of the piston changes. For example, in the context of a door closer, a damper may include a piston which is movable relative to a cylinder in one direction with little resistance as the associated door is opened, whilst a
30 significant resistance is established when the opposite movement occurs, as the door moves towards its closed position under the influence of spring or other actuating means. Movement of the sealing ring axially in its seating groove at the
35 beginning of such closure movement, whilst only slight, nevertheless allows the door initially to move without any damping through a distance which at the free edge may amount to several centimetres. During such movement, the door gathers speed and
40 when the damper becomes effective it can impose a sudden restriction on the rate of movement, which causes the door to jolt or jerk, thereby setting up undesirable strain in the hinges, the closer, and the door itself.

45 It is one of the objects of the invention to provide a novel seal which can be fitted into its seating groove without axial play, so as to enable a damper to be substantially free from such initial undamped movement.

50 According to one aspect of the invention we provide a sealing ring which affords axially directed projections on one radial face at circumferentially spaced positions.

According to a further aspect of the invention we
55 provide a piston and cylinder assembly including a sealing ring located in a seating groove wherein the sealing ring affords axially spaced radial faces which are spaced apart by a distance less than the axial width of the seating groove and a plurality of
60 axially directed projections on one of said faces at circumferentially spaced positions so that the ring is held against axial movement within the groove.

The projections may be of circular shape in transverse section and preferably of generally
65 conical form.

The radial faces of the sealing ring are preferably flat (apart from the projections) and the inner face is preferably of cylindrical form, with the inner face and each radial face meeting substantially at right
70 angles, the groove being of rectangular shape in transverse section.

The outer face of the ring may include a chamfered portion adjacent to one or both radial faces, and a central cylindrical surface. Desirably,
75 the outer diameter of the ring is controlled to a high degree of tolerance and may, for example, be machined to the required diameter.

The invention further resides in an hydraulic damper incorporating such a piston and cylinder
80 assembly, and a door closer incorporating such a damper.

The invention will now be described by way of example with reference to the accompanying drawings wherein:—

85 FIGURE 1 shows one embodiment of sealing ring in accordance with the invention in end view; FIGURE 2 shows a corresponding diametral section.

In accordance with the invention a sealing ring 10 is
90 formed with a plurality of circumferentially spaced axially extending projections 20 on one side thereof. As illustrated, there are eight equally spaced projections of circular shape in transverse section, each of substantially conical form on one otherwise
95 flat radial face 11 of the ring. The other radial face 12 is likewise of flat form, and the inner face 13 is of cylindrical form so as to meet the radial faces 11 and 12 substantially at a right angle. The outer face 14 of the ring includes a central, cylindrical portion 15 and
100 chamfered portions 16 and 17 adjacent to the radial faces.

The sealing ring 10 may be formed as a moulding of a suitable synthetic rubber, such as a nitrile rubber, but the outer surface may be ground down
105 so that the external diameter is maintained in production to a high tolerance.

In use, the ring is fitted into a rectangular section seating groove having an axial width such that the ring is received as a tight fit without axial
110 movement. Thus, the projections 20 engage one side wall of the groove whilst the opposite radial face 12 engages the other side wall. The inner surface 13 of the ring seats against the bottom wall of the groove, and the outer surface 14 projects
115 beyond the piston to the extent required to establish an effective seal with the interior surface of the cylinder within which the piston slides.

It will therefore be seen that as the piston reverse its direction of movement within the cylinder, the
120 sealing ring has no freedom to move axially, and accordingly where the piston and cylinder assembly forms part of an hydraulic damper, movement of the piston is at all times controlled in accordance with the desired characteristic of the damper.

125 In particular, where the damper is uni-directionally operative, the required damping characteristic is imposed immediately the piston commences to move in the appropriate direction.

The gaps between the projections 20 allow the
130 ring 10 to swell axially at intermediate positions and

in this way, any tendency of the ring to swell radially is eliminated, so that the resistance to movement of the piston afforded by contact between the sealing ring and the cylinder is maintained substantially
 5 constant despite ageing of the ring over an extended period of use.

Maintenance of an accurate external diameter is particularly important where the damper is of a type which allows for undamped movement of the piston
 10 at one end of its stroke by means of a locally counterbored end portion of the cylinder as described for example in British Patent specification No. 2044840. In that specification, there is described a door closer in which spring actuated closure of a
 15 door is controlled by means of an hydraulic damper. One end of the cylinder of the damper is of somewhat increased internal diameter so as to allow hydraulic fluid to flow freely past the outer face of the piston as the associated door finally
 20 moves into its position of closure, thereby enabling the door to accelerate and overcome the frictional resistance of any latch or lock which might otherwise prevent the door closing fully.

To enable such final acceleration to be achieved
 25 reliably over an extended period of use, it is essential that the external diameter of the sealing ring which is carried by the piston is maintained constant during the working life of the damper. Any increase in the external diameter of the sealing ring
 30 will impose an undesired restriction on the flow of fluid past the outer face of the ring at the widened portion of the cylinder so that the effectiveness of the final closing action will be reduced.

The chamfered portions 16 and 17 serve to
 35 minimise damage to the sealing ring as it passes repeatedly over the junction between the main portion of the cylinder in which the central portion 15 of the outer face engages the interior of the cylinder sealingly and the widened end portion of
 40 the cylinder which affords a radial clearance relative to the central portion 15 of the outer face.

The generally rectangular section of the sealing ring serves to ensure that it cannot twist within the seating groove.

45 Where the seal is used in a uni-directional hydraulic damper, as for example shown in Patent specification 2044840, the projections 20 preferably face towards the higher pressure side of the piston, so that the prevailing pressure which is exerted on
 50 the piston tends to force the radial face 12, which is not provided with projections, against the

corresponding side wall of the seating groove.

By forming the projections of substantially conical shape, rather than for example cylindrical, the
 55 volume available for axial swelling of the ring is maximised. However, the projections may have either a flat or radiused end, or in some case may be substantially part-spherical or domed form.

The features disclosed in the foregoing
 60 description, or the accompanying drawing, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, may, separately or in any combination of such
 65 features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A sealing ring affording axially spaced
 70 projections on one radial face at circumferentially spaced positions.

2. A sealing ring according to Claim 1 wherein the projections are of circular shape in transverse section.

3. A sealing ring according to Claim 2 wherein the
 75 projections are of generally conical form.

4. A sealing ring according to any one of the preceding claims wherein the radial faces are flat.

5. A sealing ring according to any one of the
 80 preceding claims wherein the inner face is of cylindrical form, the inner face and each radial face meeting substantially at right angles.

6. A sealing ring according to any one of the preceding claims wherein the outer face includes a
 85 central cylindrical surface and chamfered portions adjacent to one or both radial faces.

7. A sealing ring according to any one of the preceding claims wherein the outer diameter of the ring is machined to the required diameter.

8. A piston and cylinder assembly including a
 90 sealing ring located in a seating groove wherein the sealing ring affords axially spaced radial faces which are spaced apart by a distance less than the axial width of the seating groove, and a plurality of
 95 axially directed projections on one of said faces at circumferentially spaced positions so that the ring is held against axial movement within the groove.

9. An hydraulic door closer incorporating a piston and cylinder assembly as claimed in Claim 8.

100 10. A door closer incorporating an hydraulic damper as claimed in Claim 9.