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D E C I S I O N
of 29 May 1996

Case Number: T 0369/93 - 3.2.4

Application Number: 89904334.3

Publication Number: 0381709

IPC: F01B 11/02

Language of the proceedings: EN

Title of invention:

Compact fluid operated apparatus and method

Applicant:

YUDA, Lawrence Frank

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 54(1), 56

Keyword:

"Novelty - yes"

"Inventive step - yes"

Decisions cited:

-

Catchword:

-



Case Number: T 0369/93 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 29 May 1996

Appellant: YUDA, Lawrence Frank
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Decision under appeal: Decision of the Examining Division of the European Patent Office posted 2 Decemeber 1992 refusing European patent application No. 89 904 334.3 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: M. G. Hatherly
J. P. B. Seitz

Summary of Facts and Submissions

I. On 10 February 1993 the appellant (applicant) lodged an appeal against the decision of the examining division dispatched on 2 December 1992 to refuse for lack of novelty and inventive step the European patent application No. 89 904 334.3 (International patent application No. PCT/US89/01125, International publication No. WO-A-90/01613). The appeal fee was paid simultaneously and the statement of grounds of appeal received on 13 April 1993.

II. The following prior art documents were referred to in the appeal proceedings:

- D1 US-A-4 242 947
- D2 Hydraulic Handbook, 7th Edition, 1979, Trade and Technical Press Limited, England
- D3 US-A-3 667 785
- D4 GB-A-543 733
- D5 US-A-3 650 182

III. By letter of 8 May 1996 the appellant submitted a new main request and four auxiliary requests, each of the five requests being based on a different independent claim 1.

Following a detailed discussion with the representative during oral proceedings on 29 May 1996, the board expressed grave doubts as to the patentability of each of the five independent claims 1, citing lack of clarity and lack of support by the description (Article 84 EPC), lack of features essential to the invention (Article 84 and Rule 29 EPC), extension of the subject-matter of the

application beyond that originally filed (Article 123 EPC) and lack of inventive step (Articles 52(1) and 56 EPC).

The representative then replaced the five requests by a request that the decision under appeal be set aside and a patent be granted on the basis of the following documents, all filed during the oral proceedings:

- Claims 1 to 5 ;
- Description pages 1 to 17; and
- Drawings Figures 1 to 7.

IV. Claim 1 of the sole request reads as follows:

"A fluid operated apparatus having a cylinder assembly (10), a piston (13), and a rod (12) carried thereby comprising:

a cap member (31) carried within said cylinder assembly (10) on at least one side of said piston (13) including:

a first circumferential groove (A) in said cap member (10);

a second circumferential groove (C) within said cylinder assembly (10) adjacent an end thereof opposite said first circumferential groove (A) of said cap member;

a deformable O-ring (D) carried within a space defined between said first and second circumferential grooves (A, C) for positioning said cap member within said

cylinder assembly (10) and providing a fluid seal between the cylinder assembly (10) and the cap member (31);

when the apparatus is in an assembled state without fluid under pressure being present within the cylinder assembly said O-ring (D) is in a compressed deformed state by the walls of the grooves (A, C) including a beveled portion (26) at that end of the second groove (C) which is nearer to the outer end of said apparatus, a beveled portion (25) at that end of the first groove (A) which is nearer to said piston (13) and a retaining ridge (34) between said first groove (A) and a ramp (33);

said ramp (33) being part of a reduced end portion (B) and being defined by a substantially conical surface extending from said outer end of said end cap (31) and tapering inwardly progressively enlarging a circumference of the end cap (31) defined by said ramp (33), and terminating in an axial direction between said beveled portion (26) of the outer end of the second groove (C) and the center line of the said deformable O-ring (D)."

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*

All the features of the originally filed claim 1, except the rather unclear result expressed in relative terms in lines 3 and 4 of page 20 of the original publication,

are to be found in the present claim 1, some being reformulated in more detail.

The features added to the original claim 1 to arrive at the present claim 1 are derivable from the originally filed application as follows: page 14, lines 3 and 4 (the O-ring); line 16 of page 9, line 12 of page 15 and Figure 13 (the bevelled portions); the last line of page 12 (the retaining ridge); Figure 10 (the relative positions of the portions acting on the O-ring).

The present claims 2 to 5 are derivable from the original claims 2 and 4 to 6.

The present description consists of the originally filed description from which passages have been deleted and an acknowledgement of the prior art added.

The present Figures 1 to 7 are the original Figures 9 to 15 with an added reference numeral 25 in the present Figure 5.

There is thus no objection under Article 123(2) EPC to the present version of the application.

3. *Closest prior art, problem and solution*

- 3.1 The closest prior art document is D1 which discloses an O-ring 62 in grooves in an open ended cylinder 22 and a blind end plug 24 (see the bottom of Figure 1) and an O-ring 62 (at the top of Figure 6) in grooves in cylinder 22 and a sleeve plug 104. These "accomplish ... simultaneously adjoining and sealing" (see column 2, lines 7 to 16), "simultaneous sealing and locking" (column 5, line 55) and "component locking and sealing" (see column 3, lines 50 to 52). Thus the O-ring both

positions the plug in the cylinder and provides a fluid seal. A tapered or ramp portion extends from the groove in the plug to the latter's outer end.

Document D1 does not explicitly disclose that, when the apparatus is in an assembled state without fluid under pressure being present within the cylinder assembly, said O-ring is in a compressed deformed state. In fact document D1 consistently depicts an exact fit of the O-ring in the two grooves with no apparent O-ring deformation (see in particular Figure 4) although of course when there is pressure in the cylinder assembly it will push the O-ring in an axial direction and cause its deformation.

3.2 The problem arising from this prior art arrangement is to achieve a more secure connection of the end plug and cylinder in the absence of pressure within the cylinder assembly.

3.3 The board considers that the particular configuration of the grooves specified in claim 1 provides a solution to this problem. The O-ring is acted upon by the walls of the grooves including a bevelled portion at the outer end of the groove in the cylinder, a bevelled portion at the piston side of the groove in the cap member, and a retaining ridge between the cap member groove and a ramp which terminates in an axial direction between the bevelled portion of the cylinder groove and the centre line of the O-ring. The groove configuration puts a suitably sized O-ring into a particularly-shaped, compressed and deformed state, prior to the application of fluid pressure. This initial deformation allows the O-ring to fit more snugly and securely into the retaining grooves, and ensures a more secure seal after the introduction of pressure into the apparatus.

4. *Novelty*

The particular configuration of the grooves in cylinder and cap member specified in the present claim 1 is not disclosed by any of the prior art documents available to the board.

Therefore the subject-matter of claim 1 is considered novel within the meaning of Article 54 EPC.

5. *Inventive step*

5.1 Document D1 depicts an exact fit of the O-ring in the two grooves with no apparent O-ring deformation and so does not explicitly disclose the compressed deformed state of the O-ring in the absence of fluid pressure. Moreover, with the exception of the ramp portion in the plug, the arrangement of grooves and O-ring is symmetrical about the transverse plane containing the centre of the O-ring. Therefore the skilled person finds no information in document D1 which would lead him to the particular asymmetric ramp-ridge-grooves configuration specified in the present claim 1. On the contrary, according to the board, a person skilled in the art wanting to improve sealing and positioning of the embodiment set out in document D1 would obviously be guided by his general knowledge merely to try to use a larger O-ring.

5.2 Although Figure 1 on page 330 of document D2 shows an asymmetric arrangement of grooves and O-ring, this is a crush joint whose configuration has little in common with that of the present invention. Even if, for whatever reason, the teachings of documents D1 and D2 were to be combined, they would not yield the assembly set out in the present claim 1.

- 5.3 Document D3 concerns coupling tubular members but not a piston-containing fluid operated apparatus. While a ramp is disclosed it is on the outer member and the grooves in the inner and outer members appear to be exactly opposite each other. There are no hints in the document leading towards the particular configuration specified in the present claim 1.
- 5.4 Document D4 concerns coupling rods, tubes, shafts or the like with a symmetrical arrangement of O-ring and grooves about the transverse plane containing the centre of the O-ring.
- 5.5 The bearing cap 13 shown in Figure 1 of document D5 is held in the cylinder 10 by both a seal 25 and a snap ring fastener 28 and thus this apparatus does not provide the advantage of having a single ring member providing both sealing and locking. Similarly in US-A-4 167 134 there is both an O-ring 31 and a square wire key 16 (see Figure 2). In US-A-4 565 506, while there is a seal member 58 which both seals and locks (Figure 2; column 3, lines 4 and 5), there is an additional seal 60 (column 3; lines 12 to 15).
- 5.6 The board cannot see that any combination of the documents available to it, even assuming such a combination to be obvious, would lead to the subject-matter of claim 1.
6. The subject-matter of claim 1 of the sole remaining request is thus patentable as required by Article 52 EPC. A patent may therefore be granted based on this allowable independent claim and on claims 2 to 5 which are dependent on claim 1.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent in the following version:


Claims 1 to 5,
description pages 1 to 17, and
drawings Figures 1 to 7,
all of the sole request filed during the oral
proceedings.

The Registrar:



N. Maslin

The Chairman:



C. Andries

JRS

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