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(54) **Oil control valve for variable cam phaser**

(57) An oil control valve for a variable cam phaser (14) has a secure steel-to-steel fit between the secondary plate (62) of the bobbin (42) and the frame (52) owing to a shoulder (58) formed in the frame (52) against which the secondary plate (62) abuts, and also owing to an o-ring (64) disposed between the bobbin (42) and frame (52). This prevents oil from leaking into the electrical connector (46) of the valve, which advantageously can be oriented parallel to the axis of the valve.

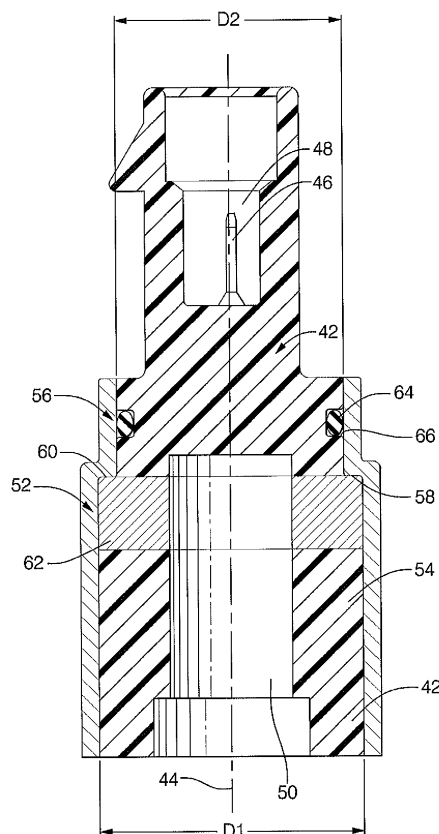


FIG. 2

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EUROPEAN SEARCH REPORT

 Application Number
 EP 08 16 1391

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2007/065566 A (THOMAS MAGNETE GMBH [DE]; HILLESHEIM THORSTEN [DE]; ALKEN JOHANNES [DE] 14 June 2007 (2007-06-14)	1,2	INV. F01L1/344 F16K27/02 F16K31/06 F15B13/044 H01F7/16
Y	-----	3,4	
X	DE 195 04 185 A1 (REXROTH MANNESMANN GMBH [DE] HYDRAULIK RING GMBH [DE]) 14 August 1996 (1996-08-14) * the whole document *	1,2	
X	WO 2007/059898 A (THOMAS MAGNETE GMBH [DE]; GEIS HARALD [DE]; ROTT HORST [DE]) 31 May 2007 (2007-05-31) * page 9, lines 16-29; figure 1 *	1,2	
X	DE 102 38 840 A1 (THOMAS MAGNETE GMBH [DE]) 4 March 2004 (2004-03-04)	1,4	
Y	* figures 1-3 *	3,4	
A	DE 199 34 846 A1 (HYDRAULIK RING GMBH [DE]) 25 January 2001 (2001-01-25) * the whole document *	1-4	
A	US 2006/237672 A1 (MORENO ALEJANDRO [US] ET AL) 26 October 2006 (2006-10-26) * the whole document *	1	
A	US 2005/178992 A1 (BARRON LUIS F [US] ET AL) 18 August 2005 (2005-08-18) * paragraphs [0018] - [0020]; figure 1 *	1	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F01L F16K F15B H01F
Place of search		Date of completion of the search	Examiner
Munich		15 December 2008	Clot, Pierre
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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 EPO FORM 1503 03.82 (P04C01)



Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see additional sheet(s)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4

an oil control valve having for sealing purpose a combination of one o-ring disposed between bobbin and frame together with an abutment of a bobbin against a shoulder of the metal frame

2. claims: 5-10

an assembly for a vehicle comprising a variable cam phaser and an oil control valve having a shoulder defining a metal-to-metal interface for inhibiting oil leakage into an electrical connector

3. claims: 11-15

an oil control valve comprising a metal secondary plate abutting against a surface defined by the frame, the surface being perpendicular to an axis defined by the frame.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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15-12-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2007065566	A	14-06-2007	DE 102005058846 A1	28-06-2007
			EP 1957840 A1	20-08-2008
DE 19504185	A1	14-08-1996	US 5871201 A	16-02-1999
WO 2007059898	A	31-05-2007	DE 102005056039 A1	06-06-2007
			EP 1952032 A1	06-08-2008
DE 10238840	A1	04-03-2004	US 2006071560 A1	06-04-2006
			US 2004135658 A1	15-07-2004
DE 19934846	A1	25-01-2001	EP 1073070 A2	31-01-2001
			ES 2263417 T3	16-12-2006
			JP 2001065730 A	16-03-2001
			US 6315268 B1	13-11-2001
US 2006237672	A1	26-10-2006	NONE	
US 2005178992	A1	18-08-2005	NONE	