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(54) **Electromagnetically driven valve and driving method of the same**

(57) An electromagnetically driven valve includes a valve element (14) that has a valve stem (12) and moves in reciprocating motion in a direction in which the valve stem (12) extends; a disc (30) that is interlocked with the valve element (14) at a driving end (32), extending to a pivoting end (33), from which a central axis (35) extends and around which the disc (30) oscillates; a coil (62) that oscillates the disc (30); a power supply (200) that supplies electric current to the coil (62); and an ECU (100) that controls the flow of current from the power supply (200) to the coil (62). A permanent magnet (300) is located on the outer side of the oscillating member, apart from the cores (61,161). During the initial period of operation of the disc, the ECU (100) controls the current so that it is supplied from the power supply (200) to the coil (62) in cycles, and in accordance with the voltage and temperature, controls the number of current cycles, the cycle length, and the value of the current.

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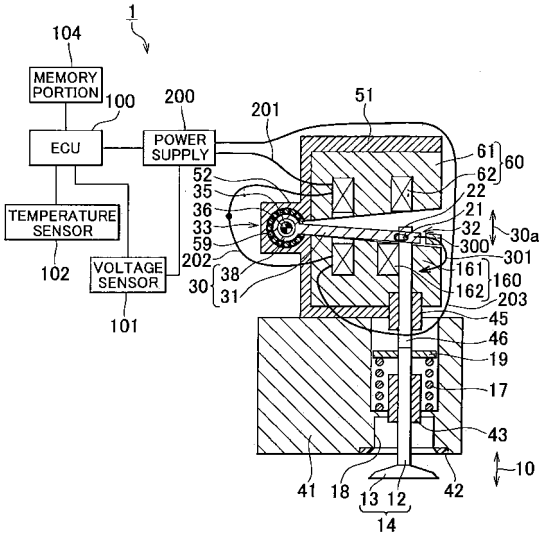

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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 3997

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	EP 1 253 298 A (DAIMLER CHRYSLER AG [DE]) 30 October 2002 (2002-10-30) * abstract * * figures 3,6 *	1,5	
Y	EP 0 395 450 A1 (ISUZU CERAMICS RES INST [JP]) 31 October 1990 (1990-10-31) * abstract * * figure 1 *	1,5	
Y	US 6 216 653 B1 (HARA SEINOSUKE [JP] ET AL) 17 April 2001 (2001-04-17) * abstract * * figure 1 *	1,5	
A	EP 1 010 866 A2 (TOYOTA MOTOR CO LTD [JP]) 21 June 2000 (2000-06-21) * the whole document *	1,5	TECHNICAL FIELDS SEARCHED (IPC) F01L

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	3 August 2007	Paulson, Bo

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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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims 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 the first ten claims.

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)

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 07 01 3997

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: 1,5

A valve driven by a pivoting electromagnetical drive unit having a parmanent magnet.

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2. claims: 2,3,4

A valve driven by a pivoting electromagnetical drive unit controlled in accordance with voltege and temperature.

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3. claim: 6

A method of controlling an electromagnetical drive unit for a valve in accordance with voltage and temperature.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 01 3997

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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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82