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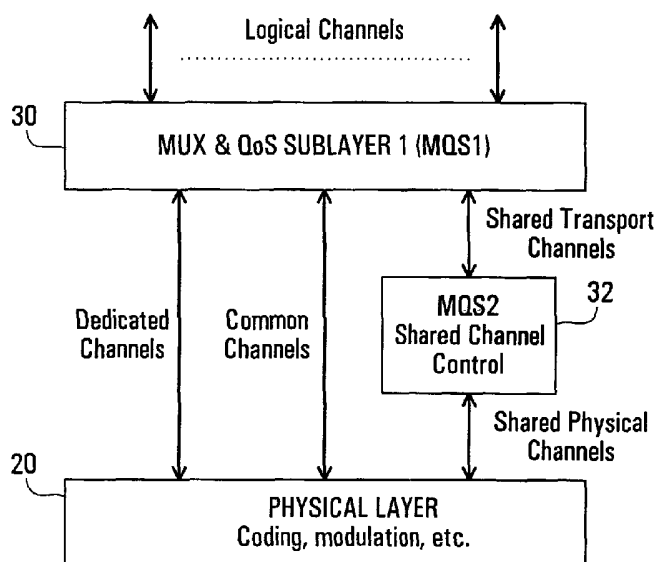
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- (74) Agent: MACRAE & CO.; P.O. Box 806, Station B, Ottawa, Ontario K1P 5T4 (CA).
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- (71) Applicant: SIEMENS VDO AUTOMOTIVE INC. [CA/CA]; 700 Park Avenue East, Chatham, Ontario N7M 5M7 (CA).
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LINEAR SOLENOID AUTOMOTIVE EMISSION CONTROL VALVE



(57) Abstract: An automotive emission control valve, such as an EGR valve, has a solenoid for operating a valve element. The solenoid stator has an annular air gap disposed within an electromagnet coil. An annular wall of an armature is disposed in the air gap. The armature is displaced by magnetic flux in the air gap. The air gap is cooperatively defined by juxtaposed walls of the stator that are spaced radially a distance greater than radial thickness of the annular wall of the armature. The annular wall of the armature is disposed radially intermediate the stator walls and spaced from each stator wall. The radially inner stator wall is tapered. Lost-motion is present between the armature and valve element so that initial armature displacement is not transmitted to the valve element. Dimensions of the stator walls and armature at the air gap may be selected to improve linearity of operation.



WO 03/016703 A3

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 02/01175

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 F02M25/07 F16K31/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F02M F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 142 445 A (IKEDA TADAAKI ET AL) 7 November 2000 (2000-11-07) column 2, line 23 - line 26; figure 1 column 4, line 59 -column 5, line 2 ---	1,12
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 06, 22 September 2000 (2000-09-22) & JP 2000 074248 A (SAGINOMIYA SEISAKUSHO INC), 14 March 2000 (2000-03-14) abstract ---	1,12
A	US 6 189 519 B1 (DAUER KENNETH JOHN ET AL) 20 February 2001 (2001-02-20) column 3, line 25 - line 41; figure 1 --- -/--	1

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

2 December 2002

Date of mailing of the international search report

17. 03. 2003

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 02/01175

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 247 461 B1 (PALMER DWIGHT ORMAN ET AL) 19 June 2001 (2001-06-19) column 4, line 31 - line 37; figure 1 ---	1
A	US 5 947 092 A (TAMMAN ALLAN ET AL) 7 September 1999 (1999-09-07) column 5, line 45 - line 62; figure 2 -----	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA 02/01175

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-10, 12-14

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-10,12-14

An emission control valve for controlling flow of gases wherein an air gap is defined by juxtaposed walls of the stator and the armature is disposed within.

2. Claim : 11

An emission control valve for controlling flow of gases wherein a lost motion connection between the armature plunger and the valve element is used with the aim of improving the linear response of the valve.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 02/01175

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6142445	A	07-11-2000	JP 10318414 A DE 19821438 A1 FR 2765942 A1	04-12-1998 14-01-1999 15-01-1999

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