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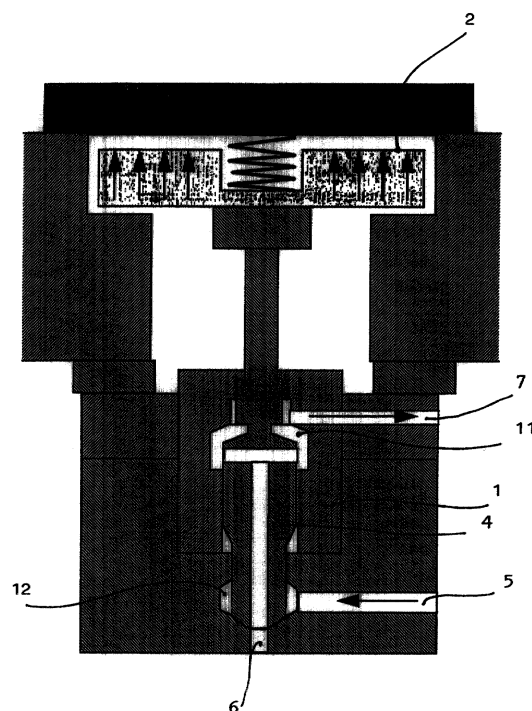
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(54) **Improved injection device in diesel engines of the common-rail type**

(57) Fuel injector for an internal combustion engine, comprising a valve body (1) provided with an inner housing, a therein sliding plunger (4), in which there are arranged at least a first (11) and a second chamber (12), three distinct conduits (5,6,7) adapted to convey a flow of fuel from a high-pressure source to one of said chambers and a flow of fuel from one of said chambers to the needle valve (51), in which the outer walls of the plunger (4) are slidably adhering to inner walls of said housing so as to prevent fuel from anyhow leaking or seeping between said two chambers through passages between the plunger and said walls.

The outflow section (B) connecting said first conduit (5) with said third conduit (6) within the second chamber (12) is of the same order of magnitude as the outflow section (B) of said needle valve (51) and is further significantly smaller than the outflow section (B) connecting said second conduit (7) within the first chamber (11).

FIG. 2





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EUROPEAN SEARCH REPORT

Application Number
EP 99 11 0390

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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A	EP 0 728 969 A (LUCAS IND PLC) 28 August 1996 (1996-08-28)	1	
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A	US 5 651 346 A (REMMELS WERNER ET AL) 29 July 1997 (1997-07-29)	1	
	* the whole document *		

A	GB 2 295 881 A (LUCAS IND PLC) 12 June 1996 (1996-06-12)	14,15	
	* the whole document *		

			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F02M
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 8 January 2003	Examiner Wagner, A
CATEGORY OF CITED DOCUMENTS		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	
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			

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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:



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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: 1-13

An injector, whereby the outflow section (B) that connects, inside said second chamber (12), said first conduit (5) with said third conduit (6) is of the same order of magnitude as the outflow section of said needle valve, and significantly smaller than the outflow section (A) that connects, inside said first chamber (11), said second or discharge conduit (7).

2. Claims: 14, 15

Injector whereby said plunger (4) is provided with two cylindrical and coaxial bodies (50, 51), of which the first body (50) comprises a cylindrical portion and a frusto-conical portion (21) adapted to move into abutting against an outer wall of said first chamber (11).

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

EP 99 11 0390

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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08-01-2003

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