

**EUROPEAN PATENT APPLICATION**

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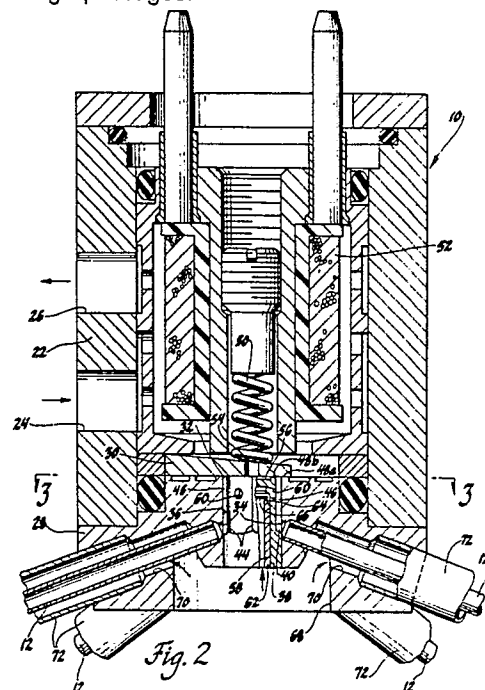
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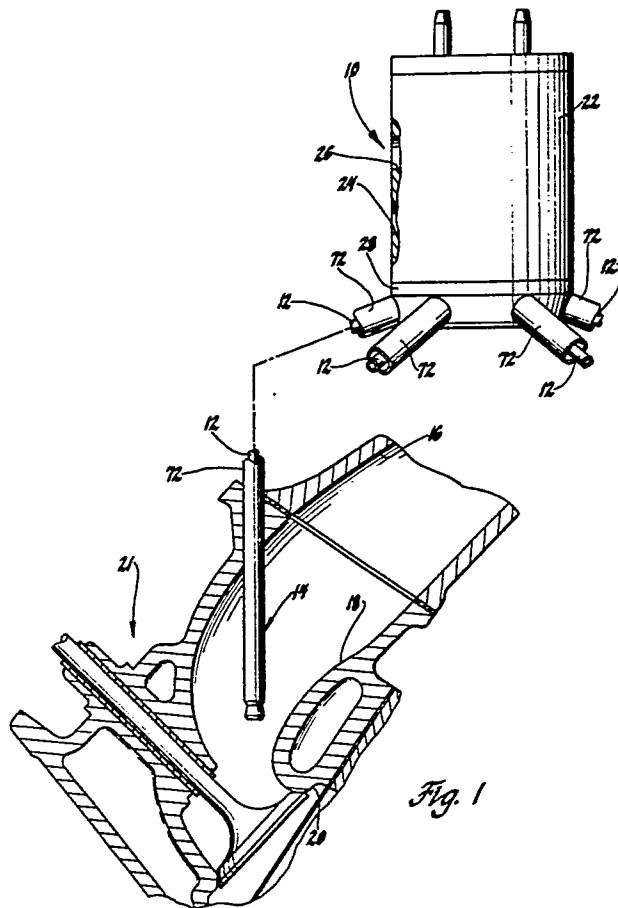
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**Fuel injection apparatus.**

In a fuel injection apparatus for a multi-cylinder internal combustion engine (21), a plurality of injection nozzles (14) discharge fuel adjacent the engine inlet ports (18), and a single fuel injector (10) meters the fuel to all of the injection nozzles. The fuel injector (10) comprises an injector base (28) having a plurality of fuel discharge passages (34) and an annular region (32) through which fuel is delivered to the fuel discharge passages, each of the fuel discharge passages being adaptable to direct fuel to one of the injection nozzles, the annular region including a valve surface (48), a single valve member (30) associated with the valve surface, the valve member being adapted to engage the valve surface to preclude fuel delivery to the fuel discharge passages, a solenoid (52) adapted to disengage the valve member from the valve surface to permit fuel delivery to the fuel discharge passages, characterised by air valve means (58, 64, 66) for controlling flow of air to the fuel discharge passages (34) and being adapted to preclude air flow to the fuel discharge passages when the valve member permits fuel delivery to the fuel discharge passages and to

admit air to the fuel discharge passages when the valve member precludes fuel delivery to the fuel discharge passages.







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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. 4)
X	US-A-4 570 598 (SAMSON) * Abstract; column 1, line 56 - column 2, line 64; figure 1 *	10	F 02 M 69/08 F 02 M 51/02
A	--	1,4,5, 8,9,12, 16	
P,A	GB-A-2 175 952 (ORBITAL ENGINES) * Abstract; page 3, line 76 - page 4, line 44; figure 1 *	1-3,6, 11	
A	EP-A-0 163 198 (VOLKSWAGENWERK) * Abstract; page 4, lines 1-21; page 5, line 15 - page 6; figure 1 *	1,7	
A	WO-A-84 04 568 (WISDOM) * Abstract; page 2, line 31 - page 5, line 9; figures 1-3 *	1,7	TECHNICAL FIELDS SEARCHED (Int. Cl. 4)  F 02 M
A	US-A-4 465 050 (IGASHIRA) * Abstract; column 3, line 11 - column 4, line 11; figure 1 *	1,7	
A	DE-A-3 320 469 (VOLKSWAGENWERK) * Abstract; pages 6-9; figures 1,3 *	1-6	
A	DE-A-3 033 644 (ROBERT BOSCH) * Page 7, line 25 - page 9; figure 2 *	12,16, 17	
The present search report has been drawn up for all claims ./. .			
Place of search THE HAGUE		Date of completion of the search 19-07-1989	Examiner ERNST
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>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</p> <p>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 &amp; : member of the same patent family, corresponding document</p>			



## CLAIMS INCURRING FEES

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

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees 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 claims:
- ☐ 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.

## X LACK OF UNITY OF INVENTION

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

namely:

1. Claims 1-7,10,11: Fuel injector with air valve means for controlling flow of air to the fuel discharge passages
2. Claims 8,9,12-17: Construction of a fuel injector

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ 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 has 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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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. 4)
A	DE-A-1 933 514 (BRICO ENGINEERING) * Figures 2-5 * --	17	
A	US-A-4 325 341 (YAMAUCHI)		
A	EP-A-0 083 516 (ORBITAL ENGINES)		
A	US-A-4 519 370 (IWATA)		
A	US-A-2 623 786 (WILLE)		
A	US-A-2 957 682 (CAMERON) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
Place of search		Date of completion of the search	Examiner
<b>CATEGORY OF CITED DOCUMENTS</b>			
<div><div>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</div><div>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  &amp; : member of the same patent family, corresponding document</div></div>			