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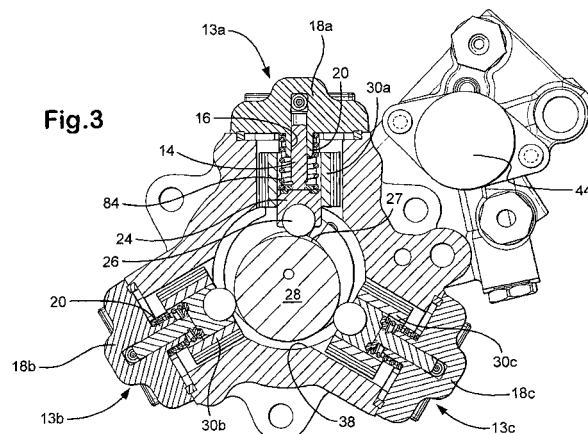
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(54) **Fuel pump assembly**

(57) A fuel pump assembly for use in an engine, the fuel pump assembly comprising a plurality of pump heads (13a, 13b, 13c) mounted upon a main pump housing (10), wherein each of the pump heads (13a, 13b, 13c) includes a pumping plunger (14) which is reciprocable, in use, within a plunger bore (16) under the influence of an associated drive arrangement (24, 26) so as to cause pressurisation of fuel within a pumping chamber (22) defined within a pump head housing (18a). The drive arrangement of each pump head includes a shoe (24) and a roller (26) which is cooperable

with a driven cam (28), common to each of the pump heads (13a, 13b, 13c), so as to impart reciprocal movement to the shoe (24) as the cam (28) is driven, in use. The shoe (24) is of substantially square or rectangular cross section and each pump head further includes an insert (30a) being formed as a separate part from the main pump housing (10) but being in permanent attachment therewith, wherein the insert (30a) defines a guide path of substantially rectangular or square cross section corresponding to that of the shoe (24) so that the guide path serves to guide movement of the shoe (24) upon reciprocal movement thereof.



**Fig.3**



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# EUROPEAN SEARCH REPORT

Application Number  
EP 03 25 6728

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.7)
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A	EP 0 517 991 A (MARTIN, T.M.) 16 December 1992 (1992-12-16) * abstract * * column 10, line 49 - column 12, line 28 * * figure 2 *	20-22	
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 30 August 2004	Examiner Gnüchtel, F
<p>CATEGORY OF CITED DOCUMENTS</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>			

EPO FORM 1503 03/82 (P04C01)



European Patent  
Office

Application Number  
EP 03 25 6728

**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  
EP 03 25 6728

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: 1-19

A fuel pump for use in an engine, wherein each pump head comprises an associated insert which defines a guide path of substantially rectangular or square cross section.

2. Claims: 20-22

A fuel pump assembly having at least one pair of pump heads, wherein one pump head of the or each pair is positioned at substantially 90° to the other pump head of said pair, and wherein the cam is shaped to result in there being two pressurisation events for each pump head per pumping cycle.

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

EP 03 25 6728

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