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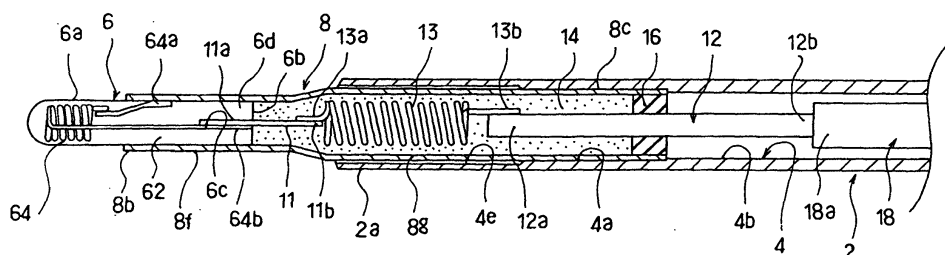
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(54) **Ceramics glow plug and method of manufacturing same**

(57) Toward an end 6d of a ceramics heater 6, a coiled heating element 64 formed of a high melting point metal and a control coil 13 having a greater positive temperature coefficient of resistance than the heating element 64 are connected together through a lead wire 11, and the other end 13b of the control coil is connected to an electrode fitting 12. The ceramics heater 6 is cemented within a reduced diameter portion 8f of a metallic outer sleeve 8 by brazing while the control coil 13 and its junction 12a, 13b with the electrode fitting 12 are contained within an increased diameter portion 8g of the

metallic outer sleeve 8. A heat resistant insulating powder 14 is filled into a space 15 located within the increased diameter portion 8g of the metallic outer sleeve 8, a seal member 16 is fitted into an opening 4d, and an end 8e is caulked before applying a swaging operation to the metallic outer sleeve. Subsequently, the electrode fitting 12 is welded to an external connection terminal 18, and a resulting assembly is assembled into a housing 2. An ease of assembly of a self-controlled ceramics glow plug 1 is improved while allowing a reduction in the cost.

**FIG.2**





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# EUROPEAN SEARCH REPORT

Application Number  
EP 01 12 6433

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)
A	US 5 218 183 A (KIMATA HIROYUKI) 8 June 1993 (1993-06-08) * column 2, line 21 - line 54; figures * -----	1	F23Q7/00
A	US 4 725 711 A (MINEGISHI SOKICHI ET AL) 16 February 1988 (1988-02-16) * column 4, line 11 - line 63; figures * -----	1	
A	US 5 059 768 A (HATANAKA KOJI ET AL) 22 October 1991 (1991-10-22) * column 3, line 44 - column 5, line 29; figures * -----	1	
A	US 6 037 568 A (HATANAKA KOJI ET AL) 14 March 2000 (2000-03-14) * column 4, line 1 - line 55; figures * -----	1	
<p><del>The present search report has been drawn up for all claims</del></p>			<p>TECHNICAL FIELDS SEARCHED (Int.Cl.7)</p> <p>F23Q</p>
Place of search		Date of completion of the search	Examiner
The Hague		15 November 2004	Van Gheel, J
<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>			

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EPO FORM 1503 03/82 (P04/C01)



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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:

1-9, 13-15



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**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
**EP 01 12 6433**

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: 1-9, 13-15**

the control coil and its junction with the rigid electrode fitting are contained within the metallic outer sleeve  
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**2. claims: 10-12**

correcting the resistance of the ceramics heater by a selection of the control resistor or by screwing the electrode fitting to an adjustable location in the control resistor  
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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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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15-11-2004

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 5218183	A	08-06-1993	JP	4143518 A	18-05-1992
			DE	4133046 A1	09-04-1992
-----					
US 4725711	A	16-02-1988	JP	1713810 C	27-11-1992
			JP	4001265 B	10-01-1992
			JP	61055526 A	20-03-1986
-----					
US 5059768	A	22-10-1991	JP	3175210 A	30-07-1991
			DE	4028859 A1	25-04-1991
-----					
US 6037568	A	14-03-2000	JP	3560753 B2	02-09-2004
			JP	9257251 A	30-09-1997
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82