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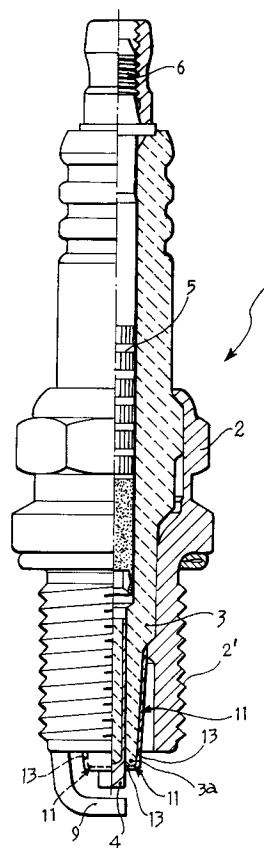
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I-10152 Torino (IT)(54) **A spark plug.**

(57) The plug (1) has a layer (13) of fluorocarbon polymer on the surfaces (11) of the insulating element (3) which are directly exposed to the atmosphere near the central electrode (4) and/or which face the outer tubular metal body (2) so as to prevent the insulating element (3) from being fouled by carbon residues.

**EP 0 633 637 A1**

The present invention relates to spark plugs for internal combustion engines with controlled ignition.

More specifically, the invention relates to a spark plug of the type comprising:

an outer tubular metal body,
a tubular insulating element disposed in the body,
a central electrode which extends through the insulating element and projects axially beyond the end of the insulating element which faces the combustion chamber in use, and
at least one earth electrode which extends from the outer metal body towards the side surface of the portion of the central electrode which projects from the insulator.

An object of the invention is to provide a spark plug of the type specified above which prevents the deposition of carbon particles on the end of the ceramic insulating element.

As it is known, conventional spark plugs are subjected to very heavy use during the movement of the motor vehicles in which they are fitted in storage yards and, in general, during the short movements necessary to transport the motor vehicles from the place of construction to the commercial network, and this may lead to the insulator of the plug being fouled with carbon substances which may short-circuit the central electrode to the outer metal body with the result that it is impossible to obtain useful sparks.

The object of the present invention is to provide a spark plug for internal combustion engines with controlled ignition which is highly resistant to fouling during the pre-sale life of the motor-vehicle in which it is mounted.

This object is achieved, according to the invention, by means of a spark plug for internal combustion engines with controlled ignition having the specific characteristics recited in the following claims.

Further characteristics and advantages of the invention will become clear from the detailed description which follows with reference to the appended drawing provided purely by way of non-limiting example, in which a spark plug, partially sectioned along its longitudinal centreline is generally indicated 1.

The plug 1 comprises, in known manner, an outer tubular metal body 2, a portion 2' of which is threaded externally.

A substantially tubular element 3 of electrically insulating material, typically ceramic material, is disposed in the body 2, in known manner.

An end portion 3a of the insulating element 3 projects axially beyond the end of the metal body 2 which faces the combustion chamber in use.

A central electrode, indicated 4, extends through a portion of the insulating element 3 and projects beyond the end 3a of the insulating element.

A conductor core 5 is also disposed in the insulating element 3. One end of the core projects axially from the insulating element 3 and forms an electrical connection terminal 6.

5 The plug 1 also comprises one (or more) substantially arcuate earth electrodes 9 which are connected (for example, by welding) to the annular end surface of the metal body 2 and the ends of which face the central electrode 4.

10 In the event of cold starting followed by travel over very short distances and subsequent stoppage for long periods, moisture and carbon particles are deposited on the surfaces 11 of the insulating element 3 which are directly exposed to the atmosphere of the combustion chamber near the central electrode 4 or which face the outer tubular metal body 2, and the moisture and carbon particles stick to the rough ceramic surface, forming a continuous electrically-conductive layer which, as already stated, may short-circuit the central electrode 4 to the metal body 2 at high voltages, preventing discharge to the earth electrode 9 and consequently rendering the plug unserviceable.

25 In order to prevent this, the Applicant has found that a covering layer 13 of waterproof and anti-adhesive material, for example of fluorocarbon polymer or a Polytetrafluoroethylene dispersion (Teflon Oil) on the walls 11 drastically reduces fouling, by preventing the binding of the carbon particles by virtue of the waterproofing and anti-adhesive properties of the aforementioned substances.

30 The layer 13 of waterproof and anti-adhesive material may be deposited by the usual spraying, mechanical application, or immersion techniques, possibly followed by a hot cross-linking treatment.

35 The layer 13 of waterproof and anti-adhesive material is conveniently a few μm (microns) thick.

40 Naturally, the principle of the invention remaining the same, the forms of embodiment and details of construction may be varied widely with respect to those described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the present invention.

45 For example, the thickness of the coating material, its chemical composition, and/or the application techniques may be varied.

50 Claims

1. A spark plug comprising
 - an outer tubular metal body (2),
 - a tubular insulating element (3) disposed in the body (2),
 - a central electrode (4) which extends through the insulating element (3) and projects axially beyond the end (3a) of the insulating element

(3) which faces the combustion chamber in use,
at least one earth electrode (9) which extends from the outer metal body (2) towards the side surface of the portion of the central electrode (4) which projects from the insulator (3), characterized in that a layer (13) of waterproof and anti-adhesive material is deposited on the surfaces (11) of the insulating element (3) which are directly exposed to the atmosphere of the combustion chamber near the central electrode (4) and/or which face the outer tubular metal body (2).

2. A plug according to Claim 1, characterized in that the layer (13) is made of fluorocarbon polymer.
3. A plug according to Claim 2, characterized in that the layer (13) is deposited by spraying.
4. A plug according to Claim 2, characterized in that the layer (13) is deposited by mechanical application.
5. A plug according to Claim 2, characterized in that the layer (13) is deposited by immersion,
6. A plug according to Claims 3 to 5, characterized in that the layer (13) is subjected to a hot cross-linking treatment.

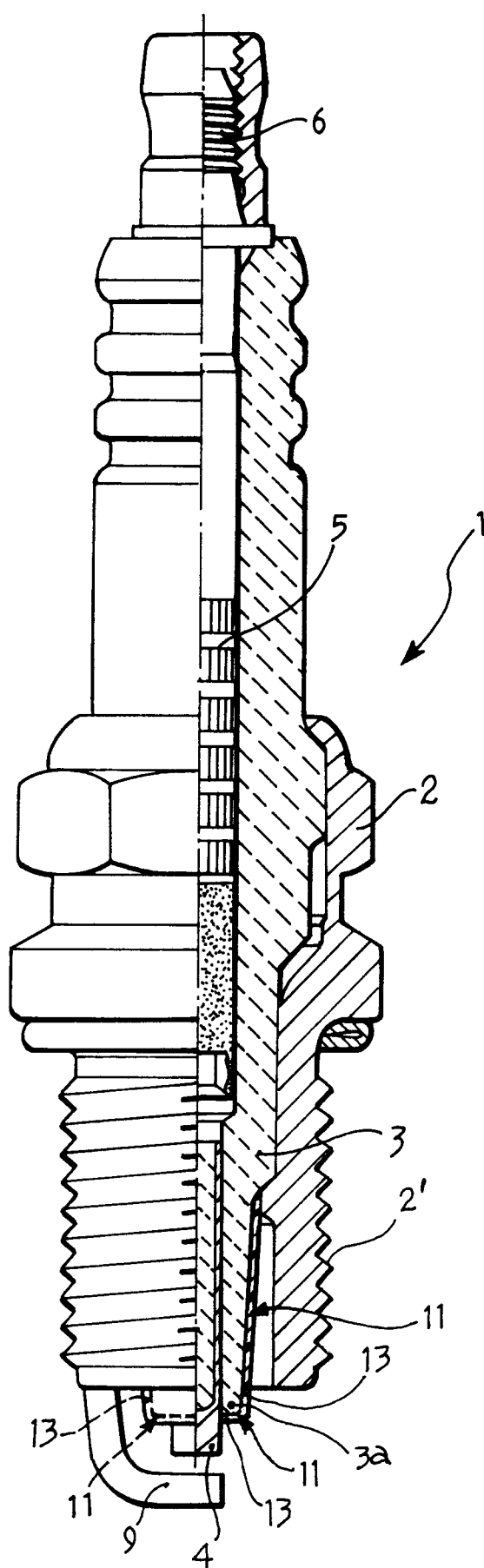
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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 0340

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)
X	PATENT ABSTRACTS OF JAPAN vol. 13, no. 558 (E-858) (3906) 12 December 1989 & JP-A-01 231 281 (NGK SPARK PLUG CO) 14 September 1989 * abstract *	1	H01T13/14 H01T13/38
Y	---	2	
Y	EP-A-0 390 065 (NGK SPARK PLUG CO) * page 5, line 7 - line 18; figure 3 *	2	
A	---	4	
Y	EP-A-0 497 189 (MATSUSHITA ELECTRIC IND.) * page 11, line 36 - line 37 * * claim 1 *	2	
A	---		
A	US-A-4 937 484 (ISHINO) ---		
A	DE-C-31 52 877 (NGK SPARK PLUG CO) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01T
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 October 1994	Examiner Bijn, E
CATEGORY OF CITED DOCUMENTS 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 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			