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(54) **Method for the assembly of a spark plug**

(57) Method for the assembly of a spark plug for a gas burner, which comprises a first stage in which an insulating body (3,23) that comprises at least one longitudinal housing (6,7,24) and a metal electrode (2,22) is provided, subsequently, welding material (14) is deposited at least on part of the external surface of the electrode, and the electrode is partially positioned in the interior of the longitudinal housing. Finally, the electrode (2,22) is fixed to the body (3,23) by means of induction welding, heat being applied from the exterior of the body until the welding material melts.

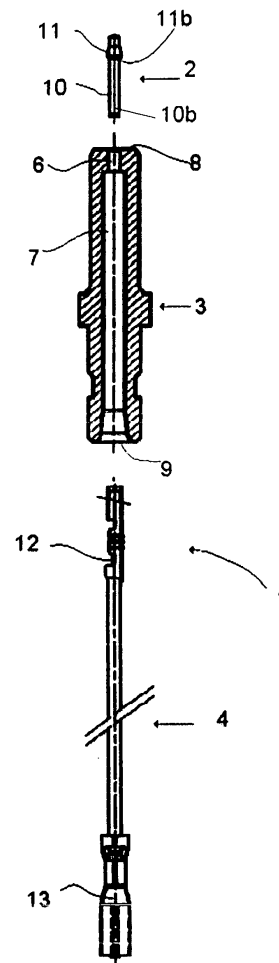


FIG. 2

EP 1 995 520 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a method for the assembly of a spark plug and to a spark plug obtained through this method.

PRIOR ART

[0002] Spark plugs are used to light domestic and industrial burners, and to cause the ignition of gaseous or liquid fuel by means of an electrical spark. Spark plugs comprise an insulating body made of a ceramic material, e.g. alumina, steatite or porcelain, which incorporates a housing into which is fixed an electrical electrode conductor that creates the ignition spark.

[0003] Known spark plug assembly methods consist of fixing the electrode to the insulating body either by mechanical or adhesive means or by a combination of both.

[0004] US 4,136,259 thus describes a spark plug in which the housing of the insulating body incorporates axial projections or teeth, so that, when exerting a pressure, the electrode is inserted into the interior of the insulating body, said axial projections or teeth lock into the exterior surface of the electrode, axially fixing the electrode in relation to the insulating body and thereby preventing the rotation of said electrode.

[0005] JP 2000-193239 discloses a method for the manufacture of a spark plug in which the fixing of the electrode to the insulating body is obtained by inserting an element under pressure between the housing of the insulating body and the electrode, with the objective of positioning the electrode in the correct position in relation to the insulating body, the housing then being filled with a heat-resistant adhesive that fixes the body-electrode unit when it dries.

[0006] GB 2282215 A discloses a spark plug and a method for fixing said spark plug, which comprises a ceramic body, a metal electrode and a conductor cable that fixes the metal electrode binding it at one end. The metal electrode is then inserted along with the conductor cable in the interior of the housing of the ceramic body in which a high-temperature adhesive is introduced beforehand.

[0007] One of the main drawbacks with the commonly used fixing methods is the time that it takes to assemble and fix the elements of the spark plug. As a result, when adhesives are used for the fixing, it is necessary to wait several hours for said adhesive to dry correctly. Furthermore, the type of adhesives used is usually a mix of ceramic components, and if the adhesive mix contains non-homogeneous areas, the fixing of the electrode to the terminal is not carried out correctly. Furthermore, when the electrode is connected to an electrical cable by a connection terminal in the interior of the insulating body, it may be the case that the amount of adhesive disposed in the interior of the connection terminal for the fixing to

the electrode interferes in the correct electrical conductivity of the connection.

DESCRIPTION OF THE INVENTION

[0008] The object of the invention is to provide a method for the assembly of a spark plug for a gas burner that solves the aforementioned problems.

[0009] To achieve this, the method for the assembly of a spark plug for a gas burner comprises the following stages:

- the provision of an insulating body that comprises at least one longitudinal housing,
- the provision of a metal electrode,
- the depositing of a welding material, at least on part of the external surface of the electrode,
- the positioning of the electrode partially in the interior of the longitudinal housing, and
- the fixing of the electrode to the body by means of induction welding, heat being applied from the exterior of the body until the welding material melts.

[0010] The invention provides a method for fixing the metal electrode to the insulating body of the spark plug that is faster than the known methods in the prior art, given that it concerns a method that may be automated and that it is not necessary to wait several hours for the adhesive to dry completely, as a result of which the productivity of the spark-plug assembly process is improved considerably. In addition, fixing by means of induction welding provides reliable fixing without the aforementioned drawbacks of fixing with adhesives.

[0011] These and other characteristics and/or advantages of the invention will be made evident in the light of the drawings and the detailed disclosure thereof.

DESCRIPTION OF THE DRAWINGS

[0012] Figure 1 is a sectional view of the assembled spark plug according to the invention.

[0013] Figure 2 is an exploded sectional view of the spark plug shown in figure 1.

[0014] Figure 3 is a ground view of another assembled spark plug according to the invention.

[0015] Figure 4 is a sectional view according to the IV-IV line of figure 3.

DETAILED DISCLOSURE OF THE INVENTION

[0016] Figures 1-2 show a spark plug 1 for a gas burner that comprises a metal electrode 2, a body 3 that partially houses the electrode 2 in its interior, and an electrical cable 4 connected to the electrode 2 in the interior of the

body 3.

[0017] The body 3, shown in detail in figure 2, is substantially cylindrical, is made of a heat-resistant, basically ceramic, material, and has a first hole 6 on one end 8, and a second hole 6 concentric and continuous to said first hole 7, which axially passes through the body 3 up to an opposite end 9. The metal electrode 2 has a first cylindrical segment 10 that is housed in the interior of the body 3, and a truncated conical and coaxial second segment 11 the base 11 b of which, continuous to the first segment 10, has a larger diameter than the diameter of said first segment 10 so that said base 11 b comes up against the end 8 of the body 3.

[0018] The electrical cable 4 is coated with an insulating material except on the two ends, one of which is connected to a free end 10b of the first segment 10 by a first connection terminal 12, and the other end to a second connection terminal 13 for the connection of the spark plug 1 to a power source, said connections providing an electrical continuity between the connection elements.

[0019] The assembly of the spark plug 1 is carried out through the following method. Firstly, the insulating body 3, the metal electrode 2 and the electrical cable 4, which has the first 12 and the second connection terminal 13 fixed on its ends, are provided. A welding paste 14 with a high silver content, i.e. with concentrations of silver of over 20% in weight, is then deposited on the free end 10b of the first segment 10, and said first segment 10 is inserted in the body 3 through the first hole 6, until the base 11 b of the electrode 2 comes up against the end 8 of the body 3, with the result that the first segment 10 is partially housed in the second hole 7. The first connection terminal 12, fixed to the electrical cable 4, is then inserted by the opposite end 9 of the body 3, and said first connection terminal 12 is connected to the free end 10b of the electrode 2 covered with the welding paste 14. Next, the assembled spark plug 1 is inserted in an induction welding device not shown in the figures, so that magnetic field lines generated by the passage of an alternating current in a coil of the welding device are oriented in such a way that they pass through the body 3 to cause the electrode 2 and the welding paste 14 to heat up, being heated to a temperature at which the welding paste 14 melts, the metal electrode 2 thus being welded to the first connection terminal 12, said welding thus enabling the electrical continuity between the electrode 2 and the electrical cable 4. Said temperature of fusion is 600-700°C.

[0020] The method for fixing by means of induction welding may also be used in another type of spark plug 21, such as the one shown in figures 3 and 4, in which the metal electrode 22 is substantially cylindrical and has a first end 22b inclined in relation to the axial axis and oriented towards the gas outlet of a burner not shown in the figures, a second end 22c that is internally fixed to a third cylindrical connection terminal 25, and at least one intermediate flat zone 22d whose width "d" is larger than the diameter of the electrode 2, and the thickness "e" is

smaller than said diameter, said flat zone 22d being obtained by means of the stamping of a die or other similar methods. At the same time, the body 23 is substantially cylindrical and made of ceramic, and has a substantially cylindrical through-housing 24 that partially houses the electrode 22 in its interior, the first end 22b being disposed at an inclination and the second end 22c on the exterior of the body 23. The housing 24 includes a pair of diametrically opposed axial grooves 17 adapted for housing the flat zone 22d, thereby preventing the metal electrode 22 from rotating in the interior of the body 23, which would cause the end 22b to be incorrectly oriented in relation to the gas outlet and would prevent ignition from occurring.

[0021] For the assembly of this type of spark plug 21 shown in Figures 3 and 4, once the insulating body 23 and the electrode 22 are disposed, the welding paste 14 is placed on the lateral surface of the electrode 22 to be disposed in the interior of the body 2. The assembled spark plug 21 is then inserted into the induction welding device, thus causing the electrode 22 and the welding paste 14 to heat up to a temperature of 600-700°C so that the welding paste 14 melts, the metal electrode 22 being fixed to the ceramic body 23, thereby preventing the axial and rotational movement of the electrode 22 in relation to the body 23.

Claims

1. Method for the assembly of a spark plug for a gas burner which comprises the following stages:
 - the provision of an insulating body (3,23) that comprises at least one longitudinal housing (6,7,24),
 - the provision of a metal electrode (2,22),
 - the depositing of a welding material (14), at least on part of the external surface of the electrode (2,22),
 - the positioning of the electrode (2,22) partially in the interior of the longitudinal housing (6,7,24), and
 - the fixing of the electrode (2,22) to the body (3,23) by means of induction welding, heat being supplied from the exterior of the body (3,23) until the welding material (14) melts.
2. Method for the assembly of the spark plug according to the preceding claim, wherein the welding material (14) is a metal paste with a high silver content.
3. Method for the assembly of a spark plug according to any of the preceding claims, wherein the induction welding is carried out at a temperature in a range of 600-700°C.
4. Gas spark plug assembled according to the method

for the assembly defined in any of the preceding claims, which comprises the metal electrode (2) and the body (3) that partially houses the electrode (2) in its interior.

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5. Gas spark plug assembled according to the preceding claim, which comprises an electrical cable (4) that is connected to the electrode (2) by a first connection terminal (5) in the interior of the body (3).

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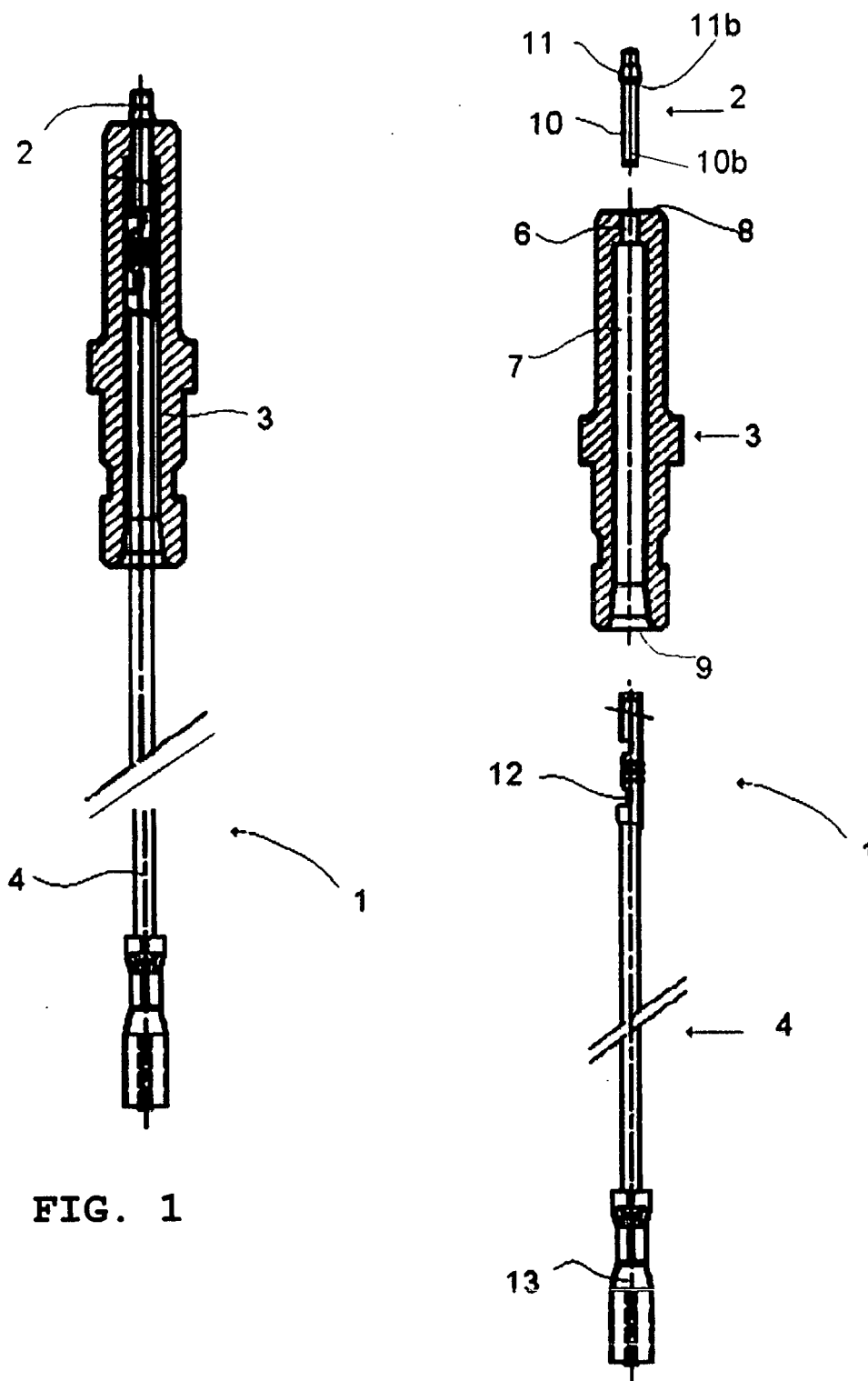


FIG. 1

FIG. 2

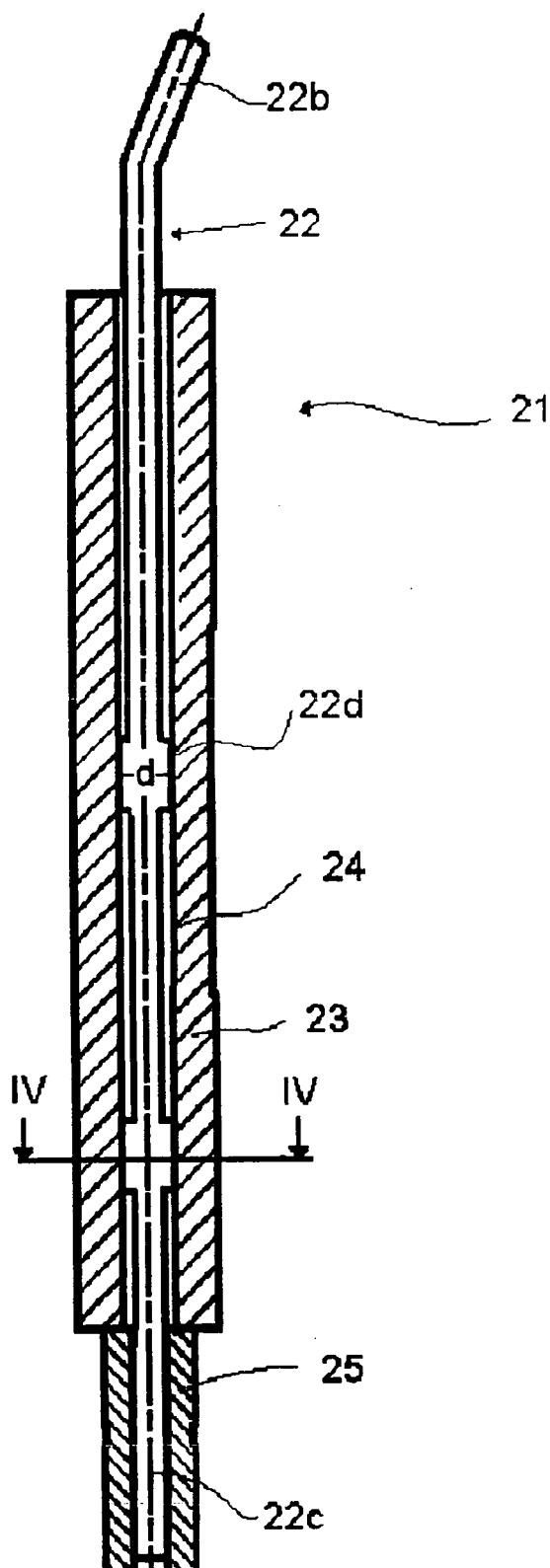


FIG. 3

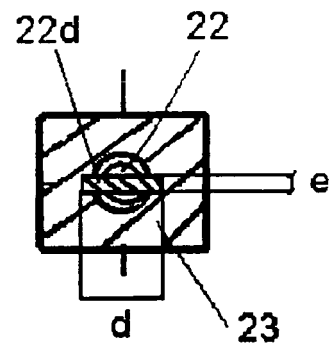


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 08 38 0029

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 580 662 A (BENDIX AVIAT CORP) 16 September 1946 (1946-09-16) * the whole document *	1-4	INV. F23Q3/00 H01T21/02
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X	GB 579 599 A (GEN MOTORS CORP) 8 August 1946 (1946-08-08) * page 1, line 83 - line 86; figure 1 *	1,2,4	
X	US 2 377 481 A (CHRISTIE ROBERT K) 5 June 1945 (1945-06-05) * page 3, line 28 - line 44; figures 3,5 *	1,2	
X	US 3 612 931 A (STRUMBOS WILLIAM P) 12 October 1971 (1971-10-12) * column 5, line 41 - line 44; figure 6 *	1,4	
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Y	* column 3, line 11 - line 21 *	5	F23Q H01T
Y	GB 1 587 002 A (KIGASS ENG LTD) 25 March 1981 (1981-03-25) * page 2, line 72 - line 82; figure 1 *	5	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 September 2008	Examiner Verdoodt, Luk
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			

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EPO FORM 1503 03/82 (P04C01)

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

EP 08 38 0029

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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17-09-2008

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- JP 2000193239 A [0005]
- GB 2282215 A [0006]