

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
13 May 2004 (13.05.2004)

PCT

(10) International Publication Number  
**WO 2004/040723 A1**

(51) International Patent Classification<sup>7</sup>: **H01T 13/28**

(21) International Application Number:  
PCT/KR2003/002060

(22) International Filing Date: 7 October 2003 (07.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
20-2002-0032708  
1 November 2002 (01.11.2002) KR

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

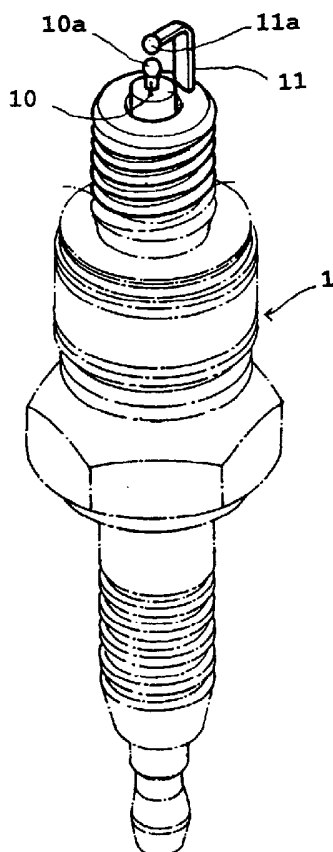
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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**Published:**  
— with international search report

[Continued on next page]

(54) Title: ELECTRIC SPARK PLUG



(57) **Abstract:** An electric spark plug is used for igniting fuel in a cylinder of a gasoline engine. Preferably, the electric spark plug is electrically discharged on a sphere-to-sphere electrical discharge basis, in which leading ends of a central electrode (10) and a ground electrode (11) which are installed in an electric spark plug body (1) are spherically shaped electrodes (10a, 11a). Accordingly, a concentrative spark discharge occurs due to an electrical path breakdown between the two spherical electrodes (10a, 11a) without a partial discharge. As a result, the spark flames become strong, to thereby burn fuel in the cylinder quickly and increase power of the engine. Also, the electrodes are not nearly worn, to thereby raise no discharge voltage increase and discharge time delay. Also, a replacement period of spark plugs becomes remarkably long. The spark plug has not nearly suffered from the circumstances in the cylinder.



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**ELECTRIC SPARK PLUG****Technical Field**

The present invention relates to an electric spark plug  
5 for use in an ignition device which burns fuel in cylinders of  
a gasoline engine.

**Background Art**

A conventional ignition plug called an electric spark  
10 plug has a central plug and a ground plug both of which  
electrodes are shaped to be electrically discharged on a plate-  
to-plate electric discharge basis. When a certain voltage is  
applied between the two electrodes, an electric field becomes  
unequally distributed, and the electric field is concentrated  
15 on a finite protrusion of the end of the electrode. As a  
result, since a pre-discharge starts from the finite  
protrusion, an electric spark is not so strong to ignite and  
burn fuel strongly. Also, a discharge voltage becomes high and  
an ignition time is delayed according to severe wear of the  
20 electrodes, to thereby cause a decreased engine power output.  
Also, since the electric spark plug are greatly influenced by  
circumstances of the cylinder, the life of the electric spark  
plug is reduced to thereby shorten a replacement period  
thereof.

**Disclosure of the Invention**

To solve the above problems, it is an object of the present invention to provide an electric spark plug in which leading ends of a central electrode and a ground electrode which are installed in an electric spark plug body are spherically-shaped or dome-shaped electrodes to accomplish an approximate point charge and equal electric field, and to make an interval between the two electrodes smaller than diameter of the sphere of the electrode. Accordingly, a concentrative spark discharge occurs due to an electrical path breakdown between the two spherical electrodes without a partial discharge. As a result, the spark flames become strong, to thereby burn fuel in the cylinder quickly and increase power of the engine. Also, the electrodes are not nearly worn, to thereby raise no discharge voltage increase and discharge time delay. Also, a replacement period of spark plugs becomes remarkably long due to having no performance deterioration.

To accomplish the above object of the present invention, according to an aspect of the present invention, there is provided an electric spark plug which is coupled to a cylinder head in a fuel engine to raise an electric spark discharge and thus burn fuel in the cylinder, the electric spark plug comprising: an electric spark plug body having a central electrode and a ground electrode both of which leading ends are formed of spherically shaped electrodes, respectively.

To accomplish the above object of the present invention, according to another aspect of the present invention, there is also provided an electric spark plug which is coupled to a cylinder head in a fuel engine to raise an electric spark discharge and thus burn fuel in the cylinder, the electric spark plug comprising: an electric spark plug body having a central electrode and a ground electrode both of which leading ends are formed of dome-shaped electrodes, respectively.

To accomplish the above object of the present invention, according to still another aspect of the present invention, there is also provided an electric spark plug which is coupled to a cylinder head in a fuel engine to raise an electric spark discharge and thus burn fuel in the cylinder, the electric spark plug comprising: an electric spark plug body having a central electrode and a ground electrode either of which leading ends is formed of a spherically-shaped electrode or a dome-shaped electrode.

#### **Brief Description of the Drawings**

The above and other object and advantages of the present invention will become more apparent by describing the preferred embodiment thereof in more detail with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of an entire electric spark plug according to the present invention;

FIG. 2 is a perspective view of essential portions of the electric spark plug according to another embodiment of the present invention;

FIG. 3 is a perspective view of essential portions of the electric spark plug according to still another embodiment of the present invention;

FIG. 4 is a perspective view of essential portions of the electric spark plug according to yet another embodiment of the present invention;

FIG. 5 is a perspective view of essential portions of the electric spark plug according to yet still another embodiment of the present invention; and

FIG. 6 is a perspective view of essential portions of the electric spark plug according to a further embodiment of the present invention.

#### **Best Mode for Carrying out the Invention**

Hereinbelow, an electric spark plug according to the present invention will be described with reference to the accompanying drawings. The like or same elements are assigned the like or same reference numerals all over the drawings, for convenience of explanation.

As shown in FIG. 1, an electric spark plug which is coupled to a cylinder head in a fuel engine to raise an electric spark discharge and thus burn fuel in the cylinder

includes an electric spark plug body 1 having a central electrode 10 and a ground electrode 11 both of which leading ends are formed of spherically shaped electrodes 10a and 11a, respectively.

5 Each diameter of the spherical electrodes 10a and 11a is larger than an interval between the two electrodes 10 and 11. Accordingly, a voltage applied between the two electrodes 10 and 11 reveals a point charge effect, and a concentrative spark discharge occurs due to an electrical path breakdown between  
10 the two spherical electrodes 10a and 11a without a partial discharge. As a result, the spark flames become strong, and the electrodes are not nearly worn, to thereby provide a sphere-to-sphere electric spark plug nearly free from influences of circumstances in the cylinder.

15 FIG. 2 is a perspective view of essential portions of the electric spark plug according to another embodiment of the present invention. In FIG. 2, a spherical electrode 10a is formed only in the leading end of a central electrode 10 in an electric spark plug body 101, and a ground electrode 11 is  
20 formed of a plate-type electrode as in the conventional art. The configuration of FIG. 2 also provides an effect similar to that of a sphere-to-sphere electric spark plug of FIG. 1.

FIG. 3 is a perspective view of essential portions of the electric spark plug according to still another embodiment of  
25 the present invention. In FIG. 3, a spherical electrode 11a is

formed only in the leading end of a ground electrode 11 in an electric spark plug body 201, and a central electrode 10 is formed of a plate-type electrode as in the conventional art. This FIG. 3 configuration also provides an effect similar to that of a sphere-to-sphere electric spark plug of FIG. 1.

FIG. 4 is a perspective view of essential portions of the electric spark plug according to yet another embodiment of the present invention. In FIG. 4, a doe-shaped electrode 11b is formed only in the leading end of a ground electrode 11 in an electric spark plug body 301, and a central electrode 10 is formed of a plate-type electrode as in the conventional art. This FIG. 4 configuration also provides an effect similar to that of a sphere-to-sphere electric spark plug of FIG. 1.

FIG. 5 is a perspective view of essential portions of the electric spark plug according to still yet another embodiment of the present invention. In FIG. 5, a dome-shaped electrode 10b is formed only in the leading end of a central electrode 10 in an electric spark plug body 401, and a ground electrode 11 is formed of a plate-type electrode as in the conventional art. This FIG. 5 configuration also provides an effect similar to that of a sphere-to-sphere electric spark plug of FIG. 1.

FIG. 6 is a perspective view of essential portions of the electric spark plug according to a further embodiment of the present invention. In FIG. 6, an electric spark plug body 501 includes a central electrode 10 and a ground electrode 11 both



of which leading ends are formed of dome-shaped electrodes 10b and 11b, respectively. This FIG. 6 configuration also provides an effect similar to that of a sphere-to-sphere electric spark plug of FIG. 1.

5           As described above, an electric spark plug according to the present invention is coupled to a cylinder head of a gasoline engine to ignite fuel. Since leading ends of a central electrode 10 and a ground electrode 11 are spherically shaped electrodes 10a and 11a, and an interval between the two  
10       electrodes is smaller than the diameter in the sphere of each electrode, a concentrative spark discharge occurs due to an electrical path breakdown between the two spherical electrodes 10a and 11a without a partial discharge. As a result, the spark flames become strong, to thereby burn fuel in the cylinder  
15       quickly and increase power of the engine. Also, since the electrodes of the electric spark plug are not influenced by circumstances in the cylinder, the spark plug has not nearly suffered from the circumstances in the cylinder. Also, the electrodes are not nearly worn, to thereby raise no discharge  
20       voltage increase and discharge time delay. Also, a replacement period of spark plugs becomes remarkably long.

#### **Industrial Applicability**

25           As described above, the electric spark plug according to the present invention can be used in a cylinder head of a fuel

engine such as a gasoline engine. Since the electrodes are not nearly worn, to thereby raise no discharge voltage increase and discharge time delay, and a replacement period of spark plugs becomes remarkably long, the present invention contributes an industrial development.

As described above, the present invention has been described with respect to particularly preferred embodiments. However, the present invention is not limited to the above embodiments, and it is possible for one who has an ordinary skill in the art to make various modifications and variations, without departing off the spirit of the present invention.

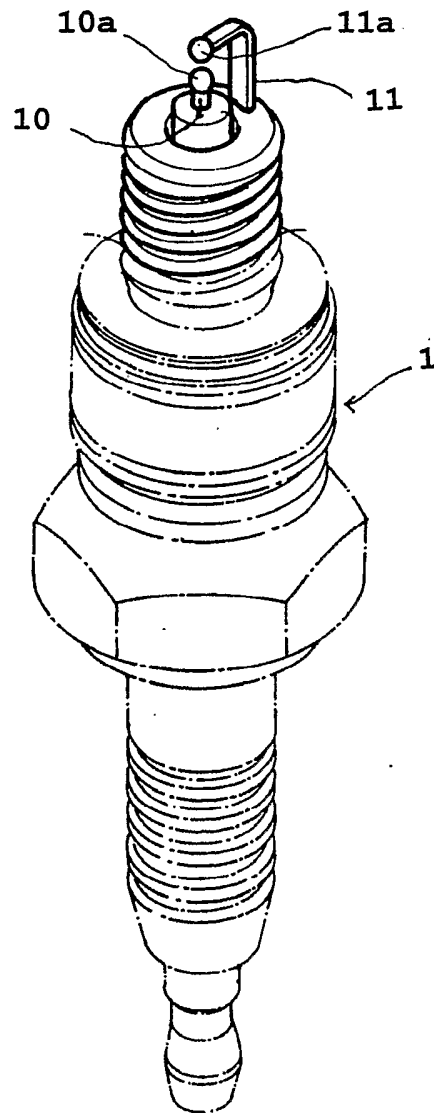
**What is claimed is:**

1. An electric spark plug which is coupled to a cylinder head in a fuel engine to raise an electric spark discharge and thus burn fuel in the cylinder, the electric spark plug comprising: an electric spark plug body (1) having a central electrode (10) and a ground electrode (11) both of which leading ends are formed of spherically shaped electrodes (10a, 11a), respectively.

2. An electric spark plug which is coupled to a cylinder head in a fuel engine to raise an electric spark discharge and thus burn fuel in the cylinder, the electric spark plug comprising: an electric spark plug body (1) having a central electrode (10) and a ground electrode (11) both of which leading ends are formed of dome-shaped electrodes (10b, 11b), respectively.

3. An electric spark plug which is coupled to a cylinder head in a fuel engine to raise an electric spark discharge and thus burn fuel in the cylinder, the electric spark plug comprising: an electric spark plug body (1) having a central electrode (10) and a ground electrode (11) either of which leading ends is formed of a spherically-shaped electrode (10a, 11a) or a dome-shaped electrode (10b, 11b).

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FIG.1



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FIG.2

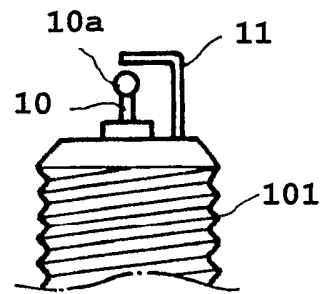
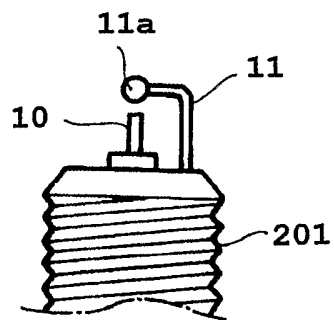


FIG.3



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FIG.4

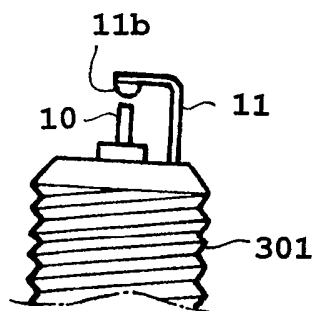
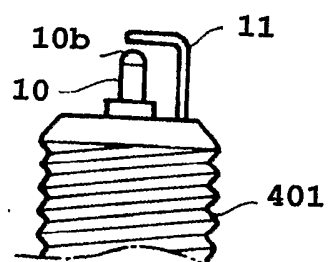
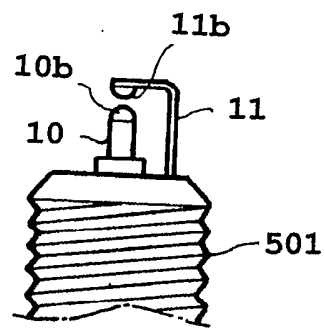


FIG.5



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FIG.6



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR2003/002060

**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 H01T 13/28**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC H01T13/00, H01T13/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean patents and applications for inventions since 1975

Korean Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP55042286(U) (KatoMoriHiro. 18, March, 1980) See the entire sentence	1-3
Y	KR19970072576(A) (Dae Wu Vehicle Co.Ltd. 07, Novem.1997) See the entire sentence	1-3
Y	US3940649(A) (Francis E. Berstle. 24, Feb,1976) See the entire sentence	1-3

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

16 JANUARY 2004 (16.01.2004)

Date of mailing of the international search report

19 JANUARY 2004 (19.01.2004)

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/KR2003/002060

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP5542286(U)	18.03.1980	None	None
KR1997-0072576(A)	07.11.1997	None	None
US3940649(A)	24.02.1976	None	None