

Oct. 24, 1950

W. B. SMITS
LOW-TENSION SPARKING PLUG

2,527,489

Filed Dec. 6, 1946

2 Sheets-Sheet 1

Fig. 1a

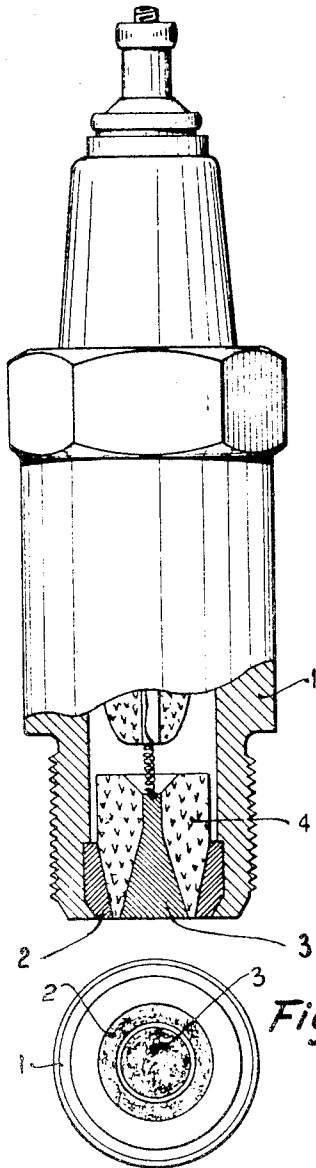


Fig. 1b

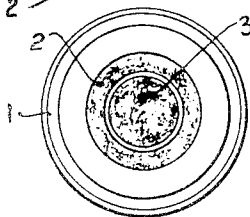


Fig. 2a

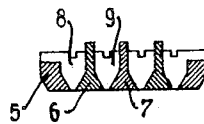


Fig. 2b

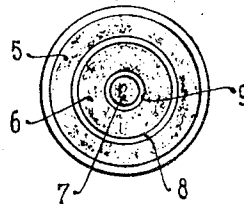


Fig. 3a

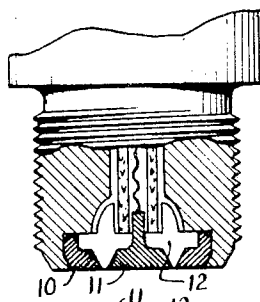
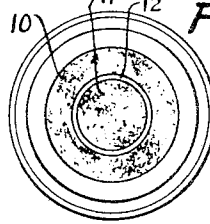


Fig. 3b



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Fig. 4a

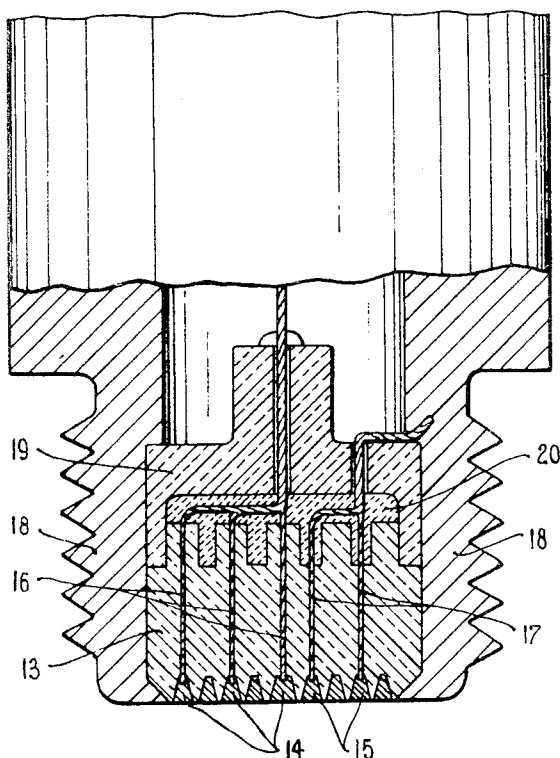
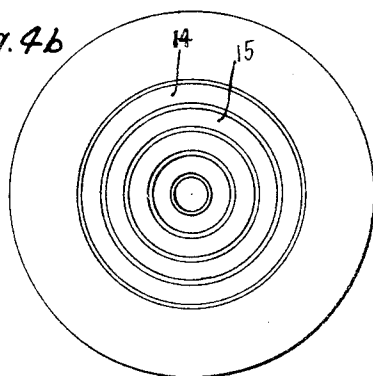


Fig. 4b



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UNITED STATES PATENT OFFICE

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LOW-TENSION SPARKING PLUG

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6 Claims. (Cl. 123-169)

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The invention relates to a low tension sparking plug, the electrodes of which are separated by electrically insulating or semi-conductive solid material, on the surface of which the igniting spark is produced. The sparks of these sparking plugs have a very high intensity and affect not only the material of the electrodes but also the solid material separating the electrodes. That is why sparking plugs of this kind do not last long.

It has been found that, if there is an air-gap between the electrodes and the separating material, the production of the igniting sparks is hampered and that the sparks strive after enlarging said air-gap. If the electrodes and the separating material would slightly resist the destructive action of the sparks, an originally very narrow air-gap would soon become so large, that under normal operating voltage sparks could not any longer be produced.

The invention has for its object to avoid this disadvantage and substantially consists in this, that in a sparking plug of the aforesaid kind the electrodes and the separating material are assembled to a firm unit by pressing, melting or sintering, in such a manner, that gaps between adjacent parts are avoided. It appeared that this measure increases the life of the sparking plug considerably.

If the separating member consists of semi-conductive material, preferably the portion of this member between the electrodes is shaped in such a way, that the distance between the electrodes is smallest on the active surface of the sparking plug, so that the electrical resistance between the electrodes is smallest on said surface. The current passing through the semi-conductive separating material then will have the highest intensity near the active surface. This is of great importance for the production of the sparks.

In order to obtain a gapless connection between the electrodes and the separating member and be able to resist great differences of temperature, it may be of advantage to make both the electrodes and the separating member of sinterable material, e. g. of various tungsten carbides, and other metals known from the sinter metallurgy and insulating or semi-conductive ceramic material. The sinterable parts of the sparking plug may first be burned or sintered individually, then assembled and finally sintered together. In many cases it will be simpler when the different parts are formed, thereupon assembled by a pressing operation and finally sintered simultaneously. The electrodes may also be burned or sintered in

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the surface of a ceramic insulator or a semiconductor and may for instance be contained in grooves of said surface.

Reference is had to the drawing, which illustrates several embodiments of the invention by way of example. In the drawing are:

Figs. 1a and 1b respectively, partly an elevational and partly a longitudinal sectional view and a bottom view of a sparking plug according to the invention,

Figs. 2a and 2b are respectively a sectional view and a bottom view of a detached system of electrodes,

Figs. 3a and 3b are respectively a sectional view and a bottom view of a sparking plug provided with a system of electrodes of another construction, and

Figs. 4a and 4b are respectively a sectional view and a bottom view of the lower part of a sparking plug having electrodes of still another construction.

In Fig. 1a the body of a sparking plug is designated by 1. Mounted in the lower part of said body 1 are an annular electrode 2 and a central electrode 3. The electrodes 2 and 3, which may be of a heat-proof hard metal, such as manganese steel, or a composition of sintered tungsten carbide and other metals, are separated by an insulating or a semi-conductive mass 4, which is forced between the electrodes.

Mass 4 may be hardened by a baking process which need not be a sintering process. The lower surface of the sparking plug has been ground smooth.

In Figs. 2a and 2b the annular electrodes 5 and 6 are mounted concentrically with respect to a central electrode 7. They are separated from one another by rings 8 and 9 of non- or semi-conductive material. Both the electrodes 5, 6 and 7 and the separating rings 8, 9 may be constructed of sinterable material and united to one whole by sintering. The system of separated electrodes thus constructed may be fixed into the body of the sparking plug after the active surface of the single system of electrodes has been ground.

Figs. 3a and 3b illustrate the body of a sparking plug in which a system consisting of two electrodes 10 and 11 and one separating ring 12 only is mounted.

In Figs. 4a and 4b 13 is an insulator or a semiconductor of porcelain or other ceramic material. Provided in the lower surface of this insulator or semiconductor are annular grooves which contain a well sinterable metal constituting electrodes 14 and 15 and attached to said insulator or said

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semi-conductor by a sintering or burning process. Conductors 16 and 17 connect the electrodes 14 and 15 to the terminal (not shown) and to the body 18 of the plug. The insulator or the semi-conductor 13 is kept in its place by a pressing member 19. Provided between pressing member 19 and insulator or semi-conductor 13 is heat-proof packing material 20 closing the ducts for the conductors 16 and 17. The surface of insulator or semi-conductor 13 provided with electrodes 14 and 15 is ground, so that the active surface of the sparking plug is smooth. This construction has the advantage that a great number of concentrically disposed electrodes may be provided, which electrodes are connected alternately in parallel. In that case electrodes are obtained which extend one opposite the other over a long distance, so that due to the fact that the igniting spark is produced only locally, the sparking plug lasts very long.

In all embodiments the shape of the electrodes is such, that the electrodes are nearest to one another on the active surface of the sparking plug. Consequently, when the separating member consists of semi-conductive material, the current through said material will be concentrated in the surface layer thereof. This fact aids the production of the igniting sparks considerably.

What I claim is:

1. An insert for use in the lower end of the bore of a cylindrical spark plug body comprising a substantially cylindrical member with a plane lower face adapted to be aligned with the lower end of the spark plug body, said insert including concentrically arranged electrodes of hard metal and at least one concentric member of solid insulating material having a semi-conductive surface separating the electrodes and sintered to the latter as a composite mass.

2. An insert for use in the lower end of the bore of a cylindrical spark plug body comprising a substantially cylindrical member with a plane lower face adapted to be aligned with the lower end of the spark plug body, said insert including at least two concentrically arranged electrodes of hard metal and a plurality of concentric members of solid insulating material having a semi-conductive surface separating inner and outer electrodes and sintered to the latter as a composite mass.

3. An insert for use in the lower end of the bore of a cylindrical spark plug body comprising a substantially cylindrical member with a plane lower face adapted to be aligned with the lower end of the spark plug body, said insert including a plurality of electrodes of hard metal arranged in spaced concentric relation with respect to each other and a plurality of concentric members of solid insulating material hav-

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ing a semi-conductive surface arranged between the electrodes and sintered to the latter as a composite mass.

4. An insert for use in the lower end of the bore of a cylindrical spark plug body comprising a substantially cylindrical member with a plane lower face adapted to be aligned with the lower end of the spark plug body, said insert including a plurality of electrodes of hard metal concentrically arranged with respect to each other, a plurality of concentric members of solid insulating material having a semi-conductive surface intermediate the electrodes and sintered to the latter in a composite mass, heat insulating material on the upper face of said insert and leadin conductors extending through said heat insulating material and connected to the alternate electrodes.

5. An insert for use in the lower end of the bore of a cylindrical spark plug body comprising a substantially cylindrical member with a plane lower face adapted to be aligned with the lower end of the spark plug body, said insert including a plurality of concentrically arranged electrodes of hard metal, a plurality of concentrically positioned members of solid insulating material having a semi-conductive surface separating the concentric electrodes and sintered to the latter in a composite mass, heat insulating material on the upper face of said insert, a backing member over said heat insulating material, and leadin conductors extending through said backing member and heat insulating material and connected to alternate electrodes.

6. An insert for use in the lower end of the bore of a cylindrical spark plug body comprising a substantially cylindrical member with a plane lower face adapted to be aligned with the lower end of the spark plug body, said insert including concentrically arranged electrodes of hard metal and at least one concentric member of solid semi-conductive material separating the electrodes and fused to the latter as a composite mass.

WYTZE BEYE SMITS.

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