April 15, 1952 W. B. SMITS 2,592,754

SURFACE DISCHARGE SPARK PLUG

Filed June 2, 1950

FIG.1

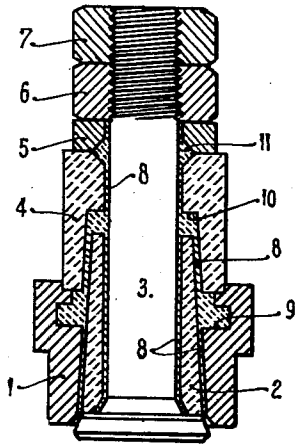


FIG.2

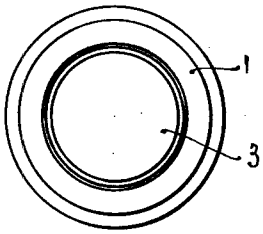
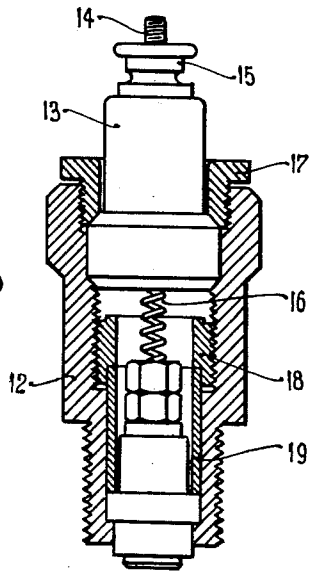


FIG.3



Inventor

Wytze Deye Smits

By Glascock Downing Seebold

Attys.

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SURFACE DISCHARGE SPARK PLUG

Wytze Beye Smits, Voorburg, Netherlands, assignor to Smitsvonk N. V., Rijswijk, Netherlands

Application June 2, 1950, Serial No. 165,632
In the Netherlands December 14, 1945

1 Claim. (Cl. 123—169)

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The invention relates to a surface discharge spark plug comprising, in combination, a housing, a leading-in insulator, a conductor passing through said insulator for the electrical connection of the spark plug, a central inner electrode, at least one annular electrode surrounding said central electrode, a member of at the most semi-conductive material separating said electrodes, said electrodes and said separating member constituting an insert member on the exposed surface of which the igniting sparks sweep. This is a continuation-in-part of my application, Serial No. 714,482, filed December 6, 1946, and now abandoned.

A spark plug of this type is composed of different materials. The electrodes consist of metal or an electrically conductive sintered mass, such as tungsten alloys. The separating member may consist of electrically insulating or of semi-conductive ceramic substance or may be made of sintered semi-conductive metal-combinations.

In such spark plugs gaps between the various parts must be avoided. Under all conditions the plug parts have to remain joined on to one another in a gas-tight manner. Up to now this condition necessitated the use of materials having nearly equal coefficient of expansion. This reduced the number of appropriate materials considerably, so that it was often impossible to meet other requirements, such as the heat-resistance, the thermal or the electrical conductivity, the insulating power, the mechanical strength and other properties, satisfactorily.

The invention has for its object to provide a surface discharge spark plug in the construction of which the coefficients of expansion of the different materials may be left out of account. It consists in that between the electrodes of the plug and the member separating said electrodes an electrically insulating plastic organic substance is provided, which extends along the entire adjoining faces of the separating member and the electrodes to the active surface of the plug and takes up the differences due to the differences of the coefficients of expansion of said electrodes and said separating member when the temperature during operation varies, said organic substance keeping the joints between said parts of the plug closed in a gas-tight manner. As plastic organic substance synthetic rubber (buna) or suitable synthetic resins may be used. The use of an organic substance in the vicinity of the active surface of the spark plug improves the generation of the surface discharge sparks, since said substance is superficially carbonized and

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therefore forms a more or less semi-conductive deposit on the active plug surface for the sparks sweeping across said surface. The carbonization of the outer end of the layer of organic substance does not go deep and does not affect the sealing properties of the remaining part of the organic insulating substance remote from said active surface.

Another advantage of the invention is that it permits the spark plugs of being manufactured in a cheap and easy manner. The selection of the materials for the construction of the different parts of the plug is not hampered by the differences in coefficients of expansion of said materials.

According to the invention the above described surface discharge spark plugs may be manufactured in such a manner that first the entire adjoining surfaces of the parts of the insert member of the plug are coated with an electrically insulating plastic organic substance, thereupon said coated parts are assembled into an insert member, and finally the completed assembly is subjected to a thermal process whereby said parts are joined together in a gas-tight manner. If synthetic rubber be used vulcanization of said organic substance may be carried out.

It is also possible to assemble the parts of the plug into an insert member first, thereupon to supply the plastic organic substance into the joints by high pressure only and finally to subject the thus made insert member to a thermal process. It is not necessary that the insert member is placed into a housing or plug jacket before being subjected to the thermal process.

For the elucidation of the invention reference is made to the accompanying drawing which illustrates an embodiment of the invention. In the drawing:

Figs. 1 and 2 are a longitudinal sectional view and a bottom view of an insert member comprising electrodes and a separating member for a surface discharge spark plug and

Fig. 3 is a longitudinal sectional view of a spark plug provided with an insert member according to Figs. 1 and 2.

In the drawing 1 designates a metal, e. g. copper annular outer electrode. The inner surface of this electrode is slightly conical. It is mounted on a tubular separating member 2 made of insulating or semi-conductive material. The outer surface of this tube corresponds with the inner surface of the outer electrode 1. Mounted in said tubular separating member 2 is a metal, e. g. copper, central electrode, which is shaped as a bolt

and is screw threaded at the end opposite the end forming part of the active surface of the plug. Mounted on said central electrode are an insulator 4 made for instance of porcelain and a washer 5. These parts are fixed to the bolt by means of two nuts 6 and 7. The coefficient of expansion of washer 5 is such, that the difference of expansion between the metal electrodes 1 and 3 and the insulator 4 is compensated.

All joints between the electrodes 1, 3, the separating member 2 and the insulator 4 are filled with an insulating plastic organic substance 8, such as synthetic rubber, resins, etc. In several places 9, 10, 11 the joints are widened so as to form chambers for the organic substance 8. This substance takes up the differences due to the differences in expansion of the various parts when the temperature varies and keeps the joint closed in a gas-tight manner. The organic substance extends along the entire adjoining faces of the parts 1, 2, 3 and 4 to the active surface of the plug. It may be applied to said faces by a coating process before or by a pressure process after these parts are assembled. After the organic substance has been provided the insert member illustrated in Figs. 1 and 2 may be subjected to a thermal process.

In Fig. 3 the above described insert member, comprising the electrodes 1 and 3 and the separating member 2, is mounted in a housing or plug body 12 provided with an insulator 13 through which a connecting conductor 14 having a terminal nut 15 is passed. Said conductor is connected to the central electrode 3 of the insert member by a compression spring or spiralled conductor 16. Screw parts 17 nd 18 and a tube 19 keep the insulator 13 and the insert member 1—11 in place in the housing or plug body 12 respectively.

What I claim is:

Surface discharge spark plug comprising, in combination, a housing, a leading-in insulator, a conductor passing through said insulator for the electrical connection of the spark plug, a central inner electrode, at least one annular electrode surrounding said central electrode, a member of at the most semi-conductive material separating said electrodes, said electrodes and said separating member constituting an insert member on the exposed surface of which the igniting sparks sweep, and an electrically insulating plastic organic substance provided between said electrodes and said separating member, said substance extending along the entire adjoining faces of the separating member and the electrodes to the active surface of the plug and taking up the differences due to the differences of the coefficients of expansion of said electrodes and said separating member when the temperature during operation varies and keeping the joints between said parts closed in a gas-tight manner.

WYTZE BEYE SMITS.

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