April 8, 1952 E. R. PAUL 2,591,718

SPARK PLUG

Filed Jan. 16, 1950

Fig. 1

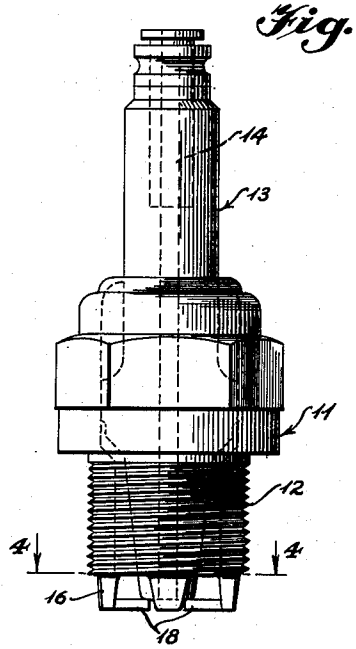


Fig. 2

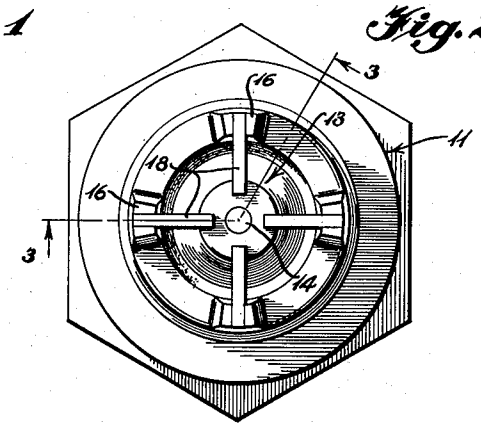


Fig. 3

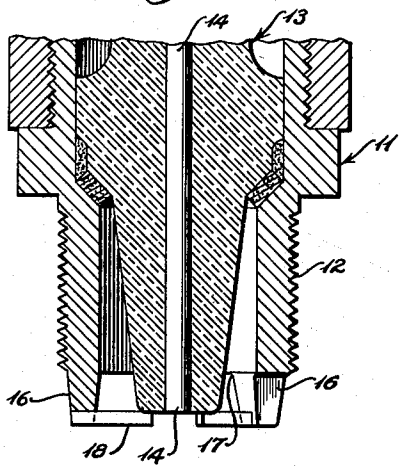
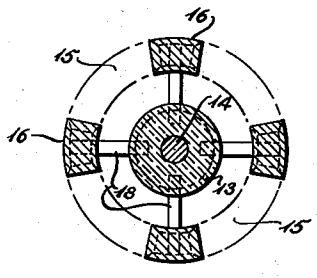


Fig. 4



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SPARK PLUG

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7 Claims. (Cl. 123—169)

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1

The present invention relates to a spark plug and more particularly to a spark plug of the multiple gap type and a method of making the same.

An object of the present invention is the provision of a multiple gap spark plug which exhibits superior anti-fouling and slower erosion rate characteristics.

Another object is to provide a spark plug having means for keeping the insulated electrode and the insulator free of objectionable deposits of oil and combustion products thereby preventing fouling and preignition.

A further object of this invention is to provide a spark plug having a plurality of apertures between the grounded electrodes to provide ready and thorough scavenging of the central electrode and the insulator.

Still another object is to provide a multiple gap spark plug having a plurality of semi-surface spark gaps without restricting thorough scavenging of the insulation.

A still further object is to provide a multiple gap spark plug having means for preventing the trapping of gases in the region surrounding the central electrode.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawing in which:

Fig. 1 is a front elevational view of a conventional spark plug modified in accordance with the present invention:

Fig. 2 is a bottom plan view of the spark plug of Fig. 1;

Fig. 3 is a sectional view of the plug taken along the line 3—3 of Fig. 2, looking in the direction of the arrows; and

Fig. 4 is a section taken along the line 4—4 of Fig. 1, looking in the direction of the arrows.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 1 a conventional spark plug having a metallic body or shell, generally designated 11, the lower end of shell 11 being externally threaded, as shown at 12, so that the plug may be readily inserted in the engine block. Coupled to shell 11 in a conventional manner, as shown in Fig. 3, is an insulating body 13, preferably made of porcelain, there being a central electrode 14 extending axially through insulating body 13.

In carrying out the present invention, several

2

rounds of threads are preferably turned off of the lower end of threaded portion 12 of shell 11, and a multiplicity of slots 15 are cut in the turned end of shell 11, leaving a multiplicity of projections 16, preferably four in number, extending longitudinally from shell 11, as shown in Fig. 1.

Projections 16 are preferably of the form shown in Figs. 2 and 4 having a relatively large substantially rectangular upper base portion and a relatively small substantially rectangular lower base portion, the transition between lower and upper portions being substantially linear except for the curvature 17 adjacent the upper portion. Projections 16 are constructed in this manner in order to insure a smooth temperature gradient between the upper and lower portions to thereby insure a smaller concentration of heat. In this manner, there is eliminated any possibility of deformation of the threaded portion 12 at the major diameter with a resultant seizing of the plug in the cylinder.

To each projection 16 is secured an electrode 18 which projects radially towards the axis of shell 11, opposite electrodes being diametrically aligned, as shown in Figs. 2 and 3. Electrodes 18 are preferably secured to projections 16 by means of spot welding in order to eliminate the introduction of another metal with its subsequent pitting.

Insulating body 13 and central electrode 14 are preferably ground off so that upon assembly body 13 just touches all of electrodes 18, electrodes 18 terminating short of electrode 14, to form a multiplicity of semi-surface spark gaps, as shown in Figs. 2 and 3. By this arrangement, the spark discharges occur across the end surfaces of body 13 and electrode 14 thereby exposing these surfaces to higher temperatures to keep them free of objectionable deposits of oil or combustion products, which would otherwise cause fouling and lead to preignition.

In addition, slots 15 in the turned end of shell 11 form apertures for permitting a fresh charge to sweep the gap between electrode 14 and electrodes 18 to thereby cool the end surfaces of body 13 and electrode 14. In this manner, the gap is always surrounded with a fresh charge, and thorough scavenging of the end surfaces of body 13 and electrode 14 is attained. Finally, slots 15 permit freedom of movement of the exhaust gases, as shown in Fig. 4, thus avoiding the deleterious effects of trapped gases in the region surrounding electrode 14.

Obviously, many modifications and variations

of the present invention are possible in the light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

The invention described herein may be manufactured and used by or for the Government of the United States of America for govenmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A spark plug comprising a shell, a central electrode disposed axially of said shell and extending beyond the lower end thereof, an insulating body surrounding said electrode and having its lower end surface coplanar with the lower end surface of said electrode, a plurality of spaced longitudinal projections on the end of said shell, and an electrode mounted on each of said projections and extending radially towards said central electrode, the inner end of each of the radially extending electrodes resting upon the lower end surface of said insulating body.

2. A spark plug according to claim 1, each of said radially extending electrodes terminating short of said central electrode to form spark gaps.

3. A spark plug according to claim 1, wherein each of said projections is tapered downwardly, said radially extending electrode being mounted on the lower end of said projection.

4. A spark plug comprising a shell, a central electrode positioned axially of said shell and extending beyond the lower end thereof, an insulating body surrounding said electrode and having its lower end surface coplanar with that of said electrode, a plurality of spaced integral projections extending longitudinally of said shell, and an electrode mounted on each of said projections and extending radially toward said central electrode, the inner end of each radially extending electrode resting upon the lower end of said insulating body to form a semi-surface spark gap between said central electrode and said radially extending electrode.

5. The method of constructing a spark plug having a central electrode surrounded by an insulator and a shell, said method comprising cutting a plurality of slots in the lower end of the shell to form spaced projections thereon around the lower end of said insulator, mounting an electrode on each of said projections to extend radially towards the central electrode, grinding the end of said central electrode flush with the end of said insulator, and aligning the lower end surfaces of said insulator with the upper surface of each radially extending electrode to bring them in contact.

6. The method of constructing a spark plug having a central electrode surrounded by an insulator and an outer shell which comprises cutting a plurality of apertures in the lower end of the shell to form spaced projections thereon around the lower end of said insulator, mounting an electrode on each of said projections to extend radially towards the central electrode, grinding off the lower ends of the central electrode and the insulator to the point where the remaining lower end surfaces of the central electrode and the insulator are contiguous, and aligning said surface of the insulator with the upper surface of the end of each radially extending electrode for full contact therebetween.

7. The method of constructing a multi-gap spark plug having a threaded shell and a central electrode surrounded by an insulator which comprises turning off several rounds of threads at the lower end of the shell, cutting a plurality of apertures in the de-threaded end of the shell to form spaced projections thereon around the lower end of said insulator, mounting an electrode on each said projections to extend radially toward the central electrode, grinding the end of said central electrode flush with the end of said insulator, and aligning the lower end surface of the insulator with the upper surface of each radially extending electrode to provide contact therebetween.

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