July 9, 1957 H. J. BEARDSLEE, JR 2,798,980

SPARK PLUG

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FIG.1.

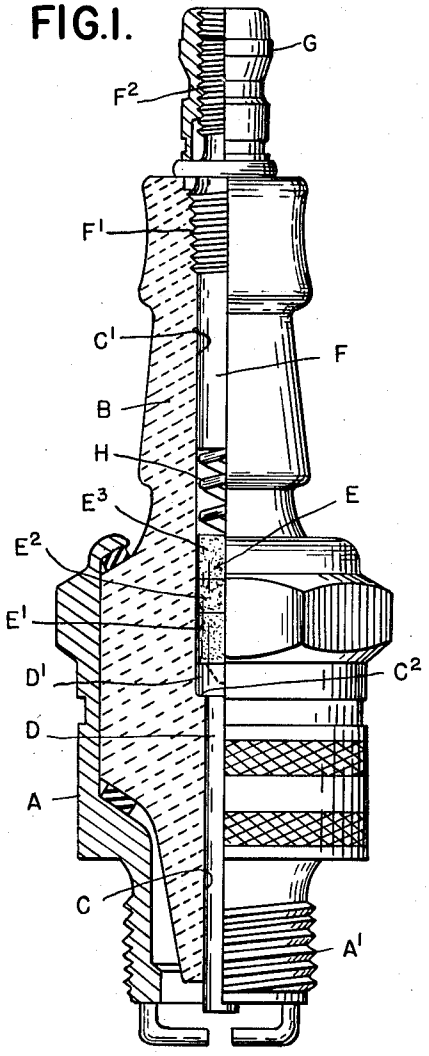
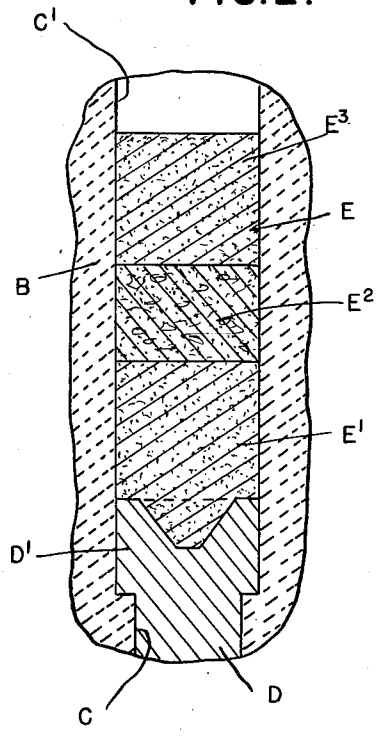


FIG.2.



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SPARK PLUG

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The invention relates to spark plugs and more particularly to that type in which the insulated electrode is restricted in length to extend only from the central incased portion of the insulator to slightly beyond the inner end thereof. One of the advantages of such construction is that the cost of the electrode, usually formed of nickel, is reduced while the current is supplied thereto from the outer end of the insulator by a less expensive conducting medium.

It is the object of the invention to obtain a construction of this type having advantageous features, including an effective gas seal, heat dissipating means for the electrode, and anchoring means for preventing displacent of either the electrode or the sealing means.

With these and other adavntageous features in view the invention consists in the construction as hereinafter set forth.

In the accompanying drawings:

Fig. 1 is a longitudinal section partly in elevation of the spark plug.

Fig. 2 is an enlarged section showing a portion of Fig. 1 illustrating the sealing plug formed of compacted comminuted material.

As shown in Fig. 1 the spark plug has the usual metallic casing A with its threaded portion A′ for connection with the engine cylinder. The porcelain insulator B has an axial channel therethrough, including a small diameter portion C extending from the inner end to centrally within the incased portion and a larger diameter portion C′ extending from this point to the outer end. D is the electrode extending within the channel portion C but provided at its outer end with an enlarged head D′ fitting within the channel portion C′ and engaging a shoulder C^2 between such portion and the portion C. Adjacent to the head D′ there is formed within the channel portion C′ a plug E of compacted comminuted material which performs the triple function of anchoring the electrode, assisting in dissipating the heat therefrom and in forming a gas seal. This plug may be formed of various comminuted materials and by various methods of compacting the same. It is essential, however, that in compacting the material the pressure against the porcelain should be safely within the fracture strength of the latter, while at the same time forming a frictional engagement sufficient to hold the plug from displacement. The portion of the plug adjacent to the electrode should have fairly high thermal conductivity to assist in dissipation of heat therefrom. The plug also must have a portion of sufficient density to prevent leakage of gas therefrom. To accomplish these results the plug E is preferably formed in a plurality of sections of different materials. These include a section E′ adjacent to the head D′ and largely composed of comminuted metal, such for instance as iron. There is also a central section E^2, formed of ceramic material, such as a mixture of talc and ball clay (aluminum silicate), but with sufficient electrically conductive material, such as iron and graphite, for the conduction of electrical current under the high voltages used for spark plugs. A third section E^3 is outside the section E^2 and may be of the same composition as the section E′. Together the three sections will hold the plug against displacement under any stresses to which it may be subjected when in operation. The central section will be most effective as a gas seal and the outer section forms the electrical connection to the conductor in the outer portion of the plug. As shown in Fig. 1, the current supplying conductor is formed by a member F which has a threaded portion F′ engaging corresponding threads in the outer end portion of the insulator and also having an outwardly extending threaded portion F^2 for engagement of a clamping nut G. Between the inner end of the member F and the plug section E^3 there is preferably arranged a helical spring H for the conduction of the current. This spring is under sufficient compression to maintain its contacts under any vibrations which may occur and at the same time permits of any slight relative movement of the members F and E′ due to differential expansion of the metal and the porcelain.

In the formation of the plug E the comminuted material is first introduced into the channel C′ and then compacted either by static pressure or by a succession of impacts. If the static pressure does not exceed 49,000 pounds per square inch, it will be safely within the strength of the porcelain. As has been stated, the section E′ is in contact with the head D′ of the electrode, and to increase the surface area of the latter, it may be formed with a V-shaped notch therein or of any other extended contour. The comminuted material fills this notch, thereby increasing dissipation of heat from the electrode into the porcelain body. The metal powder preferably has mixed therewith 2% of aluminum stearate which will act as a lubricant and allow the powder to compact into a more dense pellet. After compacting the material in section E′ the ceramic material for section E^2 is introduced and compacted. The composition of material in this section may be ball clay and talc in proportions of 50 to 65% of the former to 50 to 35% of the latter. To this mixture is added the electrically conductive elements of graphite and metal powder. The graphite tends to weaken the structure but the metal to strengthen so that by properly proportioning the two the desired degree of conductivity will be obtained without loss of strength. After compacting the material of section E^2 the material for section E^3 is introduced and compacted. Following this the spring H is introduced and the member F is then screwed into the porcelain after application of cement to the threads thereof which completes the structure. In place of the spring H any other suitable electrical connection may be placed between the member F and the plug E.

What I claim as my invention is:

1. In a spark plug, an insulator having an axial channel therethrough, an electrode extending from the inner end of said insulator into the longitudinal central portion of said channel, an electrical conductor extending from the outer end of the insulator into said central portion, and a plug between said electrode and conductor formed of compacted comminuted material completely filling the cross section of said channel and constituting an anchor for the electrode, heat dissipating means therefor, a gas seal and an electrically conductive medium said comminuted material including the ceramic elements talc and ball clay and conductive elements graphite and metal.

2. In a spark plug, an insulator having an axial channel therethrough and an electrically conductive pressure resisting seal within said channel composed of a compacted mixture of talc, ball clay, graphite and powdered metal.

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