Oct. 1, 1946. B. HOPPS ET AL 2,408,642

SPARKING PLUG

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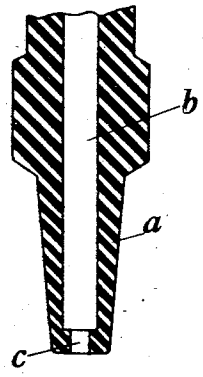


Fig.1

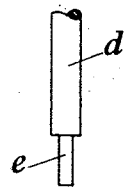


Fig.2



Fig.3

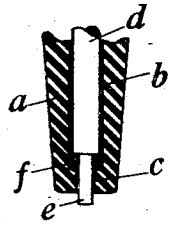


Fig.4

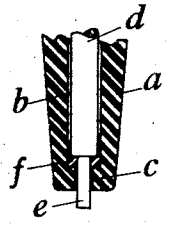


Fig.5

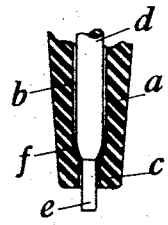


Fig.6

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SPARKING PLUG

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Application February 15, 1943, Serial No. 475,980
In Great Britain March 28, 1942

1 Claim. (Cl. 123—169)

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This invention relates to sparking plugs for internal combustion engines, of the kind in which the central electrode consists of a metal core having attached thereto or made integrally with it a firing tip of smaller diameter, the said electrode being positioned in a ceramic insulator the bore of which is reduced at its inner end where the firing tip passes through it.

In some constructions an annular space occurs between the metal core and the bore of the insulator into which products of combustion may enter. The hot combustion products passing in and out of the bore of the insulator may result in corrosion of the metal core and overheating of the central electrode, particularly when a firing tip of platinum or platinum alloy is secured to a core of silver, copper or other metal.

In constructions used heretofore a vitreous material has sometimes been employed to form a gas tight seal within the bore of the insulator, but such seals have always been located at the end of the metal core remote from the sparking tip, and consequently combustion products have not been prevented from coming in contact with the said metal core.

The object of the present invention is in a simple and convenient manner to prevent products of combustion coming into contact with the metal core of the central electrode.

The invention consists of a combination of a ceramic insulator and an electrode of the kind described in which products of combustion are prevented from coming into contact with the metal core of the electrode by a seal of vitreous material which is resistant to the action of such products, the said seal being located between the insulator and the inner end of said core.

In the accompanying sheet of explanatory drawings:

Figure 1 is a sectional view showing a portion of a ceramic insulator to which the invention is applicable.

Figure 2 illustrates a part of an electrode consisting of a metal core and a sparking tip attached to or formed integrally with the core.

Figure 3 is a sectional view of one form of vitreous seal to be employed.

Figure 4 is a part sectional view showing in the assembled condition the component parts illustrated by Figures 1–3.

Figure 5 is a similar view to Figure 4 illustrating how the seal occupies the clearances between the insulator and core after the components have been subjected to the action of heat and pressure.

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Figure 6 shows another form of construction to which the invention is applicable.

In the example illustrated by Figures 1–5, a ceramic insulator *a* (Figure 1) is formed throughout the greater part of its length with a bore *b* which terminates in a relatively smaller hole *c* at the inner end of the insulator. The electrode (Figure 2) consists of a metal core *d* having a firing tip *e* of smaller diameter. The core may be made from copper, silver, or other convenient metal, and the firing tip from platinum or platinum alloy attached to the core in any convenient manner. Alternatively, the core and firing tip may be made in one piece, of, for example, nickel or nickel alloy.

A vitreous seal *f* (Figure 3) is made in the form of a pellet from powdered glass or other vitreous material capable of forming a gas tight seal; for example, we employ a mixture of powdered Pyrex glass and powdered alumina in equal proportions to which is added a binder such as paraffin wax to enable it to be moulded to the desired form. The dimensions of the pellet are such that it can be slipped over the firing tip and into the bore of the insulator. After assembling the above components as shown in Figure 4 they are heated to a temperature sufficient to soften the pellet e. g. 850° C., and by endwise pressure applied to the core and insulator, the vitreous material is caused to flow into the annular space between the end of the core and insulator as shown in Figure 5. Some of the vitreous material may also pass into the narrow clearance between the sparking tip *e* and the hole *c* in the end of the insulator.

Additional means may be employed for further securing the electrode to the insulator. Also any convenient and ordinary means may be employed for effecting electrical connection between the core and a terminal at the outer end of the insulator, but these features form no part of the invention and are therefore not included in the drawing.

The invention is not limited to the example above described. Thus, instead of making the pellet from powdered glass it may be made from any convenient vitreous glaze capable of withstanding the engine temperature and the action of the combustion products, nor is the invention limited to electrodes of circular cross section. Also instead of forming a square shoulder at the junction of the core and sparking tip, and a corresponding shoulder in the insulator as shown in Figures 1–5, we may so shape the said parts that the portions of larger diameter merge gradu-

ally into those of smaller diameter as shown in Figure 6.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

For use in a sparking plug of the kind specified, the combination of a central electrode in the form of a metal core having at one of its ends a firing tip of reduced diameter, a ceramic insulator having a longitudinal bore through which the electrode passes and which is reduced at the end adjacent to the firing tip, and a seal of vitreous material arranged between the electrode and insulator at the inner end of the firing tip to prevent products of combustion from coming into contact with any part of the electrode other than the firing tip, the seal being resistant to the action of such products.

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