June 14, 1938. P. FIGARD 2,120,890

SPARK PLUG

Filed Jan. 15, 1937

Fig. 1.

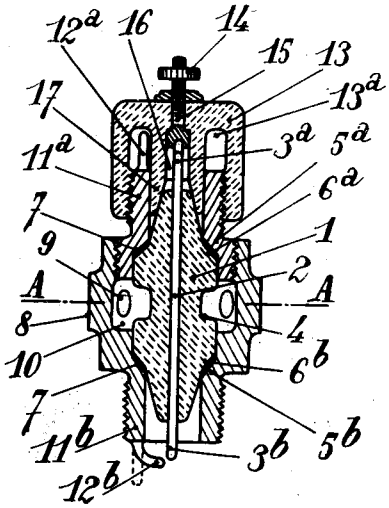


Fig. 3.

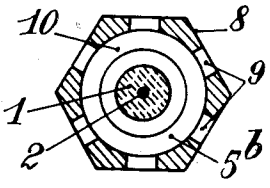


Fig. 2.

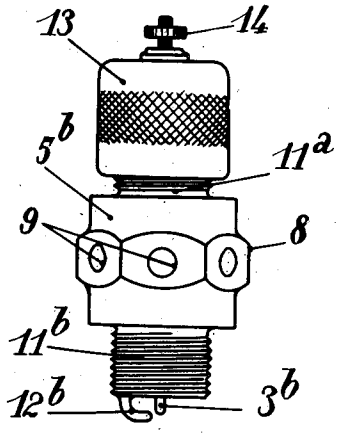
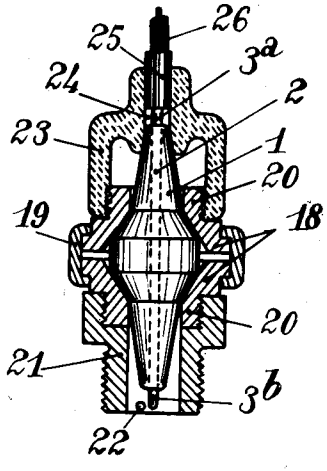


Fig. 4.



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2,120,890

SPARK PLUG

Pierre Figard, Paris, France

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In Luxemburg January 27, 1936

2 Claims. (Cl. 123—169)

This invention relates to an improved spark plug which, for a substantially equal cost price, operates during a longer period of time than the spark plugs constructed up to now.

It has already been suggested to provide spark plugs having, at each of their ends, electrodes capable of being inverted and successively put in service, the body of these spark plugs being constituted by two metal half-shells connected together by a member of insulating material, so that the half-shell carrying the side electrode which is not in service is not earthed. A cap of insulating material is fitted at the end of the spark plug the electrodes of which are not in service; this cap is provided with a terminal coming in contact with a central electrode, this allowing current to pass to the central electrode in service.

This arrangement allows of avoiding the production of sparks between the electrodes which are not in service, but it is very difficult to carry it out, as it is practically impossible to make the insulating member connecting both shells in such a manner that it has a sufficient mechanical resistance.

This arrangement has another inconvenience in that said insulating member must have a relatively great length for avoiding the production of sparks between the portion of the shell carrying the electrodes not in service and which is electrically connected to the central electrode, and the other portion of the shell or the engine body, this necessitating the manufacture of spark plugs of excessive length.

According to the invention, the insulating cap, covering the electrodes not in service, is provided with a tubular extension which covers and thus insulates the central electrode not in service from the shell of the spark plug and from the side electrode spaced from the central electrode.

In practice before utilizing the spark plug, the electrodes carried by its shell are spaced away from the electrodes carried by the insulating body. For putting the spark plug in service, the electrode of one of the ends of the shell must be curved and placed at the usual distance (4 to 5 tenths of a millimeter for instance) from the corresponding electrode of the insulating body, then the plug is screwed in the cylinder head of the engine at this end of the shell. The insulating cap is secured to the other end of the shell and it insulates the electrode, provided at this end of said shell, from the corresponding electrode of the insulating body which is in contact with the terminal of said insulating cap.

When the electrodes in service are worn, it suffices to unscrew the plug and to use the electrodes of the opposite end of said plug after having suitably curved the electrode carried by this end of the shell for placing it at the usual distance from the corresponding electrode carried by the insulating body. The insulating cap is then secured to the end of the plug carrying the worn electrodes after the side electrode of this end has been straightened or removed.

Moreover, according to the invention, the insulating body having two electrodes at each of its ends is arranged in a portion of a shell having two symmetrical screw threaded parts which can be screwed in another part of the same shell screwing in the cylinder head of the engine and having at least one side electrode; an insulating cap, covering the central electrode not in service, insulates the latter and allows the supply of electric current owing to a terminal provided for that purpose on said insulating cap.

Two spark plugs made according to the invention are described hereinafter and illustrated in the accompanying drawing:

Fig. 1 is an axial longitudinal sectional view of a first spark plug.

Fig. 2 is an external view of the spark plug.

Fig. 3 is a sectional view made according to line A—A of Fig. 1.

Fig. 4 is an axial longitudinal sectional view of a second spark plug.

The plug illustrated in Figs. 1 to 3 of the accompanying drawing is constituted by a central body 1, of insulating material, steatite for instance, of general biconical shape. This body 1 is provided, according to its longitudinal axis and embedded in its mass, with a metal rod 2 projecting beyond the ends of the body 1 for forming two electrodes 3^a and 3^b, and in its middle portion is formed a circular groove 4 adapted to facilitate its cooling.

The insulating body 1 is arranged in a metal shell formed of a member 5^a screwed in a member 5^b, these two members 5^a and 5^b rigidly embracing the body 1 by taking a bearing on circular shoulders 6^a and 6^b of the latter, through the medium of metalloplastic packings 7.

The member 5^b is externally provided with a portion 8 having a hexagonal cross section and the walls of which are perforated with holes 9 allowing aeration of the inner empty space 10 of the spark plug and, consequently, suitable cooling of the latter.

Both members 5^a and 5^b are each provided, on the one hand, with a screw threaded portion

11a—11b allowing the plug to be secured on the cylinder head of the engine which is to receive it, and, on the other hand, at the end of the portions 11a and 11b, with an electrode 12a—12b constituted by a small metal rod welded at one of its ends.

Both members 5a and 5b, after they have been screwed one on the other, can be rendered more rigid with each other by spot welding so that it is impossible for them to unscrew.

The spark plug such as above described has therefore, as shown in Figs. 1 and 2 of the drawing, two substantially symmetrical ends each provided with a central electrode 3a—3b and with a side electrode 12a—12b; each group of electrodes 3a—12a and 3b—12b can therefore be successively used according as the plug is screwed in the cylinder head at its screw threaded portion 11a or 11b. Before putting in service one of the two groups of electrodes, it is necessary to curve the side electrode 12a—12b for moving its end to a small distance (4 to 5 tenths of a millimeter) from the central electrode 3a—3b.

The spark plug further comprises a cap 13, of insulating material, which can be secured at one of its ends, for instance by being screwed on one of the portions 11a—11b.

This cap 13 is provided with a circular groove 13a adapted to receive the side electrode 12a—12b corresponding to the portion 11a—11b on which it is screwed, and with a terminal 14 the stem 15 of which constitutes, within said cap 13, a slotted socket 16 which covers the central electrode 3a—3b. An annular extension 17 of said cap 13 is interposed, when the latter is placed in position on the shell of the plug, between the socket 16 covering the central electrode and the portion 11a—11b of the shell.

This annular extension 17 electrically insulates the central electrode, on the one hand, from the corresponding side electrode and, on the other hand, from the shell.

The terminal 14 is connected, as usual, to one of the terminals of the source of electric energy, the other terminal of which is earthed.

When one group of electrodes 3a—12a or 3b—12b no longer ensures suitable ignition owing to wear, it suffices to put the other group of electrodes in service after having curved the corresponding side electrode. For securing the insulating cap 13 on the other end of the plug, it suffices to straighten or remove the other side electrode.

The spark plug illustrated in Fig. 4 of the accompanying drawing is constituted by a central body 1, made of insulating material, of general biconical shape and in the mass of which is embedded a rod 2 both ends of which project outside the body 1 and form two electrodes 3a—3b.

The insulating body 1 is arranged in a portion 18 of a metal shell. This portion 18 is formed of two members connected together by beading a ring 19, said members being each provided with a screw threaded portion 20 allowing them to be screwed in another portion 21 of the same shell.

This portion 21 is screwed in the cylinder head of the engine and is provided with an electrode 22 which is placed at the usual distance from the electrode 3a—3b in service when the portion 18 is screwed on the portion 21.

A cap 23, made of insulating material, is screwed on the screw threaded portion 20 and thus covers the electrode 3a—3b which is not in service. Said cap is perforated with a hole 24 for the passage of a clip 25 fitting on said electrode 3a—3b not in use and allowing the passage of electric current to the other central electrode through a conductor 26.

Preferably, the electrode 22 carried by the portion 21 is secured within the latter and in such a manner as to be directed tangentially to the electrode 3a—3b of the body 1 corresponding thereto.

When one of the electrodes 3a—3b is worn or damaged, it suffices to invert the body 1 with the portion 18 of the shell for allowing the other electrode 3a—3b to be used.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A spark plug comprising in combination, a substantially biconical shaped body formed of insulating material, an electrical conductor sealed in the longitudinal axis of said body and extending a relatively short distance beyond each end of said body to provide a central electrode, a shell embracing said body and rigidly engaging the mid portion thereof, each end of said shell having a side electrode and a threaded portion so that either end of the shell may be threaded into the cylinder head of an internal combustion engine, a removable cap formed of insulating material having internal threads for engaging the threads of the end of the shell opposite from the end which is then intended to be inserted in the cylinder head, and an annular extension carried by said cap extending between said shell and the end of said body to insulate the end of the central electrode from said shell, and electrical conductive means carried by said cap for engaging the central electrode within said cap.

2. A spark plug comprising in combination, a substantially biconical shaped body formed of insulating material, an electrical conductor sealed in the longitudinal axis of said body and extending a relatively short distance beyond each end of said body to provide a central electrode, a shell embracing said body and rigidly engaging the mid portion thereof, each end of said shell having a side electrode and a threaded portion so that either end of the shell may be threaded into the cylinder head of an internal combustion engine, a removable cap formed of insulating material having internal threads for engaging the threads of the end of the shell opposite from the end which is then intended to be inserted in the cylinder head, an annular extension having a conical shaped end carried by said cap, the end of said annular extension extending into wedging engagement between said shell and the end of said body to insulate the end of the central electrode from said shell and to provide a support for the upper end of said body and central electrode, and electrical conductive means carried by said cap for engaging the central electrode within the cap.

PIERRE FIGARD.