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SPARK PLUG CONSTRUCTION

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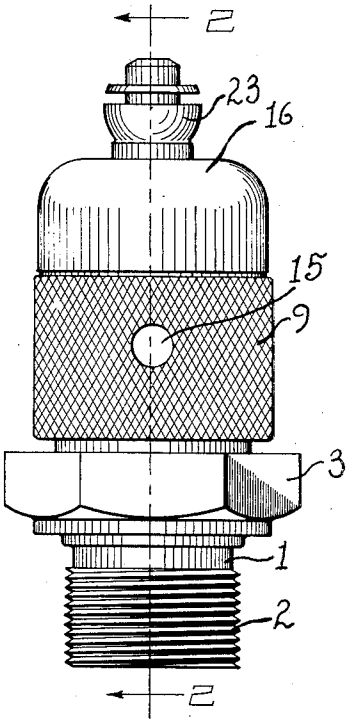


Fig-1

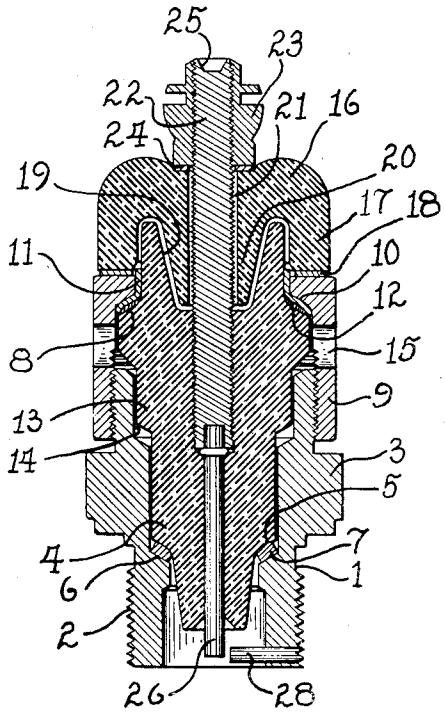


Fig-2

Inventor

Otto C. Rohde

By Owen & Owen

Attorneys

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UNITED STATES PATENT OFFICE

OTTO C. ROHDE, OF TOLEDO, OHIO, ASSIGNOR TO CHAMPION SPARK PLUG COMPANY, OF TOLEDO, OHIO, A CORPORATION OF DELAWARE

SPARK-PLUG CONSTRUCTION

Application filed May 13, 1927. Serial No. 191,028.

This invention relates to spark plugs, but more particularly to spark plugs for use on aeroplane engines.

In the operation of spark plugs, especially in connection with spark plugs used on aeroplane engines, it has been found that breakage of plugs of standard design occurs frequently, and especially when the insulators thereof are accidentally struck by a wrench or other tool during installation.

In aviation work, air cooled engines have been found desirable, but the standard spark plugs have not been thoroughly satisfactory for the purpose, because the walls of the engine cylinder cannot dissipate all the heat applied at a sufficiently rapid rate to prevent preignition.

With the above facts in mind, one of the important objects of the present invention is to provide a spark plug in which the insulating core is adequately protected against injury. In the form herein shown, this core is secured within a metallic shell and its outer end is covered by a cap which is spaced therefrom and is also of insulating material. The opposed surfaces of the core and cap are preferably provided with similarly arranged convolutions, which materially lengthen the air gap between the outer end of the metallic shell and the central spindle or electrode and eliminate any tendency for sparks to jump across this gap. In such a construction, the parts of the spark plug are so designed that the length of the plug when assembled is substantially the same as those at present in use, and the core is so covered and protected that it will not be affected by any blow on the cap.

A further object of the invention is to provide a plug of this character having means associated with the core and the cap to form an assembly which is secured to the sleeve and may be removed bodily as a unit therefrom.

The outer or shell-like part of the plug is also formed with holes which aid in the dissipation of heat from the firing end and enable air to circulate around the primary insulator within the shell, thereby preventing pre-ignition.

The preferred construction by which the above objects are attained will be more particularly explained in connection with the accompanying drawing, in which

Figure 1 is an elevation of the spark plug, and

Fig. 2 is a section taken on the line 2—2 of Fig. 1.

The illustrated embodiment of the invention comprises a metallic shell 1 having external threads 2 for engagement with the engine cylinder, and a radial enlargement 3 fashioned to receive a wrench or similar tool. Disposed within the shell 1 is a core 4 of insulating material which may be termed the primary insulator. Formed in the lower end portion of the primary insulator is a shoulder 5 in abutting relation to an internal shoulder 6 on the shell 1, and between the shoulders 5 and 6 is a copper gasket 7.

Formed around the primary insulator near its upper end portion is a shoulder 8 facing in an opposite direction from the shoulder 5. In threaded engagement with the upper end portion of the metallic shell 1 is a metallic sleeve 9 having an internal shoulder 10 adjacent the upper end thereof. The shell 1 and sleeve 9 together form a body shell for the parts. The shoulder 10 is disposed in abutting relation to the shoulder 8 on the primary insulator 4. The shoulder 10 and upper end portion of the sleeve 9 is spaced from the primary insulator by a copper sleeve 11 and gasket 12. The intermediate portion of the primary insulator is formed with an enlargement 13 disposed within an annular recess 14 in the shell 1. The particular form of the insulator is not important to the invention.

Formed in the sleeve 9 are radial holes or openings 15 which serve to ventilate the primary insulator. It will be manifest that air may enter from the outside through the holes 15 and circulate around the primary insulator, which is spaced a slight distance from the sleeve 9 and the shell 1. The holes 15 also aid in the dissipation of heat from the firing end of the spark plug so that only as much heat passes to the cylinder walls as they can carry off.

Enclosing the outer end portion of the primary insulator 4 is a cap 16 of insulating material having depending side walls 17 in abutting relation to the upper end of the sleeve 9. Disposed between the side walls 17 and the sleeve 9 is a washer 18. Formed in the outer end portion of the primary insulator is an outwardly tapered recess 19 of substantially frusto-conical shape and formed on the cap 16 is a central projection 20 extending into the recess 19 and shaped similarly thereto. The cap 16 is preferably so designed that all parts thereof are spaced from the inside and outside walls of the primary insulator 4.

It is manifest that the dome shaped cap 16 guards the outer end portion of the primary insulator from blows and shocks, and that when a blow is received by the cap 16, it is transmitted to the sleeve 9 and not to the primary insulator.

Formed in the cap is a central opening 21 through which extends a central electrode in the form of an externally threaded spindle 22, the lower end portion of which is screwed or otherwise securely anchored in the primary insulator 4. The opening 21 is preferably of sufficient diameter so that the spindle 22 is spaced therefrom throughout its length. Engaging the outer end portion of the spindle 22 is a terminal nut 23, which is spaced from the cap 16 by a washer 24. After the parts have been assembled, the upper portion of the spindle 22 may be welded or riveted over at 25 to form a permanent connection between the nut 23 and spindle 22. The nut 23 holds the cap 16 in place. It is apparent that the primary insulator 4, cap 16 and sleeve 9, together with the spindle 22 and nut 23, may be readily removed as a unit by unscrewing the sleeve 9 from the shell 1.

The inner portion 26 of the central electrode, which is connected at 27 to the spindle 22, extends centrally through the primary insulator or core 4 and cooperates with the electrode 28 fixed to the shell, as will be readily understood. The opposed surfaces of the cap 16 and the adjacent end of the core 4 have overlapping similarly curved portions, which serve to increase the length of the air gap between the shell and central spindle and thus afford the desired electrical clearance.

It will be seen that I have provided a construction which satisfies the objects above mentioned, and one which constitutes a valuable advance in the art. While I have shown the invention in a certain physical embodiment, it is to be understood that modifications of the structure shown may be made by those skilled in this art without departing from my invention as expressed in the following claims.

What I claim is:

1. A spark plug having a shell, a sleeve secured to said shell, a one-piece primary insulating core having a central conical recess in its outer end, a central electrode extending through said core, a secondary insulating cap having a central projection extending into and spaced from said recess in the primary core and having a rim bearing against the end of said sleeve, the inner end of said central projection being within said sleeve and the end of said primary core around said recess extending outwardly beyond the sleeve and within the rim of the cap to insure an air gap of sufficient length to prevent arcing at that point, in case the secondary insulating cap should be broken.

2. A spark plug having a shell, a one-piece primary insulating core having an enlarged portion formed with peripheral shoulders, means engaging said enlarged portion to secure the core to the shell, said core having a conical recess in its outer end, and a central electrode having threaded engagement with said core centrally thereof, said threaded engagement continuing inwardly beyond said securing means so as to prevent separation of the primary core at that point in case of breakage; a secondary insulator and protecting cap having a central conical portion projecting into and spaced from the recess in the primary core, the inner end of said central conical projection being within the means which secures the core to the shell to prolong the length of the air gap between the shell and the spindle, and means for securing said cap in position.

3. A spark plug having a metallic shell, a one-piece primary insulating core having a conical recess at its outer end, a shoulder on the core, means engaging the shoulder to secure the core to the shell, and a central electrode in threaded engagement with said core, said threaded engagement continuing inwardly beyond said shoulder; a secondary insulating and protecting cap surrounding the outer portion of the core and spaced therefrom and having a central conical projection spaced from and projecting into the conical recess of the primary core, the inner end of said central conical projection being within the means which secures the core to the shell and means for securing said cap in position.

4. A spark plug having a shell, an insulating core in said shell having a pair of oppositely facing shoulders, an internal shoulder on said shell to receive one of the shoulders of said core, a sleeve in threaded engagement with said shell and having an internal shoulder for engagement with the other shoulder of said core, a cap of insulating material enclosing the outer end portion of said core and in abutting relation to the outer end of said sleeve, said core extending outwardly beyond the sleeve and within the cap and having a central conical recess in its outer end, a central inwardly tapered projection on said cap disposed within said recess and

extending inwardly beyond the outer end of said sleeve, said cap being spaced entirely from said core, a central electrode extending through said cap and in threaded engagement with said core, and a sleeve on said electrode for holding said cap in place.

5. A spark plug having an outer shell, an insulating core seated within said shell, a sleeve in threaded engagement with said shell and having a flange for holding said core in place, said core extending outwardly beyond the sleeve and having a central conical recess in its outer end, a cap having an annular rim overhanging the outer end of the core and in abutting relation to said sleeve, said cap being completely spaced from said core and having a conical projection within said recess and extending inwardly beyond the outer end of said sleeve, a central electrode extending through said cap and connected to the core, and a member fixed to said electrode and in engagement with said cap for holding the latter in place, whereby all of the parts may be removed as a unit from the shell by unscrewing said sleeve.

6. A spark plug having a shell, an insulating core in said shell, oppositely facing shoulders on said core, a shoulder on said shell engaging one of the shoulders on the core, a sleeve adjustably connected to the shell, an abutment on the sleeve engaging the other shoulder of the core for forcing said core tightly into position in the shell, said core extending outwardly beyond the sleeve and having a central conical recess in its outer end, a protective insulating cap having an annular rim overhanging the outer end of the core and having a conical projection within said recess and extending inwardly beyond the outer end of said sleeve, a central electrode extending through said core and cap, and means for securing said cap in abutting relation to the sleeve with all parts of said cap in spaced relation to the core.

In testimony whereof I have hereunto signed my name to this specification.

OTTO C. ROHDE.