March 19, 1940. L. G. WALTER ET AL 2,194,251

SPARK PLUG

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Fig. 1.

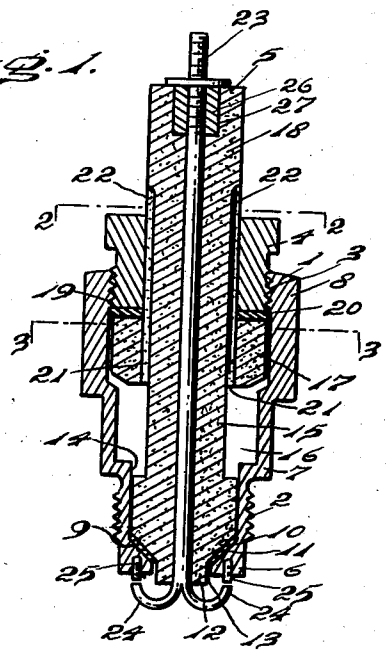


Fig. 2.

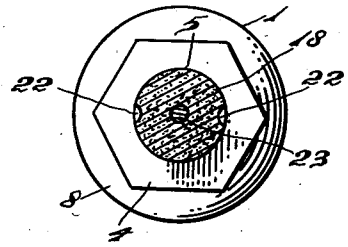
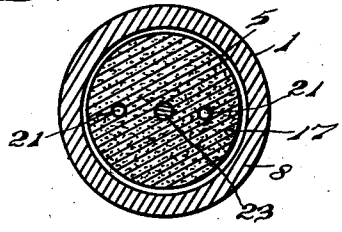


Fig. 3.



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SPARK PLUG

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5 Claims. (Cl. 123—169)

The object of our invention is to devise a novel spark plug, wherein the insulation, such as for example the porcelain which carries the main electrode, is surrounded intermediate its ends by a chamber vented through the porcelain to the atmosphere to provide for the free escape of heat, so that, under operating conditions of an internal combustion engine, the porcelain will be maintained at a substantially uniform temperature.

A further object of the invention is to devise a novel construction and arrangement of a shell, insulation, electrodes and means for retaining the parts in assembled condition.

With the above in view, our invention comprehends a novel construction and arrangement of a spark plug.

It further comprehends a novel ventilated spark plug wherein a novel construction of an insulator is secured within a novel construction of shell to provide a chamber surrounding the porcelain and vented through the porcelain to the atmosphere.

Other novel features of construction and advantage will hereinafter more clearly appear in the detailed description and the appended claims.

For the purpose of illustrating our invention, we have shown in the accompanying drawing a preferred embodiment of it, which, in practice, will give satisfactory and reliable results. It is, however, to be understood that this embodiment is typical only and the various instrumentalities of which our invention consists can be variously arranged and organized, and the invention is not limited to the exact arrangement and organization of these instrumentalities as herein set forth.

Figure 1 is a sectional elevation of a spark plug embodying our invention.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 1.

Similar numerals indicate corresponding parts.

Referring to the drawing:

1 designates the shell of a spark plug embodying our invention. The shell 1 is externally threaded as at 2 to provide for its assembly in the cylinder head of an internal combustion engine. The shell 1 is also internally threaded at its rear end as at 3 to receive a gland 4 which secures an insulation member 5, commonly called the porcelain, in sealed relation with the forward end of the shell.

The shell 1 is provided with a front portion 6 of reduced diameter, an intermediate portion 7, of greater diameter than that of the front portion 6, and a rear portion 8 of greater diameter than that of the intermediate portion 7. The forward end of the chamber of the shell has a conical or tapered seat 9 provided with a gasket 10 against which the conical or tapered face 11 of the porcelain seats. The front end 12, of the porcelain is of less diameter than that of the front opening 13 in the shell, and such front end extends into said opening 13, and preferably through and beyond such opening.

In rear of the seat 9 the porcelain is of less diameter than the chamber 14 in the front portion of the shell and merges into a portion 15 of reduced diameter contributing with the shell to form an enlarged chamber 16. In rear of the reduced portion 15 of the porcelain, the latter is of enlarged diameter as at 17, but of less diameter than the chamber of the rear portion 8 of the shell. The enlarged portion 17 of the porcelain merges into a rear portion 18 of reduced diameter thereby forming a shoulder 19 to receive a gasket 20 against which the gland 4 bears. It will thus be clear that the porcelain has sufficient clearance within the chamber of the shell to adjust itself to the seat 9 against which it is held by a direct forward pressure imparted by the gland 4.

The enlarged portion 17 of the porcelain has one or more apertures 21 extending longitudinally through it and communicating with the chamber 16 and with one or more longitudinally extending grooves 22, formed in the outer face of the portion 18 of the porcelain and terminating in rear of the gland 4.

It will thus be clear that the chamber 16 is at all times vented to the atmosphere.

The porcelain 5 carries a main electrode 23 which extends longitudinally through it and which terminates at its forward end in a pair of rearwardly curved terminals 24 which cooperate with the ground electrodes 25.

Instead of having the shell form the ground electrodes we preferably use a more durable metal having a high heat resistance such as nichrome, which is in the form of pins permanently fixed in apertures in the forward end of the shell by swaging, welding or in any other suitable manner.

The electrode 23 has a sealing member 26 in a recess 27 opening through the rear end of the porcelain.

It will be apparent from the foregoing that a pressure in a forward direction is exerted to press the porcelain towards its seat, to effectively seal the inner end of the ventilated chamber 16. Due to shrinkage and contraction in the making of porcelains, they are not always of uniform dimensions, and by providing a clearance in the

shell for the porcelain and a seat at the forward end portion of the porcelain a positive seal can be obtained.

The heat radiated from the shell to the chamber 16 is vented to the atmosphere through apertures 21 and grooves 22, so that a substantially even temperature is maintained between the shell and porcelain which contributes to proper ignition in high compression motors.

The insulator can be considered as having a head at its forward portion with a collar in rear of and spaced from said head to form with the shell a ventilated chamber vented through the collar to grooves opening to the atmosphere in rear of the gland.

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

1. In a spark plug, a shell having an internal seat near its forward end, an insulator engaging said seat and of reduced diameter intermediate its ends to form a ventilating chamber between the insulator and the shell, said insulator having ventilating ports communicating with said chamber and with the atmosphere to vent said chamber to the atmosphere, a main electrode extending through said insulator, an electrode on the shell, and means engaging said shell to force said insulator towards its seat.

2. In a spark plug, a shell having a tapered seat near its forward end, an insulator having a tapered portion near its forward end and of reduced diameters intermediate its ends to form a ventilating chamber between the insulator and the shell, said insulator having ventilating ports extending longitudinally through it and communicating with said chamber to vent said chamber to the atmosphere, a main electrode extending through said insulator and having its forward end provided with rearwardly deflected terminals, ground electrodes carried by said shell and a gland in threaded engagement with the shell to retain said insulator in sealed condition within said shell.

3. In a spark plug, a shell having a tapered seat near its forward end, an insulator of reduced diameter intermediate its ends to form with the shell a ventilating chamber having vents leading from said chamber to the atmosphere and having a tapered seat near its forward end, a gasket between said seats, said insulator having a shoulder intermediate its end, a gasket between said gland and said shoulder and a gland engaging said last named gasket whereby pressure in only one direction is exerted against said insulator to seal it within said shell, a main electrode in the insulator, and a ground electrode on the shell.

4. In a spark plug, a shell having a seat at its forward end, an insulator having a seating portion cooperating with said seat and substantially filling the forward end of said shell, said insulator having an intermediate portion of reduced diameter to form with the shell a ventilated chamber, and having an enlarged portion in rear of said chamber with vent ports leading to the atmosphere, a gland in threaded engagement with the shell to move said insulator toward said seat, a main electrode extending through said insulator and having its forward end forming terminals and ground electrodes of heat resistant metal fixed in the forward end of the shell.

5. In a spark plug, a shell having a seat at its forward end, an insulator having an enlarged head near its forward end to cooperate with said seat and a collar of greater diameter than that of said head in rear of and spaced from said head to form a ventilated chamber, a gasket for said seat, a gasket for said collar, a gland engaging the shell and collar gasket to move the insulator towards said seat, said collar having a vent aperture leading from said ventilated chamber and merging into a groove extending along the insulator and opening to the atmosphere in rear of said gland.

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