



# UNITED STATES PATENT OFFICE.

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## METHOD OF SECURING ELECTRODES IN SPARK-PLUG CORES.

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*To all whom it may concern:*

Be it known that I, OTTO CARL ROHDE, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented a new and useful Method of Securing Electrodes in Spark-Plug Cores, which invention is fully set forth in the following specification.

This invention relates to spark plugs for use in connection with internal combustion engines, and particularly to a method of securing the center electrode in the insulating core.

In the use of spark plugs, particularly in connection with high speed engines, such, for instance, as those used for aeroplane work, considerable difficulty is experienced by reason of the insulating cores of the plugs breaking, thereby permitting compression leakage and short circuiting, and sometimes permitting portions of the core to drop into the cylinder. Another difficulty is the securing of a gas tight joint between the center electrode and insulator or core member by which it is carried.

The object of the invention is to avoid the above objections by securing the center electrode in the insulator of the spark plug in such a way that a gas tight union is provided therebetween, and whereby the electrode acts as a tie to hold the insulator parts closely together in case breakage occurs.

The invention is fully described in the following specification, and illustrated in the accompanying drawings, in which,—

Figure 1 is a longitudinal section of the core of a spark plug with the electrode carrying cap loosely mounted on the core, with the electrode inserted through the core preparatory to being secured therein, and with the gland member and gasket of the shell in position on the core. Fig. 2 is a similar view with the electrode upset to rigidly secure it in tying relation to the core and with the electrode cap in permanent engagement with the core, and Fig. 3 is a side view of a spark plug embodying the invention, with the shell partly broken away.

Referring to the drawings, 1 designates the spark plug core or insulator, which may be of porcelain or other suitable insulating material, 2 the center electrode, 3 the cap member fixed to the outer end of the electrode, and 4 the shell body in which the

core is secured, in the present instance, by a gland member 5.

An opening 6 is provided longitudinally through the core for receiving the electrode 2 and is provided with an enlargement 7 a distance inward from its outer end to provide the seat or shoulder 8 therein, and is preferably provided with an enlargement 9 at its inner end to form the core petticoat portion 10.

The electrode 2 is provided with a shoulder 11 for seating on the shoulder 8 of the core opening 6 and is provided near its other end or in register with the shoulder 12, formed at the inner end of the petticoat opening 9, with a portion 13 which offers a greater resistance to the passage of an electric current therethrough than does the other portions of the electrode. The high resistance portion 13 of the electrode preferably extends a short distance both ways from the shoulder 12 and is formed in practice by a swaging action which reduces the electrode in cross section at such point and renders the metal of greater density than it is in other portions of the electrode. The cap 3 is fixed to the outer end of the electrode by electric welding or in any other suitable manner and is threaded down over the outer threaded end of the core to force the shoulder 11 of the electrode closely to its seat 8 in the core. The edge 14 of the cap is then peened under the threaded portion of the core to retain the cap in position thereon.

The electrode 2 is cemented in the core in the usual manner and the core is then baked to harden the cement thereon, the same as is now done in securing the electrodes in core members. This having been done, an electric heating current is passed through the electrode, causing a localized heating of the core at the high resistance portion 13 thereof. A longitudinal compressing force is then applied to the electrode, causing an upsetting of the heated or softened portion 13 of the electrode, as shown at 15, both within the enlargement 9 of the opening 6 and within the adjacent end portion of said opening so as to form a gas tight seal in the lower end portion of the core around the electrode and also to effect a rigid tying of the electrode together between the shoulder 11 and upset enlargement 15.

I wish it understood that my invention is

not limited to any specific construction, arrangement or form of the parts, or to the specific manner of uniting the same shown and described herein, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is,—

10 1. The method of securing the center electrode in the core of a spark plug, which consists in shouldering the electrode against a portion of the core to limit the inward movement of the electrode in the core, providing  
15 the electrode with a high electrical resistance portion adjacent to the inner end of the core, passing a heating current through the electrode to effect a localized heating thereof at the high resistance portion, and then subjecting the electrode to a longitudinal compressing force to upset the heated portion within the core.

2. The method of providing a gas tight joint between the center electrode and core of a spark plug, which consists in providing the electrode with a high electrical resistance portion, passing an electric heating current through the electrode to effect a localized heating of the electrode at the high resistance portion thereof, and then applying a longitudinal compressing force to the electrode to upset the heated portion thereof within the core.

3. The method of forming a gas tight joint between the center electrode and core of a spark plug, which consists in transversely compressing the electrode at a point therein to form it with a portion which offers a higher resistance to the passage of an electric current therethrough than do other portions of the electrode, passing an electric heating current through the electrode to heat the high resistance portion and then longitudinally compressing the electrode to upset the heated portion against the core to form a gas tight joint.

4. The method of securing the center electrode in the core of a spark plug, which consists in shouldering the electrode against the core to limit the inward movement of the electrode through the core, transversely compressing a portion of the electrode in spaced relation to the shoulder portion thereof and toward the inner end of the core to provide a hardened electrical resistance portion in the electrode, passing an electric heating current through the electrode to heat the said resistance portion thereof and then longitudinally compressing the electrode to upset the heated portion to form a gas tight joint

between the electrode and core and to cooperate with the shoulder portion of the electrode to tie the core together.

5. The method of securing a center electrode within the core of a spark plug, which consists in providing a shoulder within each end portion of the electrode receiving opening of the core, providing the electrode with a shoulder and mounting the electrode in the core with its shoulder in tight seating engagement against the outer end shoulder of the core, providing the electrode adjacent to the inner end shoulder of the core with a portion of higher electrical resistance than the other portions of the electrode, passing an electric current through the electrode to heat the resistance portion thereof, and then subjecting the electrode to a longitudinal compressing force to upset and effect a shouldering of the heated portion thereof against the inner end shoulder of the core.

6. The method of securing a center electrode in the core of a spark plug, which consists in firmly shouldering the electrode against a portion of the core to prevent further inward movement of the electrode in the core, cementing the electrode in the core, baking to harden the cement, providing the electrode adjacent to the inner end of the core with a portion which offers a greater resistance to the passage of an electric current therethrough than other portions of the core, passing an electric heating current through the core to effect a heating of said resistance portion, and then subjecting the electrode to a longitudinal compressing force to upset and cause a shouldering of the heated portion of the electrode against the core in opposition to the first shoulder engagement of the electrode with the core.

7. The method of securing a center electrode in the core of a spark plug, which consists in providing the electrode with a shoulder for seating against a portion of the core in the direction of its inner end, threading an outer end portion of the electrode onto the core to effect a firm seating of the electrode shoulder within the core, providing a portion of the electrode with a high electrical resistance portion adjacent to the inner end of the core, passing an electric heating current through the electrode, and then subjecting the electrode to a longitudinal compressing force to upset the heated portion thereof in tight shouldered engagement with the core in opposition to the first shouldered engagement of the electrode with the core.

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

OTTO CARL ROHDE.