J. A. & B. A. JEFFERY.

METHOD OF MANUFACTURING SPARK PLUGS.

APPLICATION FILED FEB. 27, 1912. RENEWED JULY 19, 1915.

1,214,472. Patented Jan. 30, 1917.

Fig. 1.

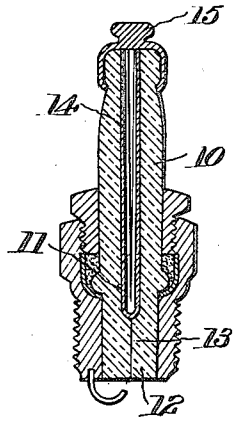
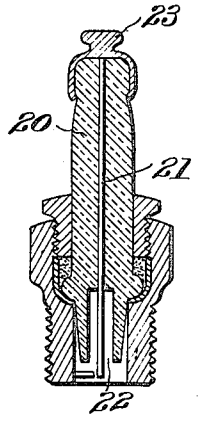


Fig. 2.



WITNESSES

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METHOD OF MANUFACTURING SPARK-PLUGS.

1,214,472. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed February 27, 1912, Serial No. 680,265. Renewed July 19, 1915. Serial No. 40,809.

To all whom it may concern:

Be it known that we, JOSEPH A. JEFFERY and BENJAMIN A. JEFFERY, citizens of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented new and useful Improvements in Methods of Manufacturing Spark-Plugs, of which the following is a specification.

This invention relates to an improved method of manufacturing spark plugs.

In the practical manufacture of spark plugs as usually carried out it has been found extremely difficult to overcome the embarrassment encountered in securing a proper union between the insulating block and the electric conductor embedded therein. This is particularly true in connection with spark plugs in which an attenuated wire terminal is employed, such as that disclosed in Letters Patent 942,646 granted to us December 7, 1909. When formed in the usual manner by molding the insulating material around the wire, air bubbles or the like form around the wire, preventing a perfect contact between the latter and the insulating material, whereby the heat generated by the electrical discharge will not radiate through the block but becomes concentrated in such a manner as not only to fuse the conductor, but very frequently to fuse or break away the insulating core as well. In this manner the efficiency of the plug is greatly impaired, and in fact the same is rendered practically useless.

The object of the present invention is to overcome the foregoing obstacles by a process in which the formation of air bubbles around the wire is prevented and a close molecular union between the wire and the insulation provided at all points.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawing:—Figure 1 is a longitudinal sectional view illustrating a spark plug, such as that described and claimed in our pending application, Serial Number 394,887, Renewal No. 40,807, Patent No. 1,174,157, Mar. 7, 1916. Fig. 2 is a similar view of a common type of spark plug.

Referring to the drawing, 10 designates the insulating block, preferably formed of porcelain and provided with a longitudinal bore 11 which is closed by a solid end wall 12. An attenuated wire 13 is embedded in said closed end, and the inner extremity of said wire contacts with the end of a split tube or quill 14 located in the bore 11. The open end of the bore is closed by the usual terminal cap 15 which also contacts with the split tube or quill 14. In this manner a continuous electric conductor is provided extending from said terminal cap to said attenuated wire.

In carrying out our process we first shape the insulating block to the desired contour in any preferred manner, the said block when completed containing the bore 11 and closed end wall 12. While the insulating material is still soft or in a semi-plastic condition, the wire 13 is forced into the closed end in a longitudinal line, preferably from the inside and as near the center as practicable. Our preferred practice, however, is not to force the wire through sufficiently far to cause the end to protrude. After forcing the conductor wire through the closed end of the plug the latter is baked in the usual manner, after which the quill 14 and terminal cap 15 are added. As a final step the closed end of the plug is ground or otherwise dressed down to provide a flat surface and to remove the surplus portion of the porcelain. The grinding is continued until the outer end of the wire 13 is exposed and brought flush with said flat surface. If desired, the wire 13 may be forced entirely through the end wall 13 until a portion of said wire protrudes. After the insulating block has been baked, the protruding portion of the wire is removed and the end of the plug ground or dressed down, as above described, to form the flat end surface with the end of the wire flush therewith.

In practice, we have found that by forcing the wire into the semi-plastic porcelain clay, or other material of which the plug is to be formed, no air bubbles can be formed around the wire, but the latter merely crowds the insulating material to one side, rendering said material somewhat denser adjacent the wire. Then by baking the block with the wire therein until the porcelain becomes vitrified, the chemical change which takes place in the block forms a close molecular union between the latter and the wire.

In Fig. 2 we have illustrated a common form of spark plug in which the insulating

block 20 is made solid throughout and provided with a conductor 21 protruding at the sparking end 22 and engaging a terminal cap 23 at the other end. In this form the block 20 is formed in any suitable manner after which the wire 21 is forced therethrough while said block is still soft. The plug is then finished in any usual or preferred manner.

Our improved process may be carried out in a slightly modified manner by first providing the semi-plastic spark plug with a bore closely approximating or slightly smaller than the diameter of the wire to be embedded therein, and then forcing the wire through said hole. In baking, the contraction of the porcelain mass during vitrification, effects a close union between the insulating material and the wire.

In our experiments we have found that the best results are obtained by employing platinum wire because the coefficient of expansion of our porcelain body and platinum is about the same. There are also some substitute materials having about the same coefficient of expansion, such for instance as a well know alloy of nickel and chromium. It will be understood, however, that while we prefer to use platinum or its substitutes, we do not desire to limit ourselves thereto, as wire of any preferred material may be employed without departing from the spirit of our invention.

We claim as our invention:—

1. The method of manufacturing spark plugs comprising forcing a conductor wire longitudinally into an insulating block of ceramic material while the latter is in a plastic condition, and until the forward end of the wire approaches the farther extremity of the blank, whereby said forward end will be embedded within said extremity, firing the blank with the wire therein, and finally removing the porcelain of the said extremity to expose the forward end of said wire.

2. The method of manufacturing spark plugs comprising forcing a conductor wire longitudinally into an insulating block of ceramic material while the latter is in a plastic condition, and until the forward end of the wire approaches the farther extremity of the blank, whereby said forward end will be embedded within said extremity, firing the blank with the wire therein, and finally grinding said extremity to expose the forward end of the wire flush with the end surface of the porcelain body.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

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BENJAMIN A. JEFFERY.

Witnesses:
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