

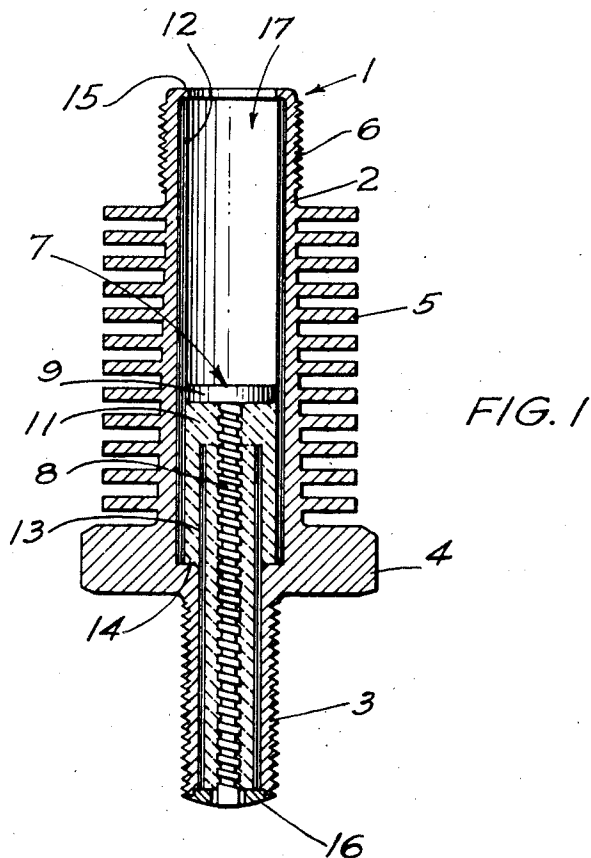
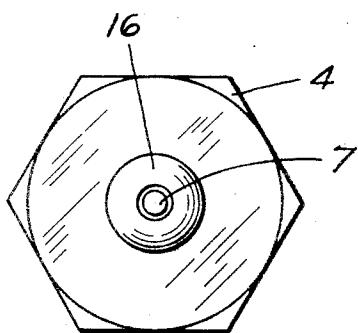
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IGNITION APPARATUS

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IGNITION APPARATUS

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Substitute for abandoned application Serial No.
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16 Claims. (Cl. 123-169)

This application is a substitute for abandoned application Serial No. 199,751, filed April 4, 1938.

This invention relates to spark plugs of the type wherein the high tension circuit is not only insulated but also shielded or screened to prevent interference with the reception in adjacent radio equipment.

One object of the invention is to provide a novel spark plug which consists of a minimum number of parts so as to simplify manufacture.

Another object of the invention is to provide a novel spark plug which is simple in structure and relatively inexpensive to manufacture.

A further object of the invention is to provide a spark plug that lends itself to be manufactured in small sizes and more particularly to the manufacture of a 10 millimeter plug.

Another object of the invention is to provide a spark plug that is capable of withstanding sudden changes in temperature.

A still further object of the invention is to provide a spark plug which is both mechanically and electrically strong, and is capable of long service under severe service conditions.

These and other objects will appear more fully from a consideration of the detailed description of the invention which follows. Although only one embodiment of the present invention is described and illustrated in the accompanying drawing, it is to be expressly understood that this drawing is for purposes of illustration only and is not to be construed as a limitation of the scope of the invention, reference primarily being had for this purpose to the appended claims.

In the drawing, wherein like reference characters refer to like parts throughout the several views.

Fig. 1 is a longitudinal sectional view of a device embodying the invention; and

Fig. 2 is a transverse end, or bottom plan view of the device of Fig. 1 showing one type of electrode design.

The spark plug comprises a unitary shell member 1 having a shielding element 2 shown as an upward extension of cylinder engaging base 3, there being an intermediate polygonal portion 4 which receives the wrench or other tool for insertion of the plug in the cylinder wall. Engaging base 3 has threads thereon to facilitate securing the plug in the cylinder wall of an internal combustion engine. Shielding element 2 is provided with cooling means in the form of fins 5, and is also provided with a threaded portion 6 which is to enable securing an ignition cable shield to the spark plug.

In shell 1 a central electrode 7 having a disc-like head portion 8 and a threaded spindle 9 is securely imbedded in an insulating compound 11, preferably composed of a ceramic material which completely fills the shell 1 from the lower side of head portion 8 to a plane adjacent the bottom-most part of base 3.

Lining the walls of the spark plug are insulating cigarettes 12 and 13 preferably made of mica. Cigarette 12 extends upwardly from the shoulder 14 in the enlarged bore of shell 1 to spun-over shoulder 15 and in extending upwardly it closely adheres to the wall in order that there shall be no air between the cigarette and the walls which might cause corona losses when the spark plug is in use, and to prevent gas leakage. Cigarette 13 extends upwardly from ground electrode 16 into the enlarged bore of shell 1 and while traversing the bore of base portion 3 it also adheres in like manner as does mica cigarette 12 to the walls.

Grounded electrode 16 is attached to base portion 3 in any well known manner such as by silver soldering, welding or spinning over.

The grounded electrode is shown in the drawing as a disc member with a single central opening through which the central electrode passes. This embodiment is preferred since it decreases the possibility of any particles of the insulating material falling into the combustion chamber of the engine.

Chamber 17 in the upper portion of the spark plug is adapted to receive an ignition cable from a magneto or other high tension source. The usual radio shield for the cable is tightly secured to the spark plug by means of a coupling nut fastened to the threads 6.

The method of manufacturing the spark plug is simple and requires a minimum number of operating steps.

Unitary shell member 1 is made in any well known manner.

Insulating cigarette 12 is inserted into enlarged upper portion of shell member 1 abutting against shoulder 14 and extends close to the top of shield 2. Mica cigarette 13 is then inserted through the bottom of the shell 1 closely fitting the walls of base 3 and extending into the upper portion of the shell 1. Central electrode 7 is then inserted through the top of the shell 1 until the lower tip of spindle 9 extends the proper distance below the bottom of base 3. Head 8 of electrode 7 bears very tightly against mica cigarette 12. After electrode 7 is inserted, the upper end of

shielding portion 2 is spun over forming a guard and holding means for mica cigarette 12.

Electrode 8 is held in position by means of a suitable tool while insulating compound 11 is inserted under pressure in a plastic state through the lower end of base 2 completely filling the space between the head 9 of electrode 7 and the lower end of base 3.

After the insertion of compound 11 the entire structure is baked to harden the insulating compound. After the hardening process insulating material 11 exerts a pressure against mica cigarettes 12 and 13 thereby giving a gas-tight fit to the spark plugs.

After the baking operation the proper amount of insulating material 11 is ground or shaved off so that the grounded electrode 16 can be permanently attached to base portion 3. Electrode 16 is preferably attached to base 3 by means of silver solder although other means can suitably be used.

While only one embodiment of the invention has been described and illustrated in the drawing, it will be apparent to those skilled in the art that the invention is capable of a wide variety of mechanical expressions, while changes may be made in the form, details and proportions of the parts without departing from the spirit of the invention. Reference is to be had primarily to the appended claims for a definition of the limits of the invention.

What I claim is:

1. In a shielded spark plug comprising a unitary shell member having a bore therethrough the upper end of which is enlarged, the lower section of said shell member having threads thereon, a mica insulating cigarette positioned in said upper portion of said shell member and a second mica insulating cigarette extending into said upper portion from the lower end of said lower portion of the shell member, a central electrode having a head portion tightly fitting the first mentioned mica insulating cigarette and a threaded spindle extending from said enlarged bore to the lower end of said shell, and a ceramic insulator imbedding said electrode, the upper surface of said head portion and the tip portion of said electrode being free of said insulator.

2. In a spark plug comprising a unitary shell member having a bore therethrough, the upper end of said bore being enlarged, a mica insulating cigarette extending throughout the entire length of said enlarged part of said bore and a second mica insulating cigarette extending throughout the length of the lower portion of said bore partially into the enlarged bore, an elongated electrode in said bore, and a ceramic insulator filling the space between said electrode and said cigarettes.

3. In a spark plug a tubular body comprising a lower portion adapted to be mounted in the cylinder of an engine to be ignited and an upper portion of larger internal diameter adapted to receive a conductor cable, a tube of insulating material lining said upper portion, a tube of insulating material lining the lower portion and extending in overlapping relation with the first tube, a central electrode, and cementative insulating material filling the spaces between the tubes and electrode.

4. In a spark plug a tubular body comprising a lower portion adapted to be mounted in the cylinder of an internal combustion engine and an upper portion of larger internal diameter adapted to receive an ignition cable, a mica insulating cigarette lining said upper portion, a mica in-

sulating cigarette lining the lower portion and extending in overlapping relation with the first mica cigarette, a central electrode, and cementative insulating material filling the spaces between the cigarettes and electrode.

5. A spark plug comprising a shell having a bore therethrough with an enlarged upper portion and a reduced lower portion, insulating tubes lining the inner walls of the shell, one of said insulating tubes lining the inner wall of the said upper enlarged portion and the other of said insulating tubes lining the inner wall of the reduced portion and extending into the enlarged upper portion, a central electrode with a head portion fixedly positioned in the enlarged upper portion and a threaded spindle extending downwardly from the head portion through the reduced portion, and a hardened insulating material completely filling said bore below the head of the central electrode.

6. A spark plug comprising a shell having a bore therethrough with an enlarged upper portion and a reduced lower portion, insulating tubes lining the inner walls of the shell, one of said insulating tubes lining the inner wall of the said upper enlarged portion and the other of said insulating tubes lining the inner wall of the reduced portion and extending into the enlarged upper portion, a central electrode with a head portion fixedly positioned in the enlarged upper portion and a threaded spindle extending downwardly from the head portion through the reduced portion, a hardened insulating material completely filling said bore below the head of the central electrode, a disc electrode attached to the lower extremity of the shell, surrounding the central electrode and bearing against the insulating material.

7. In a spark plug the combination of a finned body member having a double diameter bore therethrough, a central electrode with a disc-like head permanently positioned in the larger section of said shell and a spindle extending through the smaller section of said bore to a position near the lower extremity of said body, a second electrode member attached to the body member and surrounding the central electrode, and insulating means including a hardened ceramic insulating compound completely filling the space in said body between the disc head of the central electrode and the second electrode.

8. A spark plug comprising the combination of a shell body having a shield extension thereon, insulating sleeves lining the interior of said shell body and a central electrode element having a head and a spindle fixedly mounted in said shell, an insulator in the form of a cementative material filling the shell member beneath the head of the central electrode member and around the spindle.

9. The method of manufacturing spark plugs which consists of the following steps: Inserting an insulating sleeve into one end of a spark plug shell, inserting a second insulating sleeve through the second end of said shell, inserting an electrode through said first end, forcing an insulating compound under pressure through the second end of said shell until the space surrounding the electrode in the shell is completely filled with the insulating compound, baking the entire structure until the insulating compound is hardened, and after the hardening process attaching a ground electrode to the shell.

10. The method of manufacturing spark plugs which comprises disposing an elongated electrode

centrally of the bore in a spark plug shell, pressing an electrical insulating compound in a plastic state into said shell around said electrode, and treating the entire assembly to harden the insulating compound.

11. The method of manufacturing spark plugs which comprises forming a tubular shell having a differential bore therethrough, lining at least a portion of said bore with electrical insulating materials, placing an elongated electrode centrally of said bore, pressing an electrical insulating compound in a plastic state into said shell between said electrode and said insulating materials, and treating the entire assembly to harden the insulating compound.

12. The method of manufacturing spark plugs which comprises forming a tubular shell having a differential bore therethrough, lining each portion of said bore with a sleeve of electrical insulating material, the lining from one part of said bore extending into a larger part of said bore, placing an elongated electrode centrally of said bore, forcibly pressing an electrical insulating compound in a plastic state into said shell in the space between said electrode and said insulating sleeves, and baking the entire assembly to harden said insulating compound.

13. A spark plug comprising in combination a tubular body having a shield extension permanently fixed thereto and adapted to receive an ignition cable, insulating means lining the inner wall of said shield extension, an electrode centrally disposed in the bore of said body and having an enlarged head portion tightly engaging the inner wall of said lining, and an electrical

insulating compound substantially filling the bore of said body around said electrode.

14. In a spark plug, a tubular body having a differential bore therethrough, the portion of said bore having the larger internal diameter being adapted to receive an electrical conductor, an electrode centrally disposed of said bore and extending into portions thereof having different internal diameters, and electrical insulating materials substantially filling the space in said bore between the walls of the latter and said electrode.

15. In a spark plug, a tubular body member having a stepped bore therein, a central electrode having an enlarged portion permanently positioned in a part of said bore having the larger diameter and a spindle portion extending from said larger part of the bore through a smaller part of said bore, insulating material substantially filling the space in said body between the periphery of said electrode and the walls of said bore, and a ground electrode secured to said body for electrical cooperation with the end of said spindle.

16. In a spark plug, a tubular body comprising a lower portion and an upper portion of larger internal diameter than said lower portion, a tube of insulating material lining said upper portion, a tube of insulating material lining said lower portion and extending into said upper portion, an electrode centrally disposed in said bore, and an electrical insulating material substantially filling the space in said body between said electrode and said tubes.

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