

June 6, 1944.

H. RABEZZANA

2,350,475

SPARK PLUG

Filed July 6, 1942

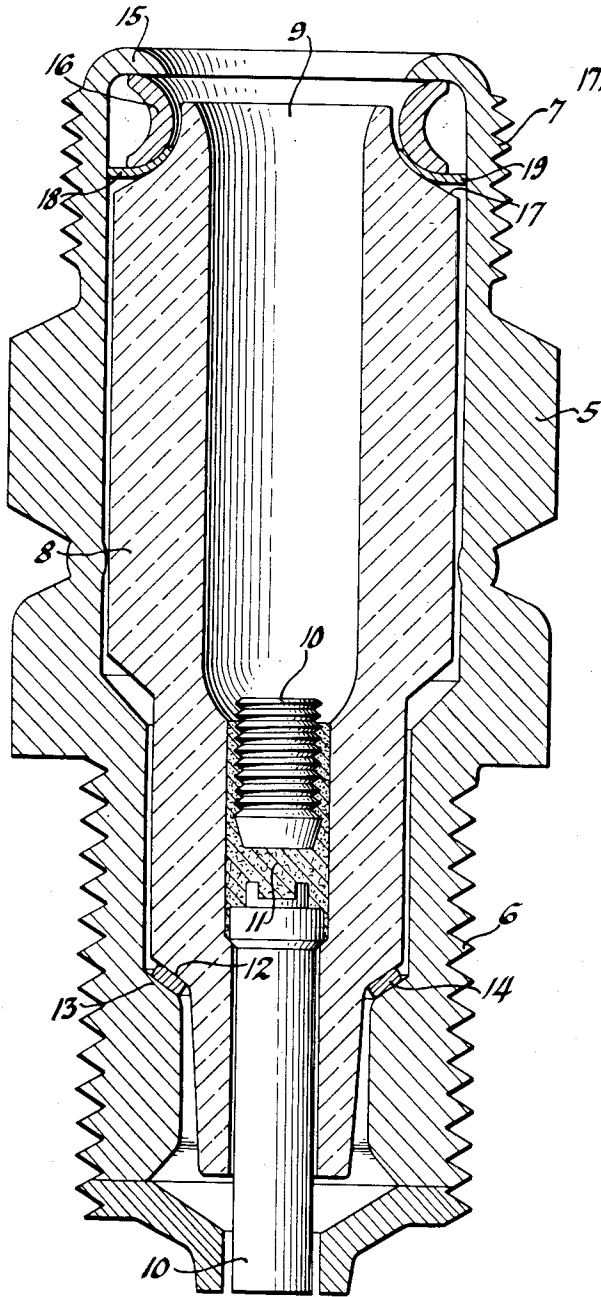


Fig. 1

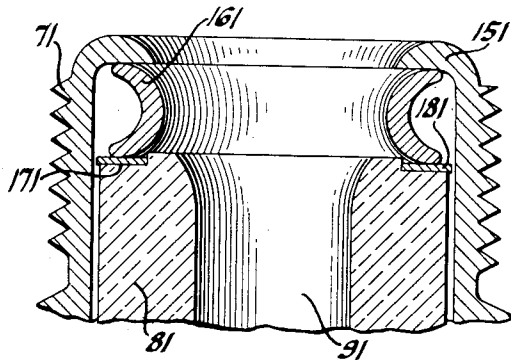


Fig. 4

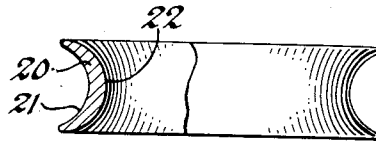


Fig. 3

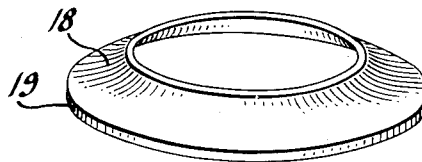


Fig. 2

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UNITED STATES PATENT OFFICE

2,350,475

SPARK PLUG

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Application July 6, 1942, Serial No. 449,896

6 Claims. (Cl. 123—169)

My invention relates to spark plugs designed to ignite successive charges of air and hydrocarbon supplied to and burned within the working cylinder of an internal combustion engine; and particularly to spark plugs adapted to be used with a conductor which supplies current to the central electrode of the plug and is enclosed in a metallic casing attached to the shell of the plug so as to be grounded to the engine through the shell; or used with a supply conductor which is not enclosed in a metallic casing secured to the shell in which case the supply conductor is connected with the plug and supplies current to the central electrode, but has no grounded metallic casing enclosing the same. The supply conductor whether enclosed in a grounded metallic casing or not is separate and independent of the plug itself; and the conductor and plug being independent of each other and made as separate devices or parts it follows that while the two must be used together in an engine ignition system, either may be replaced should it become necessary to do so without replacing the other. The spark plug unit comprises a hollow insulating member made, preferably, of ceramic material housed in its entirety within an outer metallic shell or casing threaded at its lower end to screw into an internally threaded opening in an internal combustion engine cylinder, and threaded at its upper end to facilitate the attachment thereto of a supply conductor which extends into the hollow insulating member aforesaid, and whereby current is supplied to the central insulated electrode of the plug; and which supply conductor may or may not be enclosed within an outer metallic casing which last named casing when used is secured to the casing of the plug, so as to be grounded to the engine.

The object of my invention, therefore, is to provide a spark plug and supply conductor combination wherein current may be supplied to the central electrode of the plug by a supply conductor such as is disclosed in my Patent No. 2,238,397, April 15, 1941, the same either having or not having an outer grounded metallic shield for enclosing the conductor whereby current is supplied to the central electrode of the plug; and wherein the plug part of the combination has features of construction and operation such as are hereinafter particularly referred to.

Referring now to the drawing accompanying and forming a part of this specification and wherein the preferred form of my invention is illustrated:

Figure 1 is a view showing a section upon a central plane of the spark plug part of my invention, the conductor whereby current is supplied to the insulated electrode thereof being omitted because it is substantially the same as the one disclosed in my patent above referred to.

Figure 2 is a perspective view showing an annular dished member for spacing the upper end of the insulating member shown in Figure 1 concentrically within the hollow shell of the plug.

Figure 3 is a view showing a cross-section of another form of annular holding member used as a part of my improved spark plug.

Figure 4 is a fragmentary view showing my invention modified as to certain of the features thereof.

Referring now to the drawing, the numeral 5 designates an integral hollow shell or casing cylindrical in form and threaded at its lower end, as indicated by the numeral 6, so as to screw into a threaded opening in an internal combustion engine cylinder; and threaded at upper end 7 to permit the attachment thereto of a supply conductor which, as explained, may or may not be enclosed within a metallic shield tube. If thus enclosed as in my patent hereinbefore referred to the shield which contains the supply conductor is secured to the shell as by a suitable gland nut and is thus grounded to the engine (the shell 5 being of metal) through the shell or casing of the plug, and the plug becomes one of the so-called "radio shielded" class; whereas if not provided with a metallic shield the supply conductor is secured to the shell by a suitable gland nut engaging the thread 7, and a packing (which need not be conductive) engaging the usual rubber or equivalent insulation of the supply conductor.

The shell or casing 5 contains an insulating member 8 which has a large internal chamber 9 which extends from the upper end of the plug downward into the insulating member, and a passage of lesser diameter extending from the chamber 9 downward and through the lower end of the insulating member and through which the insulated electrode 10 of the plug extends; this electrode being shown as comprising two metallic parts with an intervening conductive element 11 which provides a seal between the electrode and the interior of the passage through which it extends, substantially as disclosed in the patent to K. Schwartzwalder et al. 2,248,415, July 8, 1941. The insulating member 8 is wholly contained within the shell or casing of the plug, that is

neither of its ends projects beyond the ends of the casing 5; and when the plug is in use the supply conductor (not shown) extends into the internal chamber 9 and makes electrical contact with the upper end of the insulated electrode 10, which conductor is secured to the shell or casing of the plug as by a gland nut in threaded engagement with the threaded upper end 7 of the shell 5 as hereinbefore explained.

The lower portion of the insulating member 8 has an outer annular seat 12 which cooperates with a similar seat 13 within the casing to support said member, a suitable gasket 14 being used to secure gas-tightness between the parts; and the insulating member is held in place within the shell by flange 15 integral with the shell; and which flange is turned inward as shown and into engagement with the upper end of a C-shaped (in cross section) metallic member 16, which cooperates with an external annular shoulder 17 thereupon to hold the insulating member in place within the shell or casing of the plug.

The upper end of the insulating member 8 fits somewhat loosely within the casing 5; and the numeral 18 designates an annular spacing member made of any suitable metal, and which is preferably made dished in form as shown; or of disk form, initially, in which case it assumes a dished form when it is squeezed between the lower end of the member 16 and the shoulder 17 whereby it is supported, during the inturning of the holding flange 15 into engagement with the upper end of the holding member 16. The periphery 19 of this spacing member is forced into engagement with the interior of the upper end of the casing during the assembling of the parts, as aforesaid, and acts to position the upper end of the insulating member concentrically within the shell or casing as will be understood.

The annular metallic holding member 16 is shown as of a form which closely approximates the form of the equivalent holding member disclosed in my Patent No. 2,129,962, September 13, 1938. Figure 3, however, illustrates a holding member 20 which, because of its closer approximation (in cross-section) to a crescent shape, results in a somewhat more uniform distribution of fiber stress within and throughout the material of the holding member than is commonly present in the form of holding member disclosed in my said patent. In this other form of holding member (Figure 3) the upper and lower ends of said member (because they are less stiff than the middle part thereof) yield more readily than in the stiffer and more resistant form disclosed in said patent, because of increased flexibility of a crescent form; and more uniform tension stresses result in the outer part 21 of said member, and likewise more uniform compression stresses in the inner zone 22 of said member; these characteristics inherent in a crescent form of holding member being manifest by more uniform deformation of said member than commonly results in the use of a holding member not crescent-shaped in cross-section, such as is present in my patent above noted.

In the modified form of my invention illustrated in Fig. 4 the upper end of the shell of the spark plug is threaded externally, as at 71; and the numeral 81 designates the insulating member of the plug made of porcelain or equivalent material, this insulating member having an enlarged internal chamber 91 at its upper end the same as in the form of my invention herein described.

The C-shaped holding member 161 in this form

of my invention may be of crescent form in cross-section, as illustrated in Fig. 3, or the wall thereof may approach a more uniform thickness as in Fig. 1. The upper end of the insulating member 81, however, has a flat annular shoulder 171 instead of an inclined shoulder as in Fig. 1 which supports an annular washer 181; the periphery of which, however, does not extend to and engage the inner wall of the casing of the plug as in the form illustrated in Fig. 1. The C-shaped metallic member 161 in this form of my invention is held in place within and below the upper extremity of the shell to thereby retain the parts in assembled relation by an inturned holding flange 151 integral with the shell, the same as in the form of my invention hereinbefore described.

Having thus described and explained my invention I claim and desire to secure by Letters Patent:

1. In a spark plug of the class described, a hollow metallic shell or casing having externally threaded portions at both its ends; an internal annular supporting ledge within said shell; an insulating member within said shell and supported by said ledge and having an internal chamber within its upper portion, and an external annular shoulder adjacent its upper end; an annular spacing disc supported upon said shoulder and the outer edge of which extends to and contacts with the interior of said shell; an annular holding member within said shell and surrounding the upper extremity of said insulation member, and which holding member rests upon the spacing disc aforesaid; means at the upper end of said shell and overlaying the upper end of said holding member for holding said several parts in assembled relation with one another; and an insulated electrode extending from the lower end of the internal chamber aforesaid downward through a passage in the lower portion of said insulating member.

2. In a spark plug of the class described, a hollow metallic shell or casing having externally threaded portions at both its ends; an internal annular supporting ledge within said shell; an insulating member within said shell and supported by said ledge and having an internal chamber within its upper portion, and an external annular shoulder adjacent its upper end; an annular spacing disc of dished form supported upon said shoulder and the periphery of which contacts with the interior of said shell; an annular holding member C-shaped in cross-section within said shell and surrounding the upper extremity of said insulation member, and which holding member rests upon the spacing disc aforesaid; an inwardly extending flange integral with, and which overlays the upper end of said holding member to thereby hold said several parts in assembled relation with one another; and an insulated electrode extending from the lower end of the internal chamber aforesaid downward through a passage in the lower portion of said insulating member.

3. In a spark plug of the class described, a hollow metallic shell or casing having an integral annular supporting ledge adjacent its lower end; an insulating member within said shell and supported by said ledge and having an external annular shoulder adjacent its upper end; means supported upon said shoulder and contacting the shell for spacing the upper end of said insulating member concentrically within said shell; an an-

nular holding member crescent-shaped in cross-section associated with said annular shoulder and surrounding the upper end of said insulating member; means at the upper end of said shell for holding said several parts in assembled relation with one another; and a central electrode within a passage provided for it in said insulating member.

4. In a spark plug of the class described, a hollow metallic shell or casing having an internal annular supporting ledge adjacent its lower end; an insulating member within said shell and supported by said ledge and having an external annular shoulder adjacent its upper end; an annular holding member crescent-shaped in cross-section associated with said annular shoulder and surrounding the upper end of said insulating member; an inwardly extending flange integral with the upper end of said casing and which flange overlays the upper end of said annular holding member and serves to hold the parts aforesaid in assembled relation with one another; and a central electrode within a passage provided for it in said insulating member.

5. In a spark plug, a shell with an annular

internal shoulder at a distance from its outer end, an electrode-carrying insulator which is reduced in diameter from a point at a distance from its inner end disposed within the shell and seated on the annular internal shoulder on the shell, an annular member which encircles the portion of the insulator which is reduced in diameter and contacts the insulator and the side wall of the shell to center the insulator in the shell, and annular means to hold the insulator in place in the shell seated on the annular member.

6. In a spark plug, a shell with an annular internal shoulder at a distance from its outer end, an electrode-carrying insulator which is concavely tapered to a smaller diameter from a point at a distance from its inner end disposed within the shell and seated on the annular internal shoulder on the shell, an annular member which is seated on the taper at a distance from the inner end of the insulator and contacts the side wall of the shell to center the insulator in the shell, and annular means to hold the insulator in place in the shell seated on the annular member.

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