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SPARK PLUG WIRE TERMINAL

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Fig.1

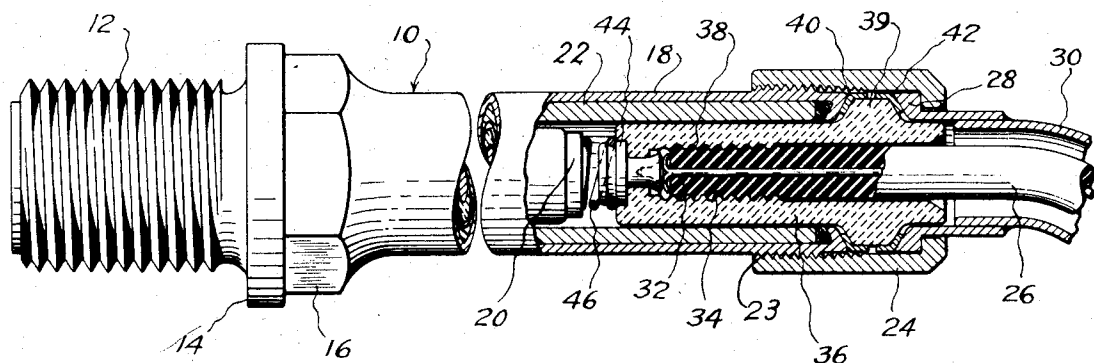


Fig.2

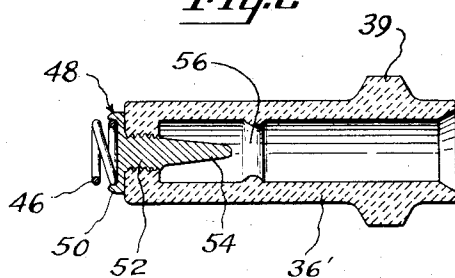
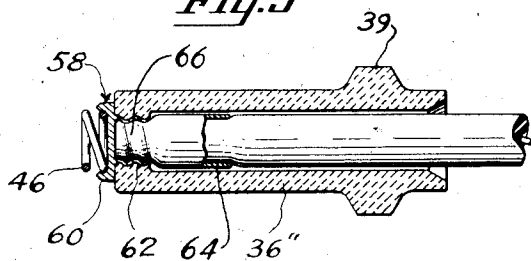


Fig.3



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SPARK PLUG WIRE TERMINAL

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4 Claims. (Cl. 173—269)

This invention relates to improvements in ignition devices for internal combustion engines and has particular reference to an improved connection between a spark plug and an ignition cable harness.

An object of the invention resides in the provision of a spark plug and ignition cable union, providing a moisture proof and gas proof connection between the ignition cable and the spark plug.

A further object resides in the provision of an improved union for connecting an ignition cable to a spark plug which union includes a ceramic insulating body to provide improved electrical insulation around the connection between the cable end and the end of the spark plug electrode.

A somewhat more specific object resides in the provision of an improved cable union for a shielded spark plug of the type ordinarily used in aircraft engines which improved union provides a secure anchorage for the cable end, an improved moisture and gas seal, and improved electrical insulation for the connection between the cable and the spark plug electrode and will prevent the leakage of gas into the cable end or the cable armor.

Other objects and advantages will be more particularly pointed out hereinafter or will become apparent as the description proceeds.

In the accompanying drawing in which like reference numerals are used to designate similar parts throughout, there is illustrated in three slightly modified forms a suitable mechanical embodiment for the purpose of disclosing the invention. The drawing, however, is for the purpose of illustration only and is not to be taken as limiting or restricting the invention since it will be apparent to those skilled in the art that various changes in the illustrated construction may be resorted to without in any way exceeding the scope of the invention.

In the drawing,

Fig. 1 is an elevational view of an internal-combustion engine spark plug a portion thereof being broken away and shown in section to illustrate the improved ignition cable union associated therewith.

Fig. 2 is a longitudinal sectional view of a somewhat modified form of insulator for the ignition cable union, and

Fig. 3 is a longitudinal sectional view similar to Fig. 2 but showing a still further modified form of insulating member.

Referring to the drawing in detail, the spark

plug generally indicated at 10, has a threaded portion 12 adapted to be threaded into an internally threaded spark plug aperture in an engine cylinder. This threaded portion is terminated by an annular shoulder 14 located adjacent to a polygonal wrench receiving portion 16. The wrench receiving portion 16 is extended outwardly on the side of the shoulder 14 opposite the thread 12 to provide a metallic shielding cylinder 18 within which is disposed the spark plug core including the metal electrode 20 and the insulating sleeve 22 dielectrically separating the electrode from the outer portion or casing of the spark plug.

At its end opposite the thread 12 the cylindrical member 18 is provided with external screw threads 23 for the reception of screw threads provided internally of a union nut 24 adapted to secure a fitting for the end of the cable 26 within the open end of the shield 18, and to secure the end flange 28 on the cable armor 30 to the end of the spark plug.

The ignition cable 26 may comprise a braided wire 32 encased in a relatively thick walled tube 34 of rubber or some other suitable flexible insulating material. In the arrangement illustrated the end of the cable 26 is forced into a hollow ceramic body 36 provided with internal screw threads 38 which engage the surface of the insulating tube 34 to secure the cable ends firmly in the insulating body. This hollow body is provided with an annular shoulder 39 which is disposed between the intumed end of the cylindrical shield 18 and the flange 28 on the end of the cable armor 30 and is securely clamped in position between the shield and the cable armor by the nut 24 screw threaded upon the end of the shield so that the insulating body is held rigidly in the end of the spark plug and the cable armor is also rigidly secured to the spark plug. If desired suitable gasket members, as indicated at 40 and 42, may be disposed around the shoulder 39 to provide a moisture and gas proof seal between the member 36 and the shield 18 and cable armor 30.

The member 36 has a closed end adjacent the outer end of the electrode 20 and through this closed end there extends a metal current conducting member 44 the inner end of which is especially designed to provide a good contact with the exposed end of the wire 32 at the end of the ignition cable 26. The outer end of this member 44 carries, by one end, a coiled spring 46, the other end of which bears against the outer end of the electrode 20 to provide an electrical

connection between the member 44 and the electrode.

In the form of the device shown in Fig. 1 the inner end of the member 44 extends within the end of the cavity in the member 36 and the end of the braided wire 32 extends over the end of the insulating tube 34. When the ignition cable is forced into the member 36 and threaded down upon the screw threads 38 the end of the wire 32 is brought into firm contact with the adjacent end of the member 44 and securely held in that position.

The member 36 has a close fit with the bore of the insulating member 22 and is rigidly held in position relative to the spark plug by the nut 24 thus providing a firm support for the end of the ignition cable 26. The member 36 is formed of a strong, highly impermeable ceramic material of good dielectric properties so that it simultaneously provides excellent electric insulation for the exposed end of the cable wire 32 and the conductor 44 and, at the same time, prevents the infiltration of moisture into the spark plug. This member has a further advantage in that it does not deteriorate if exposed to exhaust gases or the condensation product thereof and is not deteriorated by high temperatures or temperature changes.

The element 44 is firmly secured in the end of the member 36 as by providing the element 44 with a flat head portion which bears against the outer surface of the end of the member 36 and expanding the end of the element 44 which projects within the member 36. This construction provides a gas tight joint between the element 44 and the member which prevents any gas from the engine cylinder leaking through the spark plug from entering the member 36 to the ignition cable or to the joint between the ignition cable and the element 44 and which also, in combination with the gas tight joint between the shoulder 39 and the end of the shield 18, prevents the leakage of any engine gas into the space between the ignition cable and its armor 30.

In the modification shown in Fig. 2 the member 36' is substantially the same as the member 36 shown in Fig. 1 except that the connector 48 is of a somewhat different form. In this modified arrangement a member formed of brass or some other suitable metal, is provided with a head portion 50, an intermediate externally screw threaded portion 52 threaded into an aperture provided in the closed end of the member 36' and with a tapered end portion 54 projecting into the hollow interior of the member 36' and adapted to project into the insulating tube of the ignition cable into contact with the ignition wire contained in this tube. The interior of the member 36' adjacent to the tapered end 54 of the member 48 may be provided with an internal protuberance 56 which will engage the ignition cable as the end of the ignition cable is expanded upon being forced over the portion 54 of the connecting member 48 to secure the ignition cable in the body 36'. The connecting spring 46 may be secured to the head end of the member 48 by suitable means such as by securing the end of the spring within an annular flange provided on the external surface of the head. In this case also the member 48 has a gas tight connection with the member 36' and the member 36' is provided with an annular shoulder 39 similar to that shown in Fig. 1.

In the modification shown in Fig. 3 the ceramic member 36'' is also similar to the member 36

shown in Fig. 1 but a still different type of connector is utilized to provide an electrical connection between the end of the ignition cable and the adjacent end of the spark plug electrode. In this case a member 58, which also may be formed of brass or some suitable metal, is provided with a head portion 60 to which is integrally secured a concentric cylindrical member 62 provided with external and internal screw threads. This member 62 is screw-threaded into the closed end of the body 36'' and makes a gas tight connection with this member and the end of the ignition cable is provided with a ferrule 64 having a screw-threaded portion 66 which is threaded into this cylindrical portion. The spring 46 may be secured to the head 60 in the manner indicated above in connection with Fig. 2 and the insulating body 36'' is provided with an annular shoulder 39 by means of which the body may be securely clamped in position in the open end of the spark plug shield to provide a gas tight joint between the body and the end of the shield.

While a suitable mechanical embodiment in three slightly different forms has been hereinabove described and illustrated in the accompanying drawing for the purpose of disclosing the invention, it is to be understood that the invention is not limited to the particular embodiment so illustrated and described, but that such changes in the size, shape and arrangement of the various elements and of the materials of which they are formed may be resorted to as come within the scope of the sub-joined claims.

Having now described the invention so that others skilled in the art may clearly understand the same, what is desired to secure by Letters Patent is as follows:

1. In an electrical connection between a spark plug and an ignition cable having an insulated electrical conductor, a sheath surrounding said conductor, an insulating sleeve receiving said insulated conductor through one end thereof, a metal plug sealing the other end of said sleeve, means including an electrode for said spark plug, said means being in abutting relationship with said plug for electrically connecting said plug and electrode, a casing connected to said spark plug, an annular flange integral with said sleeve clamped between said casing and said sheath to form a gas tight closure for said casing and maintaining said electrical connection between said metal plug and said spark plug electrode, and means for retaining said insulated conductor in said insulating sleeve with the conductor in compressive electrical contact with said metal plug, whereby said electrical connection between said conductor and said metal plug is maintained free of mechanical separating forces and from the effects of exposure to the atmosphere or gases leaking through said spark plug.

2. In an electrical connection between a spark plug having a gas tight casing and an ignition cable having an insulated conductor and a sheath surrounding said conductor, an integral insulating sleeve for sealing said casing and securing said cable to said spark plug, said sleeve having an annular flange adapted to be clamped in gas tight engagement between said casing and said sheath, a metal plug for closing one end of said insulating sleeve and electrically connecting said cable and said spark plug, and clamping means in said sleeve for retaining said insulated cable in said sleeve and in electrical contact with said metal plug, said metal plug being in the form of a rivet having a head portion disposed against the

outer surface of the closed end of said sleeve and a stem portion extending through said closed end and expanded within said sleeve.

3. In an electrical connection between a spark plug having a gas tight casing and an ignition cable having an insulated conductor and a sheath surrounding said conductor, an integral insulating sleeve for sealing said casing and securing said cable to said spark plug, said sleeve having an annular flange adapted to be clamped in gas tight engagement between said casing and said sheath, a metal plug for closing one end of said insulating sleeve and electrically connecting said cable and said spark plug, and clamping means in said sleeve for retaining said insulated cable in said sleeve and in electrical contact with said metal plug, said metal plug being in the form of a pin having a flat head portion disposed against the outer surface of the closed end of said sleeve, an intermediate screw threaded portion threaded through the closed end of said sleeve, and a tapered portion within said sleeve.

4. In an electrical connection between a spark plug having a gas tight casing and an ignition cable having an insulated conductor and a sheath surrounding said conductor, an integral insulating sleeve for sealing said casing and securing said cable to said spark plug, said sleeve having an annular flange adapted to be clamped in gas tight engagement between said casing and said sheath, a metal plug for closing one end of said insulating sleeve and electrically connecting said cable and said spark plug, and clamping means in said sleeve for retaining said insulated cable in said sleeve and in electrical contact with said metal plug, said metal plug being in the form of a screw having a flat head portion disposed against the outer surface of the closed end of said sleeve, and a hollow stem portion having external and internal screw threads threaded through the closed end of said sleeve and adapted to receive a threaded ferrule on the end of said ignition cable.

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