

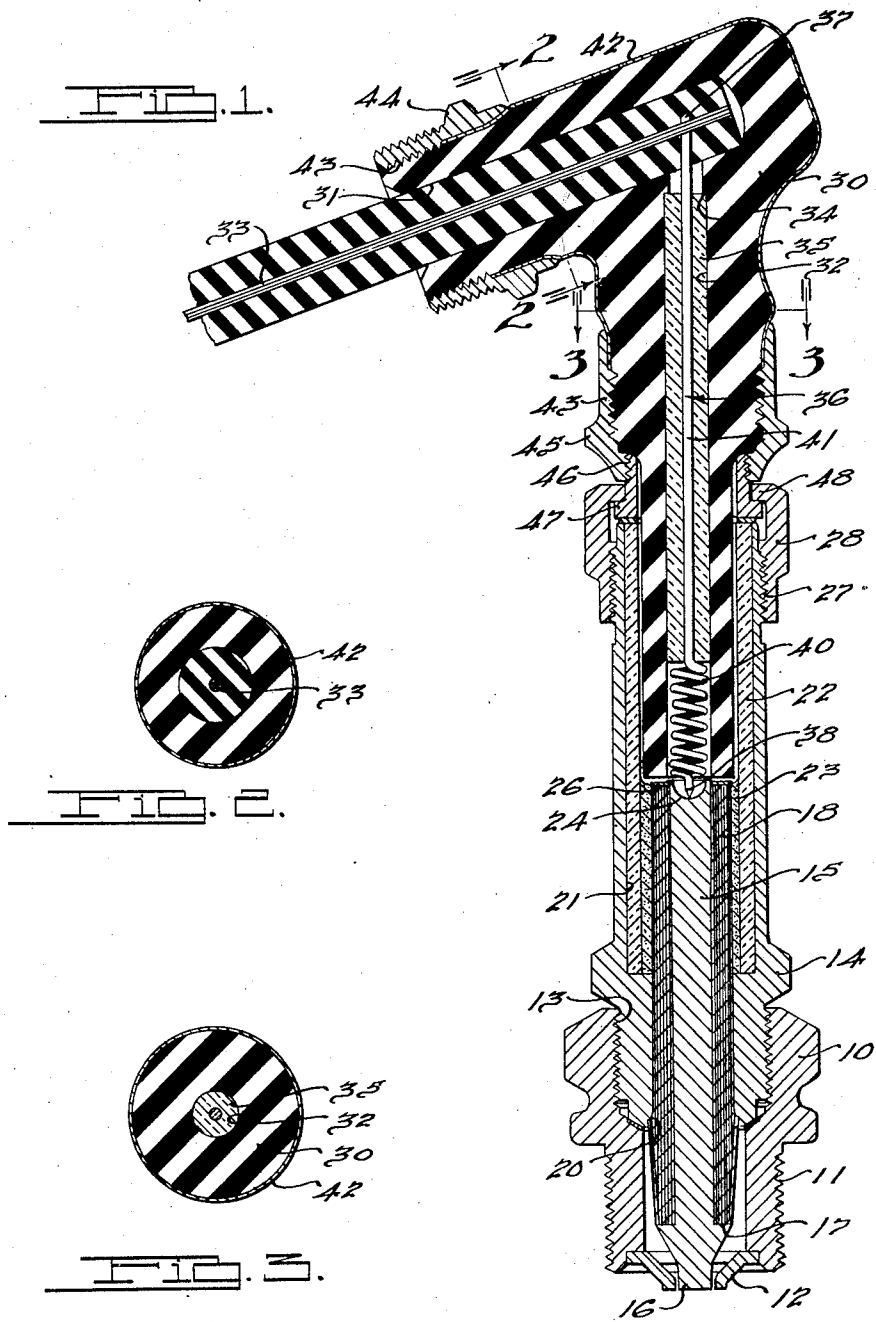
May 16, 1944.

T. W. MILTON

2,348,919

METHOD OF MAKING SHIELDED SPARK PLUG CONNECTORS

Filed April 6, 1942



INVENTOR
Thomas W. Milton
BY
Errett G. Wright
ATTORNEY

UNITED STATES PATENT OFFICE

2,348,919

METHOD OF MAKING SHIELDED SPARK
PLUG CONNECTORS

Thomas W. Milton, Detroit, Mich., assignor to
The Flex-O-Tube Company, a corporation of
Delaware

Application April 6, 1942, Serial No. 437,746

4 Claims. (Cl. 29—155.5)

This invention relates to ignition devices for internal combustion engines and more especially to shielded spark plug connectors for aircraft engines.

The principal object of the invention is to improve the art of spark plug connectors.

Another object is to provide a spark plug connector in which the number of electrical joints or connections is held to a minimum.

Another object is to provide in a spark plug connector a contact element which insures intimate contact with both a spark plug and the ignition conductor leading thereto and includes a yieldable portion for securing and maintaining such intimate contact irrespective of elongation or contraction of the spark plug and connector elements incident to a wide variation of temperature conditions encountered in practice.

A further object is to provide a spark plug connector including such a yieldable element and means for preventing the portion which makes contact with the ignition lead conductor from puncturing the latter and its insulation to such an extent that it will then puncture the connector body and cause electrical leakage or short circuiting.

Another object is to provide a spark plug connector with a radio shielding envelope which has no mechanical functions, in other words, the insulating body of the connector mechanically carries the load of connection to the spark plug and to the ignition lead shielding.

A further object is to provide a spark plug connector by a method which involves first moulding the insulating body, then plating the radio shielding thereon, then securing shield connections or connection elements to the body, and then completing the electrical path between such connection elements and the shielding for such connector body.

For the purpose of illustrating the genus of the invention, a typical embodiment is depicted in the accompanying drawing, in which:

Fig. 1 is a central vertical section taken through a spark plug, a connector therefor, and a portion of an ignition conductor which leads into such connector.

Figs. 2 and 3 are transverse sections taken through the connector substantially on the line 2—2 and 3—3 of Fig. 1.

Referring to the drawing, the spark plug comprises a body shell 10, threaded externally as indicated at 11 for engagement with an appropriate opening in a cylinder wall. The outer end

of the shell 10 is provided with an electrode piece 12 and the inner end of the shell is internally threaded as indicated at 13 to receive the lower end of a retaining sleeve 14.

Disposed within the lower half of the retaining sleeve 14 and within the shell 10 is a center electrode 15 having a tip 16 formed with a shoulder 17. Disposed about the electrode 15 is a mica or like tube 18 provided with a shoulder 20 adapted to cooperate with the lower end of retaining sleeve 14. The retaining sleeve 14 is internally recessed or cored out throughout the major portion of its length beginning from its upper or inner end as indicated at 21 to receive a ceramic insulating sleeve 22 which is cemented to the mica tube 18 by a layer of heat resistant cement 23. The upper end of the electrode 15 is provided with a partially spherical depression 24 and the metal at the extremity of electrode 15 adjacent such depression is swaged over a washer 26 disposed at the upper end of the mica tube 18 to fix the parts of the plug in assembled relationship. The upper end of the retaining sleeve 14 is externally threaded, as indicated at 27, to receive a spark plug nut 28.

The spark plug connector comprises a moulded plastic elbow 30 formed under conditions most favorable to moulding operations so that the elbow will have of itself the requisite mechanical strength. The elbow body 30 is provided with bores 31 and 32 intersecting at a suitable desired angle as illustrated in Fig. 1, the bore 31 being adapted to receive an ignition lead 33 and the bore 32 to receive up to a shoulder 34 a ceramic insulator and spring guide 35.

A contact spring 36, preferably of a copper beryllium alloy, as pointed in 37 and 38, the end 37 being adapted to pierce the insulation of ignition lead 33 and point 38 being adapted to make positive contact with the upper end of electrode 15 within the partially spherical depression 24. The contact spring element 36 is further provided with a number of active coils 40 disposed between the lower end of the ceramic insulator 35 and the upper end of the center electrode 15 so that with the elbow 30 in assembled relation with respect to the spark plug, these coils remain in compressed condition and force a straight portion 41 disposed within the ceramic insulator 35 upwardly so that the point 37 of this straight portion just pierces the conducting wires of ignition lead 33 without projecting through the insulating layer of lead 33 which lies above the conducting wire thereof. It is noted that the insulating element 35 abuts

shoulder 34 of the elbow body 30 so that point 37 cannot be driven upwardly so as to puncture the insulation of lead wire 33 which lies above the conducting wires and cannot puncture the plastic material of elbow 30 above the ignition lead. In this manner the spring contact wire 36 provides for positive contact with both the conductors of the ignition lead and the center electrode of the spark plug while holding the electrical joints to a minimum of two.

The plastic elbow 30 is electroplated as indicated at 42 for radio shielding purposes, and this plating is preferably copper of a thickness of about four thousandths which is then tin plated to a thickness of from one to one and one-half thousandths in thickness. Threads 43 are provided at the ends of the ignition wire and spark plug branches of elbow 30 and fittings 44 and 45 are threaded thereon. The fittings 44 and 45 are anchored to the plated radio shielding 42 by first cleaning the portion of the radio shielding which is to be covered by portions of the fittings 44 and 45, then wrapping the ends of the shielding with a flux solder foil, then threading the fittings onto the elbow until the solder foil is compressed between the fittings and the radio shielding, then crimping the fittings centrally at the foil, and then completing the soldering by localized heat.

It is noted that the lower end of the fitting 45 is internally threaded as indicated at 46 to receive a flanged bushing 47 with an intumed flange 48 of spark plug nut 28 arranged on the bushing between its flange and the lower end of fitting 45. The threaded connection between the fitting 45 and the flanged bushing 47 is preferably soldered or brazed to prevent disconnection of these parts. The fittings 44, 45, electroplated shield 42, bushing 47, spark plug nut 28, retaining sleeve 14 and spark plug body 10 provide a complete radio shielding over the spark plug connector and spark plug, such shielding being grounded to the spark plug body 10.

As many changes may be made in the above described construction and many apparently widely different embodiments of this invention could be had without departing from the spirit and scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. The method of making a radio shielded spark plug connector body which consists in molding a plastic body having ignition wire and spark plug branches, then electroplating said body, forming threads in the plastic body free end portions of said ignition wire and spark plug branches, threading fittings on said threaded branch ends of said plastic body with solder interposed between the fittings and the plating on said body, inwardly compressing the fittings at points over the solder, and completing the soldering by local applications of heat.

2. In the manufacture of a radio shielded spark plug connector body, the steps of molding a body of non-metallic plastic material of the desired size, shape and contour, applying an enveloping metallic coating to the exterior surfaces of said body by an electro-plating process, forming threads in said material at an end of said body, threading a metallic threaded connector member on said threaded end of said body, then metallurgically bonding said metallic connector member to said coating, and mechanically interlocking said connector to said body.

3. In the manufacture of a radio shielded spark plug connector body, the steps of molding a non-metallic plastic material to the desired size, shape and contour of the desired body, subjecting said body to an electro-plating process whereby to apply an enveloping metallic coating to the exterior surfaces thereof, forming threads in said material on an end of said body, threading a metallic threaded connection exteriorly on said end of said body, securing said threaded connection against relative rotation on said body, and then bonding said threaded connection to said coating.

4. In the manufacture of a radio shielded spark plug connector body, the steps of molding a plastic non-metallic material to substantially the desired size, shape and contour of the finished body, applying an enveloping metallic coating to the exterior surface of said body by an electro-plating operation, forming threads in said material at each end of said body, applying a threaded connector exteriorly to the threads at each said end of said body, inter-locking said threaded connectors to said body to prevent relative rotation between them, and metallurgically bonding said threaded connectors to said coating.

THOMAS W. MILTON.