

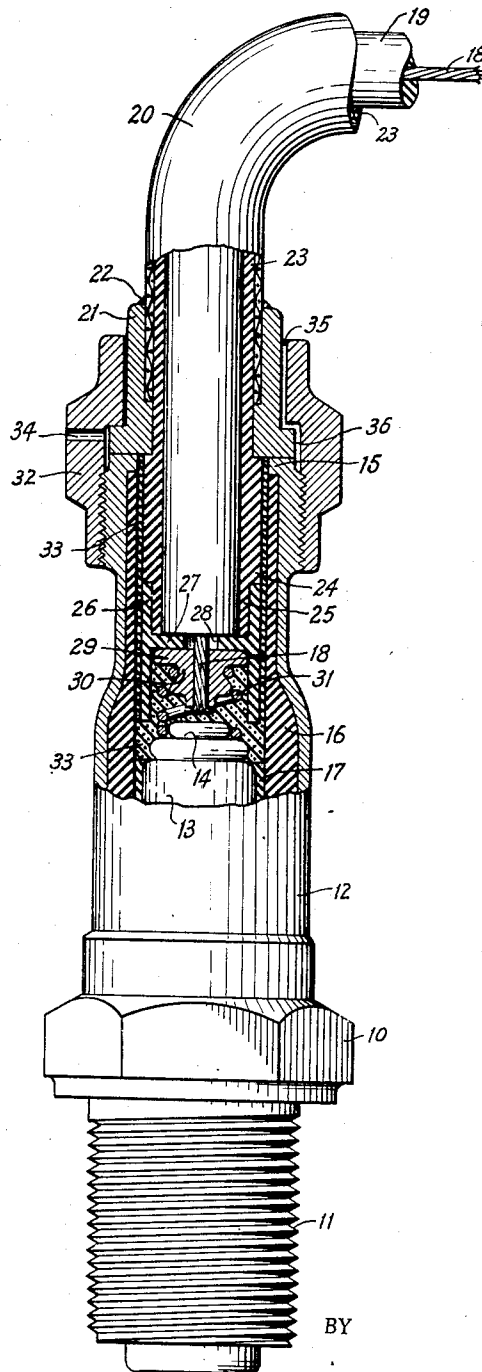
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RADIO SHIELDED IGNITION MEANS

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RADIO SHIELDED IGNITION MEANS

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This invention relates to ignition apparatus for internal combustion engines and more particularly to radio-shielded spark plugs and shielded conductors connected therewith.

One of the objects of the present invention is to provide a novel moisture-proof and flash-over proof radio-shielded spark plug assembly for internal combustion engines.

Another object of the invention is to provide a radio-shielded spark plug having means incorporated therein in a novel manner whereby a moisture tight seal is effected between said plug and the shielded ignition conductor connected therewith.

Another object is to provide a novel radio-shielded spark plug having flowable means incorporated therein whereby variations in the diameter of the ignition conductor and in the bore of said plug are automatically compensated for and a moisture tight seal between said plug and connector is assured.

A further object is to provide a radio-shielded spark plug having means incorporated therein in a novel manner whereby the danger of flashovers from the center electrode of said plug or the supply conductor therefor to a grounded part thereof is eliminated.

A still further object is to provide a novel radio-shielded spark plug having flowable means incorporated therein which not only insures a moisture tight seal between said plug and the ignition conductor and prevents flashovers in said plug, but also assists in preventing the entry of gases from the combustion chamber of the engine cylinder into the spark plug well, through and around the center electrode assembly.

Another object is to provide a radio-shielded spark plug and shielded ignition conductor assembly embodying a plastic insulating material for completely filling the space between a part of said conductor and a surrounding part of said spark plug, and having means of novel construction for attaching said conductor to said spark plug and providing an outlet for any excess plastic material upon assembly of said plug and conductor.

Another object is to provide novel means which may be incorporated in existing radio-shielded spark plugs without altering the construction or other characteristics thereof to render the same moisture proof and to prevent flashovers therein.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying

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drawing. It is to be expressly understood, however, that the drawing is for the purpose of illustration only and is not intended as a definition of the limits of the invention, reference for this latter purpose being had primarily to the appended claims.

In the drawing, the single figure illustrates a radio-shielded spark plug and shielded ignition conductor assembly embodying the present invention, with portions thereof broken away and other portions in section for purposes of clearer illustration.

The invention is illustrated in the drawing, by way of example, as being embodied in a radio-shielded spark plug assembly of the general type used in present day aircraft type engines. As shown, the spark plug comprises a tubular metallic shell 10 provided with external threads 11 for threaded engagement with an opening in an engine cylinder (not shown). Extending upwardly from shell 10 is a tubular metallic shielding barrel 12 which may be formed integrally with said shell or secured to the latter in any suitable manner. Mounted in a well-known manner centrally in shell 10 and barrel 12 is a center electrode assembly comprising an insulator 13 made of ceramic, aluminum oxide or like materials, and a center electrode 14 extending through and projecting beyond opposite ends of said insulator.

Lining the under wall of barrel 12 and extending upwardly therealong into engagement with an internal annular flange 15 on said barrel is a ceramic or the like insulating sleeve 16. The annular space between insulator 13 and insulating sleeve 16 is preferably filled by a suitable solid insulating compound 17 of any suitable known composition.

The shielded ignition conductor for connecting the spark plug with a source of high tension electrical current comprises a lead 18 of suitable wire surrounded by an insulating cover 19. Surrounding insulated cable 18, 19, for the most part thereof, is a flexible metallic conduit 20. The latter may be covered by a covering of insulating material if so desired. Engaged over the end of shielding conduit 20 is a rigid externally flanged metallic ferrule 21 through which cable 18, 19 extends, said ferrule and conduit being soldered or otherwise connected together, as indicated at 22, to mechanically and electrically connect the same. Shielded conductor 18, 19 is filled with a suitable flexible insulating compound 23 which is placed therein in liquid form and solidified in a manner well understood in the art, such as by

chemical reaction or vulcanization. In molding filler 23, the latter is extended through ferrule 21 so as to surround the projecting free portion of conductor 18, 19, and is formed exteriorly of said ferrule with an enlarged cylindrical portion 24 terminating in a reduced cylindrical portion 25. The diameter of the portion 24 of filler 23 is slightly less than the diameter of the bore of flange 15 and of the bore of insulating sleeve 16 to facilitate inserting said molded filler and the conductor 18, 19 into barrel 12. Engaged over the reduced end 25 of filler 23 is a ceramic or like insulating sleeve 26 formed intermediate its ends with an internal flange 27 forming a central opening 28 through which lead 18 extends. Engaged over the projecting end of lead 18 and disposed within sleeve 26 is a button 29 formed of a suitable electrically conductive material and provided with a reduced neck portion 30 to receive one end of a compression coil spring 31 which is made from a suitable electrically conductive material. Button 29 is electrically connected to lead 18 by spreading the ends of said lead and applying a drop of solder over said ends.

In connecting shielded conductor 18, 19 to the spark plug, the projecting end of said conductor, together with the exposed spacing sleeve 24, 25, sleeve 26, button 29 and spring 31, are inserted in the spark plug well or bore of barrel 12 until ferrule 21 engages the upper end of said barrel, whereupon the opposite free end of spring 31 will be engaged with the center electrode 14, and said spring will be placed under compression, thereby electrically connecting lead 18 with center electrode 14 through button 29 and spring 31. Thereupon an internally flanged nut 32 is threaded on the threaded upper end of barrel 12, and through cooperation of said nut with the external flange of ferrule 21, the conductor 18, 19 is firmly attached to the spark plug, and the shielding conduit 20 is electrically connected with barrel 12.

With the construction thus far described, much difficulty has been experienced in preventing flash-overs from spring 31 or terminal 14 to a grounded portion of the spark plug along a path between insulating sleeve 16 and the enlarged portion 24 of filler 23 or equivalent spacing means. Flashovers of this character are facilitated by the accumulation of moisture on the adjacent surfaces of sleeve 16 and filler 23 caused by natural conditions, condensation and leakage through the attaching ferrule 21 and nut 32. The present invention comprehends means incorporated in the above described assembly in a novel manner for obviating the accumulation of moisture on said parts and to prevent flashovers of the above nature without altering the other characteristics and advantages of the shielded spark plug or parts thereof, said means providing a moisture-tight seal between the insulating sleeve 16 and filler portion 24, and between the engaging surfaces of ferrule 21 and barrel 12, and, in addition, assisting in preventing gases from getting into the spark plug well through and around the center electrode assembly from the combustion chamber of the engine cylinder.

As shown, said means are constituted by a non-hardening insulating filling compound 33 which is in a soft plastic-like state, as, for example, heavy polymerized castor oil or linseed oil mixed with powdered mica, asbestos, rubber, or the like. The filling compound 33 is introduced into the spark plug well or bore of barrel 12 and over the exposed surfaces of the insulator 13, center elec-

trode 14 and filler 17, through the upper open end of said barrel prior to inserting the cable 18, 19 therein as above described. Preferably a quantity of filling compound 33 is used which will substantially half fill the bore of barrel 12.

When the cable 18, 19 and spacer sleeve 24, 26 are inserted in the spark plug well or bore of barrel 12 as hereinbefore described, the quantity of compound 33 displaced by said cable is caused to flow upwardly between said sleeve and insulating sleeve 16 and out through the open end of said barrel, thereby filling the entire space in the spark plug well around sleeve 24, 26. Thus, a moisture proof and insulating seal is effected between the sleeve 24, 26 and liner 16 which eliminates flashovers from spring 31 or terminal 14 to a grounded portion of the spark plug along a path between said sleeves and cable. Since the compound 33 also covers the exposed ends of insulator 13 and filler 17, said compound also assists in preventing gases from getting into the spark plug well through and around the center electrode assembly from the combustion chamber of the engine cylinder. To provide an outlet for the excess quantity of compound 33 upon tightening of nut 32, the latter may be formed with an outlet port or opening 34 extending radially through the body thereof, or with a vertically extending groove 35 which communicates with the annular space 36 surrounding ferrule 21 and opens outwardly through the upper end of said nut. Thus, as nut 32 is screwed home to press ferrule 21 into sealing engagement with the upper end of barrel 12 any excess compound 33 will be squeezed out of the spark plug well without exerting any undue pressure on the enclosed parts. Also, this construction insures complete filling of the space in barrel 12 by compound 33, thereby leaving no space for gases and moisture.

There is thus provided a novel moisture-proof and flash-over proof radio-shielded spark plug assembly for internal combustion engines. The novel moisture-tight seal producing and flash-over preventing means compensates for irregularities in the size of associated parts of the spark plug due to manufacture or other causes, it permits greater tolerances in manufacturing said parts, and may be employed in existing radio-shielded spark plugs without altering the construction or other characteristics and advantages of said plugs or parts thereof.

While only a single embodiment of the present invention is illustrated and described in detail, it is to be expressly understood that the same is not limited thereto. Various changes, such as in the design and arrangement of the parts illustrated and in the materials used, may be made without departing from the spirit and scope of the invention as will now be apparent to those skilled in the art. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. In apparatus of the class described, a radio-shielded spark plug comprising a tubular metallic shielding barrel, an insulating sleeve lining said barrel, an insulated conductor extending loosely into said barrel a shielding conduit surrounding said conductor exteriorly of said barrel, a non-hardening plastic insulating material completely filling the space between said sleeve and the portion of said conductor disposed within said barrel, a flanged member connected with said shielding conduit and adapted to engage the upper surface of said barrel, and nut means engaged with said member and threaded on said barrel

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for securing said member to said barrel, said nut means having an opening extending there-through and communicating with the interior of said barrel during assembly before said member engages said barrel to provide an outlet for any excess plastic material during tightening of said nut means.

2. In apparatus of the class described, a radio-shielded spark plug comprising a tubular metallic shielding barrel, an insulating sleeve lining said barrel, an insulated conductor extending loosely into said barrel, a shielding conduit surrounding said conductor exteriorly of said barrel, a non-hardening plastic insulating material completely filling the space between said sleeve and the portion of said conductor disposed within said barrel, a flanged member connected with said shielding conduit and adapted to engage the upper surface of said barrel, and nut means engaged with said member and threaded on said barrel for securing said member to said barrel, said nut means having a passage opening outwardly through the upper end thereof and communicating with the interior of said barrel during assembly before said member engages said barrel to provide an outlet for any excess plastic material during tightening of said nut means.

3. In apparatus of the class described, a shielding barrel for an electrical conductor, a shielding conduit having a conductor projecting therefrom into said barrel for electrical connection with said first named conductor, and means for detachably connecting said barrel and conduit to hold the ends of the latter in abutting relation, said means including a nut threadedly engaging said

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barrel and having an internal flange engaging an external flange on said conduit, said nut having an opening therein to permit the escape of fluid material from said barrel until said conduit and barrel are moved into engagement by said nut.

4. In apparatus of the class described, a shielding barrel for an electrical conductor, a shielding conduit having a conductor projecting therefrom into said barrel for electrical connections with said first named conductor, and means for detachably connecting said barrel and conduit to hold the ends of the latter in abutting relation, said means including a nut threadedly engaging said barrel and having an internal flange engaging an external flange on said conduit, said nut and conduit cooperating to permit the escape of fluid material from said barrel until said conduit and barrel are moved into engagement by said nut.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,958,580	Kasarjian	May 15, 1934
2,136,497	Finnegan et al.	Nov. 15, 1938
2,258,810	Rabazzana	Oct. 14, 1941
2,278,448	Ingalls	Apr. 7, 1942
2,356,104	Tognola	Aug. 15, 1944
2,399,402	Spengler	Apr. 30, 1946
2,428,608	Bass	Oct. 7, 1947