

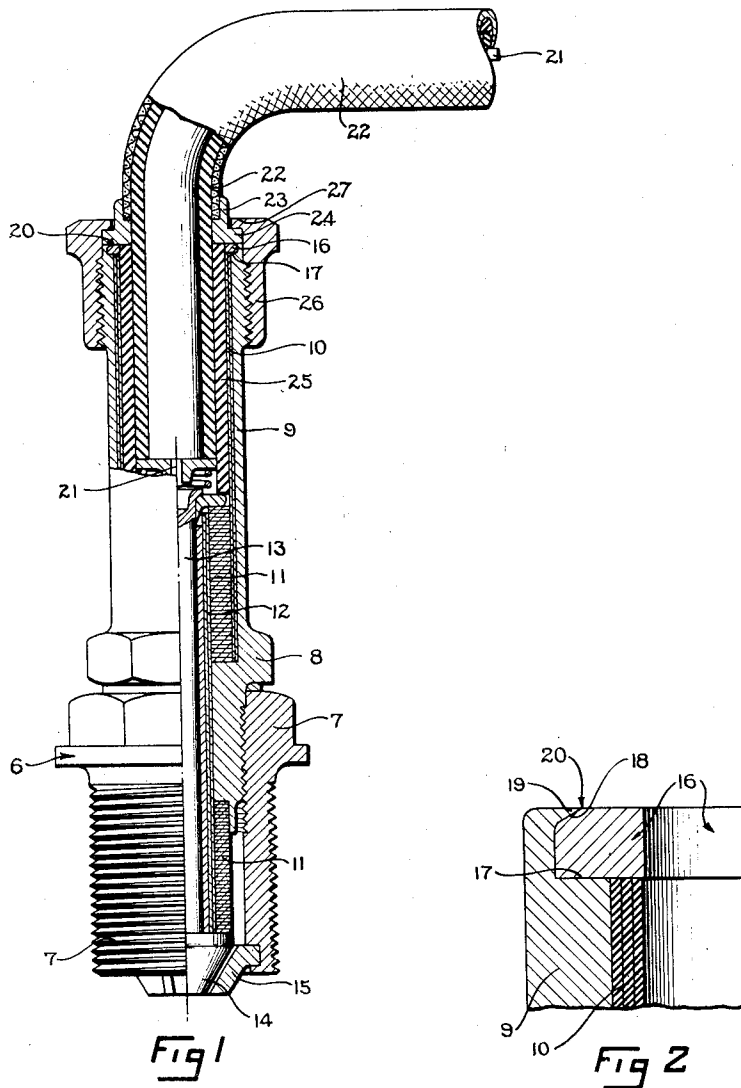
Nov. 3, 1942.

T. TOGNOLA

2,300,714

RADIO SHIELDED SPARK PLUG AND THE LIKE

Filed March 22, 1940



INVENTOR
Tullio Tognola
BY
F. Bascom Smith
ATTORNEY

UNITED STATES PATENT OFFICE

2,300,714

RADIO SHIELDED SPARK PLUG AND
THE LIKETullio Tognola, Sidney, N. Y., assignor to Bendix
Aviation Corporation, South Bend, Ind., a cor-
poration of Delaware

Application March 22, 1940, Serial No. 325,286

8 Claims. (Cl. 123—169)

This invention relates to radio-shielding means for electrical conductors, and more particularly to radio-shielding conduits for high tension ignition conductors, such as at the spark plug of an internal combustion engine.

In radio-shielding means heretofore provided for the ignition leads to the spark plugs of an internal combustion engine, for example, much difficulty has been continuously experienced in providing connecting shielding units which may be readily assembled and disassembled without danger of damaging insulation within the same and also provide adequate shielding to prevent interference with radio reception and adequate protection against the entrance of moisture under severe operating conditions, such as high speed flying in rain.

It is accordingly one of the objects of the present invention to provide novel means particularly adapted for use in shielded spark plugs of the type now in common use whereby the foregoing difficulties may be obviated.

Another object of the invention is to provide novel means in a shielded spark plug whereby the insulation within the shielding barrel thereof is protected against damage and whereby a firm seat having a comparatively large flat surface is provided for engagement by the connecting shielding conduit to thereby obviate the entrance of moisture and provide a good electrical connection between the connecting parts of the shield.

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

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

Fig. 1 is a side elevation, partly in section and with parts broken away, of a shielded spark plug and associated shielding conduit embodying one form of the invention; and,

Fig. 2 is a detail view, partly in section and with parts broken away, showing a portion of the upper end of the spark plug barrel on an enlarged scale.

The single embodiment of the invention illustrated in the drawing is shown, by way of example, in connection with the shielding barrel of

a shielded spark plug 6, but it will be understood that the invention may be employed at other points in a radio-shielding system, such as at the connection between a shielding conduit and the shielding manifold of a radio-shielding harness for the ignition system of an engine. Generally speaking, spark plug 6 may be of a type well-known in the art which comprises a shell 7 adapted to threadedly engage an opening in an internal combustion engine cylinder (not shown). Threaded into shell 7 or otherwise secured thereto is a nut 8 which has an upwardly extending tube or barrel 9 that is lined with electrical insulating material 10, such as rolled sheet mica. Supported by nut 8 and insulated therefrom in any well-known manner, such as by means including stacks of mica washers 11 and mica sleeve 12, is a center electrode 13, the lower enlarged end 14 of which is in cooperative relation with a ground electrode 15 secured in shell 7.

For the purpose of protecting the upper end of insulating sleeve or lining 10 from damage during insertion and removal of a conductor to and from barrel 9 for connecting center electrode 13 with a source of high tension current (not shown), a number of expedients have heretofore been employed but none has been completely successful. In some instances, for example, the outer end of the spark plug barrel has been made thin and rolled inwardly to form a protecting flange. In other instances, the end of the insulating sleeve has been bound either separately or together with the end of the barrel by means of a metallic ferrule or the like. Also, split rings have been removably inserted in the upper end of the barrel as a protecting means. All of these methods or structures possess disadvantages which are well-known to those skilled in the art.

In order to obviate the disadvantages of prior structures of the above character, the present invention comprehends associating a rigid metallic ring 16 with barrel 9 in a novel manner. In the form shown, barrel 9 is provided with an enlarged bore at the outer end thereof to form an internal shoulder 17. Ring 16 is formed to fit snugly into said enlarged bore and seat against shoulder 17, the inner diameter of said ring being equal to or preferably slightly less than the internal diameter of insulating lining 10. In radial cross-section, ring 16 is substantially rectangular, except that the upper outside corner thereof is beveled or chamfered, as at 18. The outer end of barrel 9 is rolled or staked inwardly into contact with the beveled surface 18 to form an annular tongue 19 adapted to secure ring 16 in position. After

the end of barrel 9 is spun or pressed inwardly, both the barrel and the ring are machined so that tongue 19 and the outer face of the ring together form a flat annular seat 20 of substantial radial width—a metallic seat which is firm and not subject to being damaged by bending or otherwise. The machining also eliminates any rough edges resulting from the spinning-in operation.

For connecting center electrode 13 to a source of high tension current there is provided an insulated conductor 21 which extends through a flexible metallic conduit 22. The end of conduit 22 has a ferrule 23 secured thereto, said ferrule having an external flange 24 adapted to engage seat 20. The projecting end of cable 21 is preferably surrounded by a rigid insulating spacer sleeve 25 which is adapted to slidably extend into barrel 9. One end of sleeve 25 abuts against conduit 22, 23 and is secured at its other end, in any well-known manner, to conductor 21. Surrounding conduit 22 is an internally threaded nut 26 having an internal flange 27 adapted to engage flange 24, whereby said conduit may be removably secured to barrel 9 to form a continuous shield for the ignition conductor 21. The threads in nut 26 engage external threads on barrel 9 and constitute means whereby flange 24 may be pressed and held firmly against seat 20 to thereby form an excellent water-tight joint having relatively large engaging surfaces and to establish a good electrical connection between the parts 23 and 9 of the shielding means.

There is thus provided novel radio shielding means particularly adapted for use in connection with a shielded spark plug whereby the probability of damage to the insulating lining in the spark plug barrel or other shielding conduit is reduced to a minimum. Additionally, novel means are provided whereby a water-tight joint is insured between the connected parts of a shielded conduit without decreasing the effectiveness of the electrical connection therebetween. The novel structure provided also lends itself to ready reconditioning of the plug with which it is associated. The invention is simple in construction and may be readily and inexpensively incorporated in shielded spark plugs and other shielding units of the character now in almost universal use on aircraft.

Although only a single embodiment of the invention has been illustrated and described in detail, it is to be expressly understood that the same is not limited thereto but that various changes may be made, particularly in the size, shape and composition of parts illustrated and described, without departing from the spirit and scope of the invention as the same will now be understood by those skilled in the art. For example, a gasket of soft metal or other suitable material may be inserted between flange 24 and seat 20, if desired. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. The combination of a rigid metallic shielding barrel having an enlarged bore at one end thereof, a comparatively thin lining of electrical insulating material in the normal bore of said barrel, and a rigid metallic ring having a smooth outer peripheral surface and a beveled corner tightly fitted into said enlarged bore and engaging an annular shoulder in said barrel, the internal diameter of said ring being substantially

equal to the internal diameter of said lining, and the edge of said barrel being pressed inwardly around the entire periphery thereof to form a lip engaging said beveled corner and having a radially extending flat surface flush with the outer face of said ring.

2. The combination of a rigid metallic shielding barrel having an enlarged bore at one end thereof, a comparatively thin lining of electrical insulating material in the normal bore of said barrel, and a rigid metallic ring having a smooth outer peripheral surface and a beveled corner tightly fitted into said enlarged bore and engaging an annular shoulder in said barrel, the internal diameter of said ring being approximately equal to the internal diameter of said lining, and the edge of said barrel being pressed inwardly around the entire periphery thereof to form a lip engaging said beveled corner and having a radially extending flat surface flush with the outer face of said ring to form a seat, a metallic shielding conduit having an external flange thereon adapted to engage said seat, and a coupling nut having threaded engagement with said barrel and having an internal flange engaging said first-named flange whereby the latter is held in firm engagement with said seat.

3. Radio-shielding means for electrical conductors comprising a rigid metallic conduit having an internal shoulder adjacent one end thereof, a relatively thin insulating sleeve in said conduit terminating adjacent said shoulder, and a rigid metallic ring having a smooth external peripheral surface tightly fitted into the bore of said conduit against said shoulder, the internal diameter of said ring being approximately equal to the internal diameter of said lining and the edge of said conduit being pressed inwardly entirely around the periphery thereof into engagement with said ring, said inwardly pressed edge having a surface forming a continuation of the corresponding surface of said ring.

4. The combination of a rigid metallic shielding barrel having an internal shoulder adjacent one end thereof, a relatively thin insulating lining in said barrel terminating adjacent the plane of said shoulder, and a rigid metallic ring having a smooth external surface tightly fitted in said barrel in engagement with said shoulder, said ring having an inner diameter which is approximately equal to the inner diameter of said lining and the outermost edge of said barrel being pressed inwardly to form a lip for permanently securing said ring in position in the barrel.

5. Radio-shielding means for electrical conductors comprising a rigid metallic conduit having an enlarged bore at one end thereof, a rigid metallic ring having a smooth external periphery tightly fitted in said enlarged bore against an annular shoulder in said conduit, said ring having a smaller internal diameter than the diameter of the normal bore of said conduit, and means for securing said ring in said enlarged bore.

6. Radio-shielding means for electrical conductors comprising a rigid metallic conduit having an internal shoulder adjacent one end thereof and a rigid metallic ring having a smooth outer periphery fitted and secured in the bore of said conduit against said shoulder, the edge of said conduit having a flat surface in the plane of the outer flat surface of said ring, said flat surfaces forming a continuous annular plane surface.

7. A radio shielded spark plug comprising a

metallic shell, a center electrode mounted in said shell and electrically insulated therefrom, said electrode extending beyond the upper end of said shell, a tubular metallic shielding barrel secured to said shell and surrounding and projecting beyond the upwardly extending portion of said electrode, said barrel having an enlarged bore forming an internal shoulder adjacent the outer end thereof, a relatively thin lining of insulating material in said barrel terminating adjacent the plane of said shoulder, and a rigid metallic ring having a smooth external peripheral surface secured in said enlarged bore and engaging said shoulder, the inner diameter of said ring being approximately equal to the inner diameter of said lining and the upper face of said ring being flush with the end of said barrel to form therewith a relatively wide annular seating surface.

8. A radio shielded spark plug comprising a tubular metallic shell, a center electrode assembly comprising a center electrode and insulating means therefor mounted in said shell and ex-

tending upwardly therefrom, a tubular metallic shielding barrel secured to said shell around said upwardly extending portion of said assembly, said barrel projecting beyond said assembly to form a socket and having an enlarged bore forming an internal shoulder adjacent the outer end thereof, a relatively thin lining of insulating material in said barrel terminating adjacent the plane of said shoulder, a rigid metallic ring having a smooth external peripheral surface and a beveled corner seated in said enlarged bore in engagement with said shoulder, the internal diameter of said ring being approximately equal to the internal diameter of said lining and the edge of said barrel being pressed inwardly around the entire periphery thereof to form a lip engaging said beveled corner and having a radially extending flat surface flush with the upper surface of said ring to form a relatively wide annular seating surface.

TULLIO TOGNOLA.