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E. B. NOWOSIELSKI

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IGNITION APPARATUS

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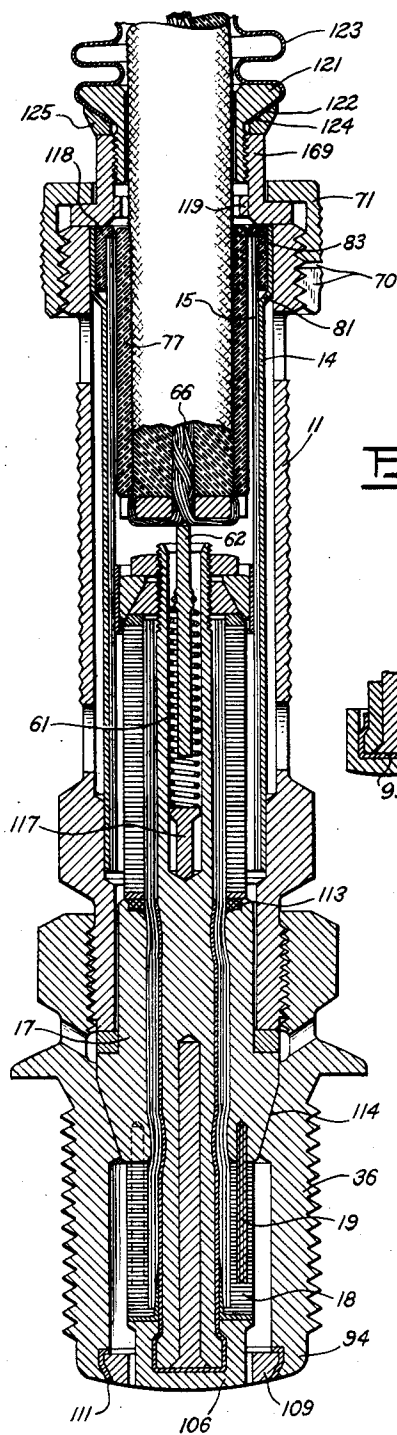


Fig. 1

Fig. 2

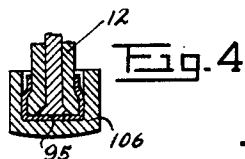
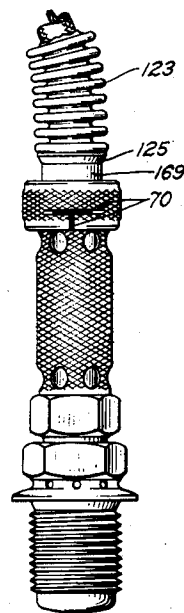


Fig. 4

Fig. 3

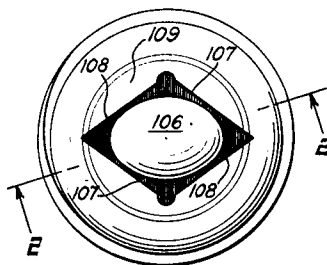


Fig. 5



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UNITED STATES PATENT OFFICE

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IGNITION APPARATUS

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Application January 18, 1937, Serial No. 121,216

5 Claims. (Cl. 123-169)

This invention relates to spark plugs, and particularly to those intended for use under severe conditions as to heat development and current intensity, necessitating maximum efficiency in heat dissipation and in electrode construction. The application is a continuation, in part, of my application Serial No. 16,882, filed April 17, 1935, and in part, of my application Serial No. 29,530, filed July 2, 1935.

Some of the objects are to provide improved electrodes including novel methods of constructing and assembling the electrodes, and of adjusting the spark gap; to provide improved heat deflecting and cooling means; and to provide improvements in the manner of insulating the current; including a novel method of insuring against development of "pipes" along the edges of the rolled mica sheets employed as part of the insulating means; and to provide other improvements and advantageous combinations the nature of which will appear.

In the accompanying drawing forming part hereof:

Fig. 1 is a view in elevation of one embodiment of the invention;

Fig. 2 is a longitudinal sectional view of the plug shown in Fig. 1 but on an enlarged scale;

Fig. 3 is a bottom plan view of the plug;

Fig. 4 is a sectional view of the central electrode in course of formation; and

Fig. 5 is a diagrammatic view showing an alternative shape for the electrodes 106 and 109 of Fig. 3.

For the purpose of a shielded aviation spark-plug the metal body 10 of the plug is provided with a shield extension 11 which extends upward considerably above the upper end of the spindle 12 to enclose the spindle and the electrical connection between the same and the conductor which leads the high-tension current to the spindle. This extension is preferably in one piece with the attaching nut 5, though such unity is not necessary.

Instead of completely closing the space between the shield extension 11 and spindle 12, I provide a cooling and ventilating chamber 13 in the form of an annular space between the shield extension 11 and a long thin cylindrical metallic sleeve 14 having low thermal conductivity, and lined with a tube 15 formed of rolled mica constituting the wall of a second chamber 16 bounded at its lower end by the upper surface of the compressible metal gland 17, and at its upper end by a novel heat deflecting and sealing assembly more fully described, as well as claimed, in my

"parent" application No. 16,882, above referred to. The same is true as to those other elements not discussed in detail herein; the detailed description herein being confined to those features which are more particularly the subject of this continuation application. Among these is the central electrode 106 whose outer surface has an elliptical contour, as indicated best in Fig. 3, while the cooperating parallel walls 107 and 108 of the outer electrode 109 form a parallelogram in transverse section as viewed in Fig. 3. In place of a true elliptical contour as shown in Fig. 3 the contour may be a combination of arcs and parallel edges as shown in Fig. 5. Either arrangement permits ready adjustment of the spark gap by producing relative angular motion between the parts 106 and 109 about the common axis of said parts. This adjustment can be effected by inserting in the space between the two elements a gage of proper thickness to give the desired spark clearance and then applying said gage to the elements as a lever to cause one of said elements to turn sufficiently to produce the desired clearance therebetween. If desired the electrode 109 may be integral with the recessed end 94 of the shell 36 but I prefer to have it as a separate piece fused or welded thereto through the instrumentality of a joining piece 111 of a soft metal similar to that of the sleeve 95 of Fig. 2 and fused thereto, preferably in the same manner as hereinafter outlined in connection with the description of the parts constituting the central electrode assembly as shown in Figs. 2 and 4.

In the construction shown in Fig. 2 I have interposed an annular member 113 of low heat conductivity such as asbestos, to provide a further means of deflecting the heat of the spindle in a radial direction at this point in the plug thereby adding to the heat deflecting capacity of the copper gland 17. The latter is also shown as having a series of heat conducting wires or rods 19 embedded therein and extending down into openings in the mica washer 18 to absorb heat therefrom and conduct such heat toward the outer wall of the plug. Gland 17 also has a tapered surface for registering with a correspondingly tapered seat 114 in the shell 36, to supplement the heat dissipating action of the soft metal rods 19, and the annular soft metal seat 38 in Fig. 2 also aids in such heat dissipation. Also in this second embodiment I provide a pedestal 117 made of carborundum or stainless steel having low heat conductivity to reduce the amount of heat entering contact spring 61 which main-

tains the electrode pin 62 in contact with the conductor 66.

In view of the wider clearance shown in Fig. 2 as between the inner wall 14 and the outer shield extension 11 there is a correspondingly greater distance between the upper surface of the mica lining 15 and the inner wall 14, which greater distance makes it advisable to employ in place of the ferrule shown at 79 in my application No. 16,882, a non-metallic spacer 83 of sturdier dimensions, and low thermal conductivity, the lower end of said spacer resting upon the shoulder 81 of the wall 14 while the upper end extends across the upper edges of the layers of the mica lining 15 and rests lightly thereon, the inner diameter of this upper rim 118 being slightly larger than the outer diameter of the spacer 77 so as to provide a clearance therebetween. Spacer 77 is therefore free to move upwardly beyond this rim 20 118 but only to the point of contact with the annular rim 119 on the swivel member 169. The said member 169 is internally threaded to receive a correspondingly threaded gland 121 of steel or similar material to firmly grip the inwardly turned end 122 of a metallic corrugated tube 123 which by reason of the pressure exerted thereupon by the application of the nut 121 is pressed firmly upon the beveled annular seat 124 to a bonding member 125, constituting the means for providing 30 a firm electrical bond between the shielding elements 123 and 169, the latter being in firm contact with the complementary shielding element 11 by reason of the pressure exerted thereupon by the act of tightening the coupling nut 71 threaded to the upper end of the shield extension 11. This nut 71 is shown at 70 (Figs. 1 and 2) as milled out horizontally and also vertically to increase the effectiveness of the hold. This milling provides flexibility which facilitates establishment of a 40 locked connection by the exertion of inward pressure upon the open ends.

In both embodiments there is provided a completely shielded plug including a detachable conductor having a connection with the plug facilitating connection of the cable regardless of the 45 angle required and providing in each case improved insulating and heat dissipating means as well as improved methods of spark production and adjustment. While both of the embodiments illustrated possess obvious practical merit in each of the respects above described, it is to be understood that latitude is to be allowed within the scope of the respective claims appended hereto.

The electrode cup 106 is initially of uniform bore, so that it may be slipped over the enlarged base of spindle 12 and its covering sleeve 95 (as indicated in Fig. 4) and then secured in position thereon by a pressure sufficient to change the cross-section of the upper end of said cup 106 and cause its contour to conform to that of the spindle base 106 and sleeve 95 (as shown in Fig. 2) all said parts being fused into a unitary assembly by the process.

What is claimed is:—

1. In a spark plug having a central spindle surrounded by a stack of insulating discs, and an enclosing shell, the combination with said discs, spindle and shell of metallic means extending through apertures in said discs for facilitating rapid transfer of heat from said discs to said shell.
2. In a spark plug having a central spindle surrounded by a stack of insulating discs, and an enclosing shell, the combination with said discs, spindle and shell of metallic means including rods extending through apertures in said discs for facilitating rapid transfer of heat from said discs to said shell.
3. In a spark plug having a central spindle surrounded by a stack of insulating discs, and an enclosing shell, the combination with said discs, spindle and shell of metallic means including a pressure gland and a series of rods extending through apertures in said discs for facilitating rapid transfer of heat from said discs to said shell.
4. In a spark plug having a central spindle surrounded by a stack of insulating discs, and an enclosing shell, the combination with said discs, spindle and shell of metallic means including a pressure gland and a series of rods extending through apertures in said discs for facilitating rapid transfer of heat from said discs to said shell, and means for causing air to circulate around the periphery of said gland.
5. In a spark plug having a central spindle surrounded by a stack of insulating discs, and an enclosing shell, the combination with said discs, spindle and shell of metallic means extending axially of said spindle and in actual contact with a plurality of the discs for facilitating rapid transfer of heat from said discs to said shell.

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