Sept. 13, 1938. H. RABEZZANA 2,129,961

RADIO SHIELDED SPARK PLUG

Filed March 27, 1937

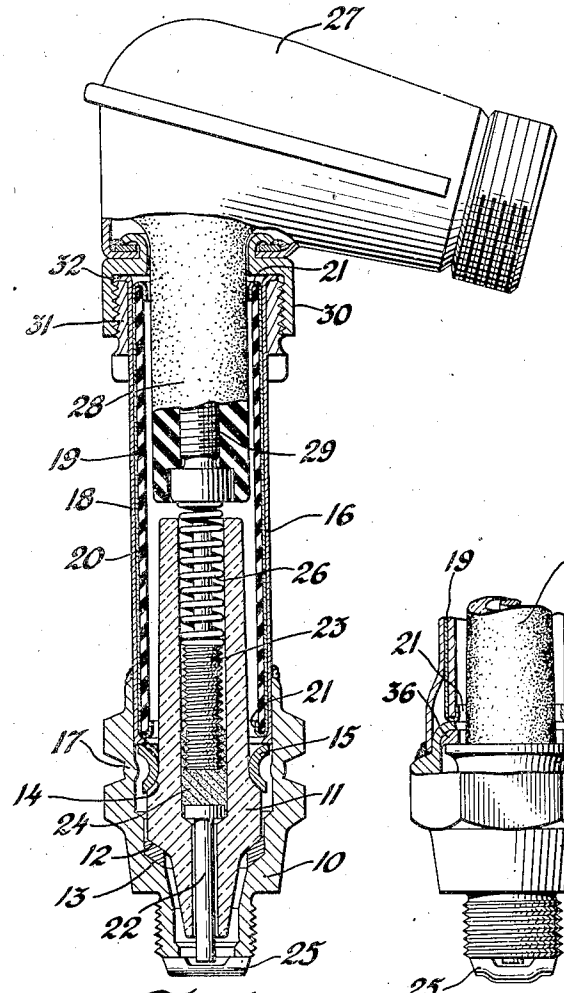


Fig. 1

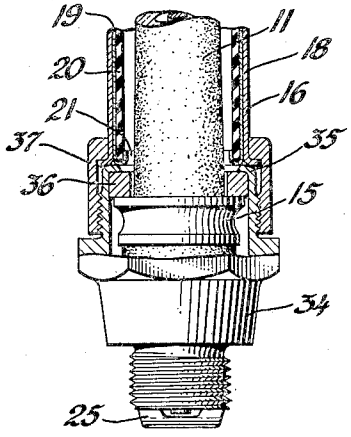


Fig. 2

Fig. 3

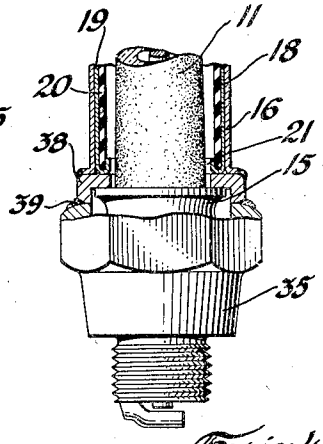


Fig. 4

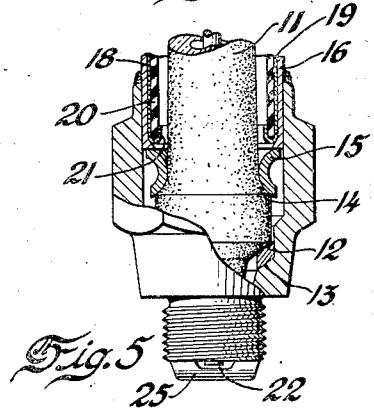


Fig. 5

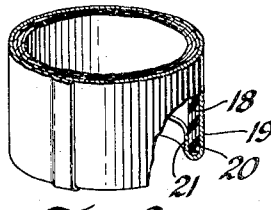


Fig. 6

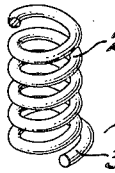


Fig. 7

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RADIO SHIELDED SPARK PLUG

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4 Claims. (Cl. 123—169)

My invention relates to radio shielded spark plugs designed to prevent the high tension current supplied to them from interfering with adjacent radio receiving instruments, or interfering with the operation of other sensitive electrical devices; such plugs being used for the most part with internal combustion engines used to propel airplanes. My invention consists in improvements in and relating to various of the parts and features of radio shielded spark plugs all as hereinafter described and as claimed in the concluding claims.

In the drawing wherein various embodiments of my invention are illustrated:

Figure 1 is a view showing a section upon a central axial plane extending longitudinally thereof, of a radio shielded spark plug made in accordance with my invention.

Figures 2, 3 and 4 are fragmentary views showing modified forms of my invention.

Figure 5 is a view showing a modified form of spark plug shell or casing to which my invention is applicable.

Figure 6 is a fragmentary view showing the lower end of a tubular insulating member which forms a part of my improved spark plug.

Figure 7 is a view showing a coil spring which forms a part of my invention, in side elevation.

Referring now to the drawing, the numeral 10 designates a hollow metallic spark plug shell or casing adapted to screw into a spark plug receiving passage in an internal combustion engine cylinder; and 11 is the insulating member of the plug having a lower annular shoulder 12 whereby the insulator is supported from an internal ledge 13 of the shell, and an upper annular shoulder 14 against which the lower part of an annular metallic holding member 15 presses. This member is resilient, and C-shaped in cross-section, and is in effect a stiff spring whereby in the finished plug the insulating member is held within the shell and is yieldably pressed against the ledge 13, a suitable gasket or equivalent means for securing gas tightness of the plug being interposed between said ledge and the lower shoulder of the insulating member.

The numeral 16, Figure 1, designates a tubular metallic shield the lower end of which fits within the upper end of the hollow shell and is welded or brazed in place therein, with its lower extremity in contact with the upper end of the annular holding member 15. After the insulating member, the member 15 and the tubular shield have been assembled and the shield welded in place, as aforesaid, the shell is axially compressed while a current of electricity of sufficient volume to soften a thin wall section 17 of the shell flows therethrough. The pressure thus applied acts through the holding member 15 to force the insulating member toward the lower supporting ledge 13 and secure a gas-tight joint at the lower end of the insulating member; and at the same time said member 15 is wedged against the upper shoulder 14 of the insulating member and is collapsed in the direction of its axis and the axis of the plug, whereby a force is set up in said annular member which acts throughout the life of the plug to maintain, by the resiliency of said member 15, a gas-tight joint between the lower end of the insulating member and the supporting ledge 13. The heating current is interrupted and the collapsed wall section 17 is permitted to cool before the pressure applied to the shell is released, from which it follows that the member 15 is held in its stressed condition after the parts have been assembled and the thin wall section 17 has been softened and collapsed as aforesaid.

Instead of first welding the tubular shield 16 in place and then compressing the shell to simultaneously stress or load the member 15 and collapse a thin wall section of the shell, the shell may be made without a thin wall section, as shown in Figure 5, in which case the shield is forced into the shell and against the upper end of the resilient holding member 15 sufficiently to secure gas-tightness at the lower end of the insulating member and to collapse said member, so that it will exert a continuous pressure upon the insulating member throughout the life of the plug, and said shield is then welded in place within the shell while force is applied to said shield and such pressure is maintained. In both methods of assembling the parts and while tight joints are secured to a degree between the lower end of the tubular shield 16 and the upper end of the holding member 15, and between the lower part of said member and the upper shoulder 14 of the insulating member, gas-tightness of the plug is due for the most part if not wholly to the joint between the lower shoulder 12 of the insulating member and the lower supporting ledge 13 within the shell. The lower end of the shield 16 engages the upper end of the member 15 and holds it and the insulating member in place within the shell as will be appreciated.

The numeral 18 designates a removable tubular insulating member arranged within the tubular shield 16 and surrounding the upper end of the insulating member 11 as shown. This insulating member is made up of an outer thin me-

tallic shell or casing 19, Figure 6, within which there is a lining of insulating material 20 such as mica, a tube of molded plastic material, or equivalent substance. The insulating member made up of the metallic casing 19 and its lining of insulating material form a single element which is removable as a unit from and replaceable in the tubular shield 16 and the lower end of which rests upon an inwardly extending ledge at the lower end of the shield tube, and the upper end of which terminates slightly below the upper end of said shield; and the insulating member fits somewhat loosely in the shield so as to be easily removable therefrom and replaceable therein. The thin metallic shell 19 is preferably provided with portions which are folded inward and upward to embrace and protect the ends of the insulating material lining 20 as indicated by the numerals 21; and said shell is preferably formed from a thin flat sheet by bending it into cylindrical form and securing meeting edges together along a longitudinally extending seam, as shown in Figure 6.

The numeral 22 designates the inner and 23 the outer part of a two-part central electrode extending through a longitudinally extending passage in the insulating member and between and more or less surrounding the adjacent ends of said parts there is a sealing composition 24, which is conductive to a degree such that high tension current can flow therethrough; and 25 designates the grounded or shell electrode of the plug. The upper end of the insulating member extends upward and into the insulating member 18 and shield tube 16 and is tubular, as shown, and a coil spring 26 is housed within the cylindrical passage in said extending portion and projects slightly above the upper end of the insulating member. The lower end of this spring contacts with the upper end of the electrode part 23 so that current is supplied to the central electrode through said spring.

The numeral 27 designates a connecter whereby current is supplied to the central electrode, the same having a depending part 28 which enters the upper part of the tubular insulating member 18 and has a screw 29, the head of which contacts with the upper end of the spring 26 when the connecter 27 is secured to the tubular shield 16 as shown. This connecter has an internally threaded neck 30; and 31 is a tubular nut carried by the tubular shield and the upper end of which engages a flange 32 at the upper extremity of said tube and secures the connecter 27 thereto as will be understood.

The lower end of the spring 26 engages with the inner wall of the passage in the insulating member in which it is housed so that the spring remains in the passage when the connecter 27 is detached from the tubular shield 16 and removed from the plug structure, which has often to be done, so that the spring is protected from injury both by its position within said passage and the fact that it is located well down within the shield tube 16. Removal of the connecter, therefore, does not expose a delicate contact spring and render it liable to injury as has heretofore been the case when an equivalent spring has been carried by and removed with a connecter, like the connecter 27, when the same is removed from a shielding tube. This holding action may be readily accomplished by bending the extremity of the lower whorl or convolution of the spring outward slightly from the cylindrical boundary of the spring, as indicated at 33, Fig. ure 7, so that said end will press outward against the interior of the passage within which it is located and thus hold the spring within said passage.

In the forms of my invention illustrated in Figures 2 and 3 the annular resilient member 15 which holds the insulating member 11 in place within the shell or casing 34 is itself held in place by an inturned holding flange 35 and a metallic gasket 36, as in single piece spark plugs; said member being compressed and loaded sufficiently to insure a continuously acting force upon the insulating member throughout the life of the plug by a die member which turns a flange at the upper end of the shell inward and into holding engagement with the gasket 36; the difference between the two forms being that in Figure 2 the lower end of the tubular shield is fastened to the shell by a gland nut 37, whereas in Figure 3 the lower end of the shield is welded to the upper end of the shell or casing of the plug.

Figure 4 illustrates a variation of my invention wherein the annular resilient member 15 is compressed and loaded by a ring 38 channel-shaped in cross-section and to which pressure is applied by a suitable press and, while the ring contacts with the upper end of the shell and the member 15 is in a stressed condition, the ring is welded to the shell as indicated by the numeral 39; the shield being welded to the ring so as to be in effect an integral part of the shell or casing in this, the same as in the other forms of my invention hereinbefore described.

Having thus described and explained my invention I claim and desire to secure by Letters Patent:

1. In a radio shielded spark plug, a hollow metallic shell or casing; a tubular metallic shield carried by said shell; an insulating member within said shell and extending into said shield, and which insulating member is held in place within said shell by said tubular metallic shield; a passage extending longitudinally of said insulating member and the outer part of which is cylindrical in form; a central electrode within said passage; and a coil spring within the outer cylindrical part of said passage and extending beyond the outer end of said insulating member, and which spring contacts with said central electrode so as to supply current thereto.

2. In a radio shielded spark plug, a hollow metallic shell or casing; a tubular metallic shield carried by said shell; an insulating member within said shell and extending into said shield, and which member has an annular shoulder and a longitudinally extending passage; a central electrode within said passage; means for supplying current to said central electrode; and an annular resilient metallic member C-shaped in cross-section secured in place within said shell between the lower end of said shield and said annular shoulder and surrounding said insulating member, and which resilient member engages said shoulder to thereby hold said insulating member in place within said shell.

3. In a radio shielded spark plug, a hollow metallic shell or casing; an insulating member within said shell and extending upwardly therefrom, and having an annular shoulder and a longitudinally extending passage; a central electrode within said passage; means for supplying current to said central electrode; an annular resilient metallic member C-shaped in cross-section within said shell and surrounding said insulating member and the lower end of which engages the

shoulder aforesaid; and a tubular metallic shield carried by said shell and surrounding the upper end of said insulating member, and the extremity of which engages the upper end of said annular resilient member and holds it in place within said shell.

4. In a radio shielded spark plug, a hollow metallic shell or casing; a tubular metallic shield carried by said shell; an insulating member within said shell and extending upwardly therefrom, and having a longitudinally extending passage; means for holding said insulating member in place within said shell; a central electrode within the passage aforesaid; means for supplying current to said central electrode; and a removable tubular insulating member within said tubular shield, said insulating member comprising an outer metallic casing and an inner lining of insulating material within said outer casing, the ends of said outer casing being turned inwardly so as to embrace the extremities of said insulating lining to thereby protect said ends.

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