July 23, 1940. J. DEVINE 2,208,667

AVIATION SPARK PLUG

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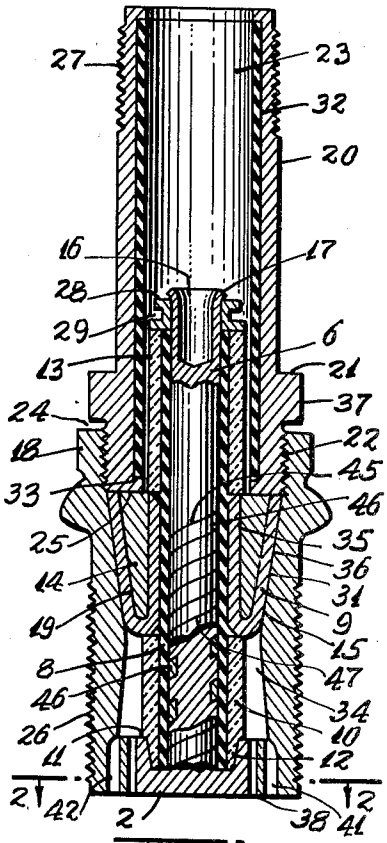


Fig. 1.

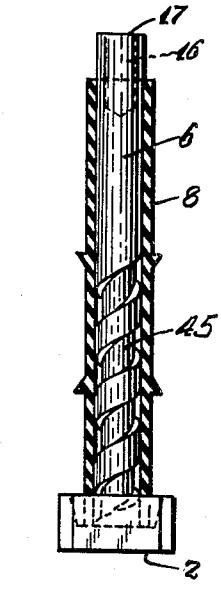


Fig. 3.

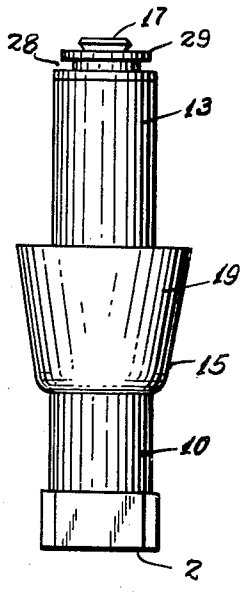


Fig. 5.

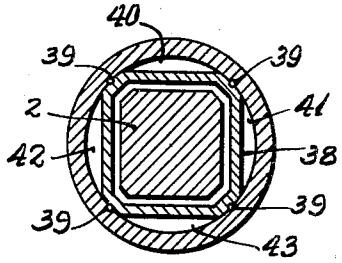


Fig. 2.

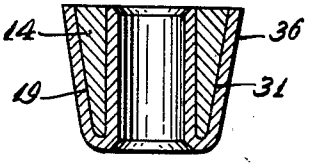


Fig. 4.

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AVIATION SPARK PLUG

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7 Claims. (Cl. 123—169)

This invention relates to spark plugs for the use in internal combustion engines, but most particularly this spark plug is designed for internal combustion engines used in aeroplanes to withstand the high destructive measures caused by the mixture of gases in the gas chamber of the spark plug, arising from the engine cylinder which is compressed to very high explosive degrees, especially in high altitude flights where failure results from lack of combustion which is partly due to such high compression under severe atmospheric changes.

The combined hot and cold gases penetrate into the insulator surrounding the positive electrode which is partly the result of air pockets, carbon, fouling, conduction, lack of combustion, preignition which shortens the life of the plug and strains the magneto, resulting in inefficient performance, and at times complete failure.

One of the objects of my invention is to eliminate the strain on the magneto by the use of a new and novel type of positive and negative electrodes for the combined purposes of eliminating frequent gap setting, and increasing many times the life of the electrode material by obtaining a large burning area between the positive and negative electrodes.

Other objects of my invention is to provide a regulating means of cooling and heat deflecting by use of a new and novel means of the electrode shank.

Another object, is to insure a gas tight seal around the insulator without damage by the use of a novel type of an annular housing member, which is also for the purpose of eliminating and taking up metal expansion as well as to retighten the plug should a gas leakage develop after long service.

Briefly, the above description is my purpose of construction to render a plug free from gas and current leakage, free from the ill effects of metal expansion, and to have a heat regulator and means for retightening of the plugs, and to have large burning areas between the positive and negative electrodes in order to insure long life of the plug.

In the drawing Figure 1 is a cross section of my invention.

Figure 2 is a perspective view showing the lower end of the central electrode head in the form of a square head as in line 2—2, Figure 1.

Figure 3 represents the insulated electrode showing spiral worm cut.

Figure 4 represents the annular housing member.

Figure 5 represents the outer view of the assembly.

The annular housing member 9, preferably of copper surrounding insulator 8, and resting on mica washers 10, the mica washers 10 surrounding lower end of insulator 8, and resting on top of the grooved electrode head 2 and filler 12 composed of glass or other nonconducting material.

The insulator 8 extends down into the groove 11 of head 2.

Insulating washers 13 surrounding the upper part of the electrode 6 and insulator 8, and resting on top of the annular housing member 9 and a soft metal or glass filler 14.

The whole assembly 15 Fig. 5, surrounding the electrode 6 is supported on head 2 and comprises the glass filler 12, the washers 10, the annular housing member 9, the soft metal filler 14, and the washers 13 are compressed together under a load of approximately 40 thousand pounds P. S. I. A metal terminal cap resting on top of washers 13 is securely fastened on the top of the electrode 6, by turning over the upper ends 17 of the top of the electrode 6 which has a little hole 16.

The above assembly 15, Fig. 5, is then placed into a shell 18, the annular housing member 9 composed of hard or soft metal, preferably copper is resting in the annular receiving space 19 of the shell 18.

A so called radio shield 20 or member in combination with a gland extension 21 at its lower end, externally threaded as at 22 having a hole in its center 23, is placed over the washers 13, and screwed together with internal thread 24 of shell 18.

The lower end 25 of the shield 20 rests on top of housing 9 and filler 14.

The lower end of the shell 18 is threaded to be engaged with cylinder wall of an engine. The upper end 27 of the radio shield 20 is threaded to receive a threaded metal elbow coupling not shown, and ignition lead not shown of engine to be connected to shoulder 28 of terminal cap 29. A mica insulator 32 is resting on inner shoulder 33 of lower end of shield 20.

What I claim as new, novel, and useful, is to have an annular housing member 9 made of soft metal, a wedge receiving recess 31 made by means of a forging, casting, turning, or upsetting, so that when said housing member 9 is sectioned in two, it appears like a W, as is the drawing of Fig. 4. The purpose of the above is to effect a tight seal around insulator 8 surrounding the electrode 6 above the gas chamber 34, by the

easily spreading action of the W shaped housing 9 when wedge 14 composed of glass or copper is forced into receiving space 19.

The annular housing member 9 of the assembly 15, Fig. 5, when placed in relationship with shell 18, effects a gas tight seal between the housing member 9 and the shell 18 above the gas chamber 34 by action of 21 of shield 20 when screwed together with shell 18.

The best features of the above type of housing member 9 is that I do not destroy the insulator 8 by placing a proper fitting wedge 14 into space 31, and can always be retightened should a gas leak develop between the wall 35 of housing member Fig. 4 and insulator 8, and between the wall 36 of housing member Fig. 4, and inner wall 19 of shell 18, after the plug has been subjected to long service due to metal expansion and contraction, an additional turn on hex 37 will add additional pressure on wedge 14 and housing member 9, spreading wall 35 inwards and wall 36 outwards thus affecting again a tight seal at both intersections.

The purpose of the square head 2—2, Fig. 2, is to obtain a large 4 side burning area between the positive electrode head 2 and negative electrode 38.

The negative electrode 38 is a square tube of high heat resisting metal, the corners 39 of which are soldered, braised, or welded into the round and lower end of the shell 18, as at Figs. 1 and 2, allowing four gas passages 40—41—42—43 figs. 2—2 of Fig. 1, between the lower end of the shell 18 and square negative electrode tube 38.

The electrode 6 fig. 3 of Fig. 1 has a spiral worm cut 45, a copper filler 46 is for the purpose of regulating the heating and cooling by a natural spiral flow of heat.

The heat traveling the spiral path of least resistance, would heat up the plug more readily, at the same time the heat would not drop too soon, as the copper spiral is in continuous contact with the basic spiral 47 of electrode 6 which keeps on picking up and withdrawing heat from one to another not allowing the heat to drop too quickly, thus maintaining the plug at a normal operating temperature.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. In a spark plug, a shell, a central electrode having a square firing head for the purpose of obtaining four flat sparking surfaces when placed in gap space relationship with a negative electrode, comprising a square metal tube.

2. In a spark plug, a shell, a central electrode having a square firing head, a shell having at its lower round end inserted a square metal tubing to act as a negative electrode when placed in gap space relationship with square firing head of central electrode.

3. In a spark plug, a central electrode, insulation material surrounding said electrode, a metal housing surrounding said insulation material, a shell surrounding said housing and having a hollow metallic square in its lower end forming a negative electrode, said hollow square forming four separate gas passages between its outside face and the inside face of said shell.

4. In a spark plug, a central electrode, insulation material surrounding said electrode, a metal housing surrounding said insulation material, a shell surrounding said housing, and a hollow metallic square mounted in the lower end of said shell and spaced from and encircling the lower end of said central electrode forming a spark gap between the adjacent faces of said central electrode and said metallic square.

5. In a spark plug a pair of massive electrodes embodying around its gap end a shell having an annular square gas chamber and in which one of the electrodes in the form of a hollow square is housed within said shell in gap space relationship with one of the said electrodes and means for clamping said hollow square electrode into said shell to provide for passages of gas larger than the gap space to enter into the said gas chamber between the adjacent faces of the shell and the outer faces of the said square electrode to eliminate fouling of the gap, and to eliminate gap setting.

6. In a spark plug comprising a shell, a central electrode, insulated from said shell by mica wrappings, an annular means of heat conducting metal interposed between the adjacent faces of said shell and insulator for sealing the space between the said shell and insulator against the passage of gases, a hollow square shaped negative electrode mounted in the bottom end of said shell, and a massive electrode head on the bottom end of said first mentioned electrode, and coaxially engaged into gap space relationship with said hollow square shaped electrode, forming four separate gas passages between the adjacent faces of the shell and the outside faces of the said hollow square negative electrode to eliminate fouling of the gap and to eliminate gap setting.

7. In a spark plug a massive central electrode, embodying around its gap end a shell having a hollow chamber, and a hollow square tube housed within said chamber in gap space to the said electrode to act as a ground electrode, and having flat sides to provide for passages of gas to enter into the said gas chamber between the adjacent faces of the shell and the outer faces of the said ground electrode.

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