

July 29, 1958

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2,845,565

LOW-TENSION SPARKING PLUG FOR INTERNAL COMBUSTION ENGINES

Filed Jan. 2, 1957

Fig. 1

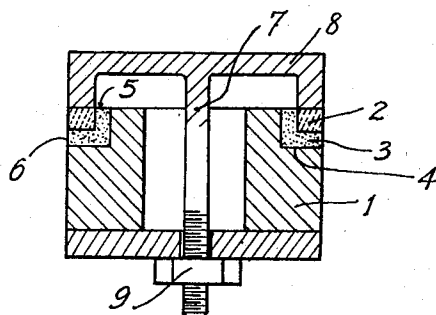


Fig. 2

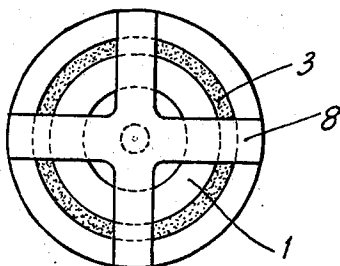
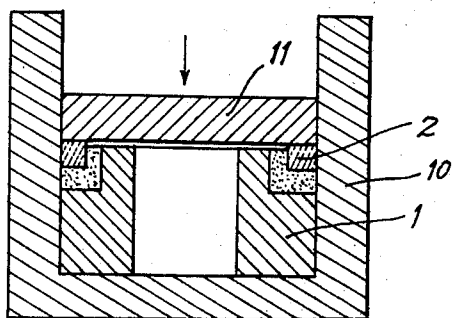


Fig. 3



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LOW-TENSION SPARKING PLUG FOR INTERNAL COMBUSTION ENGINES

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Application January 2, 1957, Serial No. 632,050

Claims priority, application France January 12, 1956

5 Claims. (Cl. 313—131)

It is already known that low-tension sparking plugs for internal combustion engines have been developed in which the sparks are produced by discharging the current delivered from a condenser across a relatively reduced gap of from about 0.004" to about 0.012" between the two electrodes. This gap is filled with a mass of insulating material and the spark glances off its surface. As a rule, the assembly comprising the electrodes and the insulator is called "insert" or "cartridge."

Sparking plugs having a plurality of sparking zones have already been proposed.

This system is theoretically extremely advantageous; in fact, it seems that the greater the number of points between which a spark can be produced, the longer the useful life of the insert. However, the various attempts made up to now, notably by stacking discs connected alternately to one and the other pole of the current source, were not followed by a production on a commercial scale. This is due to the fact that the probability of failure and the possibility of longer life increase in proportion to the length of the spark gap, and this is unfortunately the case when the most frequent fault, i. e. the sparking within the insert subsequent to a local deterioration of the insulator.

So far as the applicant is aware, no electrode arrangement has so far been found, in which the accuracy of its electrodes and the rigidity of all its component elements are sufficient to ensure a useful life of the device consistent with a practical application, i. e. production on a commercial scale.

Now it is the essential object of this invention to provide an insert or cartridge of the aforesaid type for low-tension sparking plugs which comprises a double sparking zone, as the two electrodes consist of two concentric rings or annuli of same outer diameter, one of these rings having a height considerably lower, and an inner diameter considerably greater than the other ring, so that the first or smaller ring may be fitted in an annular cavity provided in the larger ring, a suitable insulator forming a thin, substantially uniform layer being interposed between the two rings, so that the complete insert will be of cylindrical shape.

In an insert constructed in accordance with the characteristics set forth hereinabove is obtained, by using two metal parts, a double spark-producing zone, i. e. a peripheral sparking zone located on the lateral surface of the insert, and a zone created in a plane at right angles to the axis of the insert. Of course, it would not constitute a departure from the principle of this invention if the electrodes and the insert were of prismatic configuration.

In order to afford a better understanding of the present invention and of the manner in which the same may be carried out in the practice, reference will now be made to the accompanying drawing, wherein:

Figure 1 is an axial elevational section showing an insert constructed according to this invention;

Figure 2 is a plan view corresponding to Figure 1, and

Figure 3 is another axial elevational section showing

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the means employed for manufacturing the improved low-tension sparking plug insert of this invention.

Figures 1 and 2 of the drawing illustrate an insert comprising two electrodes 1, 2 having interposed therebetween an insulator 3. According to this invention, the electrode 1 is of substantially cylindrical configuration and has its upper outer edge formed with an annular groove 4 adapted to receive the insulator, the other electrode 2 consisting of a simple ring-shaped member of same outer diameter as the first electrode 1. Both electrodes provide two sparking zones 5, 6, i. e. a flat zone and a cylindrical zone, as shown.

The low-tension current is fed to the ring-shaped electrode 2 through a central rod 7 ending on the insulator side with a spider 8 and on the opposite side with a screw-threaded portion engaged by a clamping nut 9 which, when tightened, provides a proper electric contact between the spider 8 and electrode 1. This electrode 1 is grounded through the plug body (not shown) in which it is forced-fitted. Preferably, these electrodes will consist of tungsten and the insulator of glass, more particularly borosilicated glass.

The electrodes constituting with the insulator the insert of the sparking plug may be assembled very easily, preferably by the method described in Figure 3 of the accompanying drawing.

The registering surfaces of the electrodes 1, 2 are coated with a glass powder suspension in a liquid, and subsequently dried in the air. Both electrodes are then laid upon each other and introduced with a certain clearance into a hollow cylinder 10 of refractory steel. The assembly is then heated to about 1,470° F. and sealed to a compact unit by the application of pressure, for example by using a piston 11 (Fig. 3).

After cooling, the insert is ejected and its outer surface ground as required.

I claim:

1. In a low tension surface discharge spark plug, in combination, a first substantially cylindrical electrode provided with an end portion having a reduced diameter, an annular second electrode having an outer diameter substantially equal to the outer diameter of the first electrode and an inner diameter greater than the reduced diameter of said end portion of the first electrode, the second electrode being disposed circumferentially of said end portion spaced radially therefrom and spaced axially of the first electrode with its outer surface substantially flush with the outer surface of the first electrode and an exposed face surface thereof substantially flush with the end surface of said end portion of the first electrode, an insulator disposed between the two electrodes and having exposed surfaces substantially flush with the outer and end surfaces of said first electrode, conductive means comprising an annular member disposed against said face of the second electrode registering therewith and support means for said annular member spaced axially of said end portion of the first electrode to provide an electrical energy path to the second electrode and thereby forming two sparking zones on said spark plug one of which is on said end portion of the first electrode and the other on the outer surfaces of the two electrodes.

2. In a low-tension surface discharge spark plug, in combination, a first substantially cylindrical electrode provided with an end portion having a reduced diameter, an annular second electrode having an outer diameter substantially equal to the outer diameter of the first electrode and an inner diameter greater than the reduced diameter of said end portion of the first electrode, the second electrode being disposed circumferentially of said end portion spaced radially therefrom and spaced axially of the first electrode with its outer surface substantially flush with the outer surface of the first electrode and an

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exposed face surface thereof substantially flush with the end surface of said end portion of the first electrode, a borosilicated glass insulator disposed between the two electrodes and having exposed surfaces substantially flush with the outer and end surfaces of said first electrode, conductive means comprising an annular member disposed against said face of the second electrode registering therewith and support means for said annular member spaced axially of said end portion of the first electrode to provide an electrical energy path to the second electrode thereby forming two sparking zones on said spark plug one of which is on said end portion of the first electrode and the other on the outer surfaces of the two electrodes.

3. In a low-tension surface discharge spark plug, in combination, a first substantially cylindrical tubular electrode provided with an end portion having a reduced diameter, an annular second electrode having an outer diameter substantially equal to the outer diameter of the first electrode and an inner diameter greater than the reduced diameter of said end portion of the first electrode, the second electrode being disposed circumferentially of said end portion spaced radially therefrom and spaced axially of the first electrode with its outer surface substantially flush with the outer surface of the first electrode and an exposed face surface thereof substantially flush with the end surface of said end portion of the first electrode, an insulator disposed between the two electrodes and having exposed surfaces substantially flush with the outer and end surfaces of said first electrode, conductive means comprising an annular member disposed against said face of the second electrode registering therewith and a conductor disposed axially of the first electrode provided with radially extending arms acting as support means for said annular member, the arms being spaced axially of said end portion of the first electrode to provide an electrical energy path to the second electrode thereby to form two sparking zones on the spark plug one of which is on said end portion of the first electrode and the other on the outer surfaces of the two electrodes.

4. A method of manufacturing low-tension spark plug inserts having two sparking zones which comprises, providing a first electrode having an end portion with a re-

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duced diameter and an annular second electrode having an outer diameter substantially equal to the outer diameter of the first electrode and an inner diameter greater than said reduced diameter, coating the end portion surfaces defining the reduced diameter with an insulating material composition of a viscous consistency comprising powdered glass, disposing the annular electrode circumferentially around the coated end portion of the first electrode, confining the two electrodes in a refractory fixture, treating the assembled electrodes with heat at a temperature in the order of 1470° F., and applying pressure on the second electrode while so confined to bond the insulating material to the electrodes and position the second electrode with its outer surface substantially flush with the outer surface of the first electrode and an exposed face of the first electrode substantially flush with the end face of said end portion of the first electrode.

5. A method of manufacturing low-tension spark plug inserts having two sparking zones which comprises, providing a first electrode having an end portion with a reduced diameter and an annular second electrode having an outer diameter substantially equal to the outer diameter of the first electrode and an inner diameter greater than said reduced diameter disposing the annular electrode circumferentially around said end portion of the first electrode, prior to disposing the annular electrode around said end portion coating the registering surfaces with an insulating material of a viscous consistency comprising powdered glass, confining the two electrodes in a refractory fixture, treating the assembled electrodes with heat at a temperature sufficient to melt and glaze the glass particles, and applying pressure on the second electrode while so confined to densify the insulating material and bond it to the electrodes and position the second electrode with its outer surface substantially flush with the outer surface of the first electrode and an exposed face of the first electrode substantially flush with the end face of said end portion of the first electrode.

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