

G. W. HENRICKS.
VACUUM SPARK AMPLIFIER.
APPLICATION FILED MAY 28, 1920.

1,406,858.

Patented Feb. 14, 1922.

FIG. 1

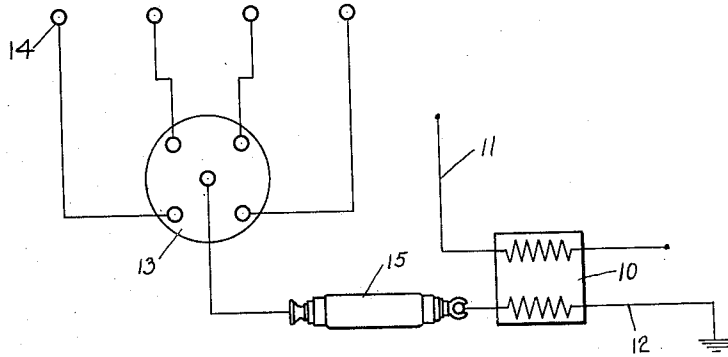


FIG. 2

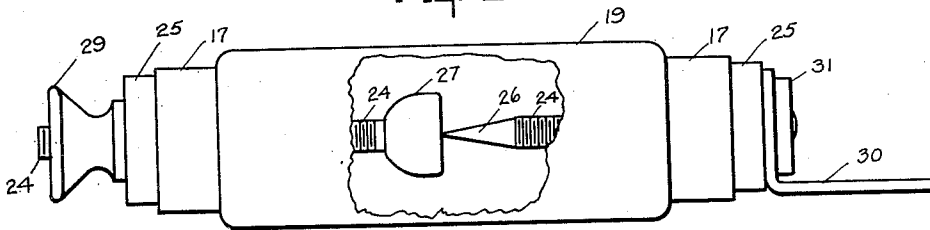
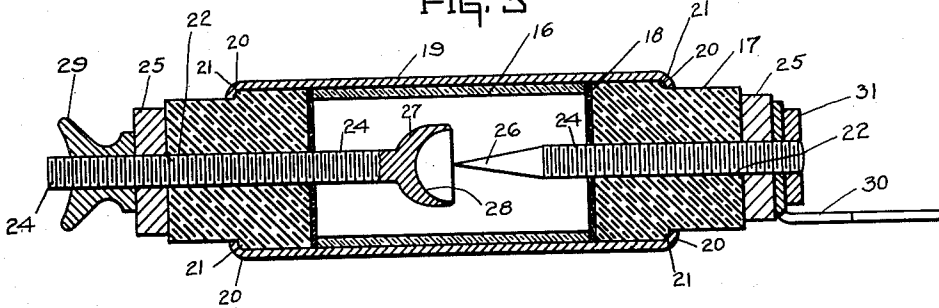


FIG. 3



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VACUUM SPARK AMPLIFIER.

1,406,858.

Specification of Letters Patent. Patented Feb. 14, 1922.

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To all whom it may concern:

Be it known that I, GARRETT W. HENRICKS, a citizen of the United States, and a resident of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Vacuum Spark Amplifier; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like numerals refer to like parts.

This invention relates to the ignition system of internal combustion engines and in particular to means for prolonging the use of imperfect and deteriorated spark plugs in the ignition system.

The chief object of this invention is to provide means associated with the ignition system to prevent leakage from the secondary of the spark coil of said system, whereby when the voltage is suddenly applied across the spark plug, the current at the spark plug will pass from terminal to terminal by means of the device rather than seek another path, such as through the punctured porcelain, the insulator, traces of carbon upon the insulator and condensate or moisture associated therewith, or accumulated thereon.

One feature of the invention is the provision of means whereby the formation of a partial vacuum in the amplifier is maintained therein which in turn prevents the oxidation of the electrodes.

Another feature of the invention consists in constructing the amplifier such that the position of the contact terminals may be adjusted within the amplifier.

A further feature of the invention consists in the hemispherical cup-shaped contact terminal within the amplifier.

The full nature of this invention will be understood from the accompanying drawings and the following description and claims.

In the drawings Fig. 1 is a diagrammatic view of the ignition system of a four cylinder internal combustion engine to which the invention has been applied. Fig. 2 is an enlarged side elevation of the invention, parts being broken away to show other parts in detail. Fig. 3 is a central cross sectional view of the amplifier showing the construction thereof in detail.

In the drawings 10 indicates the coil of

an ignition system of an internal combustion engine, 11 indicates the primary circuit and 12 indicates the secondary or ignition circuit proper. 13 indicates the distributing device, shown diagrammatically in Fig. 1, the terminals of which are connected to the spark plug indicated by the numeral 14 positioned in the cylinders of the engine in the usual manner. Between said coil 10 and the distributing device 13 of the ignition circuit is the master vacuum spark amplifier 15 embodying the features of the invention and included in series with said circuit. When the amplifier is positioned as shown but a single amplifying means is required for the ignition circuit.

The amplifier indicated by the numeral 15 in Fig. 1 is shown enlarged and in detail in Figs. 2 and 3. In said figures 16 indicates a cylinder of insulating material, preferably of gauge glass. Each end of the cylinder is closed by an insulating plug, end or closure member 17, the same being suitably secured to the insulating cylinder 16, such that an air tight joint is formed therebetween. The means for forming this air tight joint comprises a packing washer 18 of suitable material interposed between the circular end of the cylinder 16 and the adjacent end of the closure member 17. In the present instance the means for securing said closure member to said cylinder comprises a metallic sleeve member 19, the same being concentric with the insulating cylinder 16. The ends 20 of the cylinder 19 are turned inwardly to engage a flanged portion 21 formed upon each of the closure members 17. When thus turned inwardly said ends 20 serve to draw the closure members towards each other causing the washers to engage the ends of the insulating cylinder 16 so as to form an air tight joint between the several members mentioned.

Each of the closure members 17 is substantially cylindrical in form and extending axially through the same is an elongated threaded opening 22, each adapted to receive an elongated threaded electrode 24. In the present invention the electrodes are locked in the closure member by means of the nuts 25.

As shown clearly in Figs. 2 and 3 the electrodes 24 are dissimilar in form, one being pointed as at 26 and the other being cup-shaped as at 27, said cup having a substan-

tially hemispherical formation 28, the point 26 being adapted to be positioned at the center of the hemispherical cup. With the construction shown in Fig. 3 it will be understood that one or both of the electrodes 24 may be adjusted longitudinally of the closure member 17 and said members may be adjusted relative to each other such that the pointed end 26 will be positioned at the center of said hemispherical cup portion 28. Upon the outer end of each electrode 24 is positioned suitable terminal means, such as the knurled nut 29 and the contact terminal clip 30, the latter being secured to the electrode 24 by means of the nut 31. It will be understood that by the use of shellac or other suitable means a substantially air tight connection is secured between the insulating plug or closure member 17 and the electrode 24. Thus when the parts are secured in the assembled and adjusted positions and the current is passed from the terminal clip 30 through the amplifier to the nut 29, the oxygen is exhausted or burned out and a partial vacuum is formed within the insulating cylinder 16. Thus further oxidation of the contact point 26 or the cup 27 is substantially eliminated. Since in practice the spark will follow the path of least resistance from terminal to terminal, the hemispherical cup-shaped terminal end is adapted to receive the spark from the pointed contact 26 at any point upon its surface. Furthermore if two points were substituted for the construction illustrated, experiments show that one of said points would gradually wear away due to the action of the spark. To prevent this wearing away and to insure positive action of the amplifier at all times there is substituted for the proper pointed contact the

hemispherical cup-shaped contact 27, as shown.

The operation of the device is as follows: The introduction of the amplifier into the distributing circuit of an ignition system for an internal combustion engine introduces an air gap into said circuit which increases the resistance of said circuit and also changes the time relation between the current and the voltage of the circuit. By thus retarding the voltage or potential the current is prevented from seeking its way through a puncture in an insulator of a spark plug or through condensate or moisture formed within the spark plug or adjacent to the parts thereof.

With the device constructed as shown the electrodes can readily be adjusted to the potential of any make of coil included in the ignition circuit, which in turn permits the use of and the successful operation of many spark plugs which have been discarded for minor defects.

The invention claimed is:

1. In a spark amplifier for the ignition system of an internal combustion engine including a pair of separated electrodes, one of said electrodes being pointed and the other substantially cup-shaped.

2. A spark amplifier for the ignition system of an internal combustion engine, including a pair of separated electrodes, one of said electrodes being pointed and the other being hemispherical and cup-shaped, said pointed electrode being positioned substantially at the geometrical center of said hemispherical portion.

In witness whereof, I have hereunto affixed my signature.

GARRETT W. HENRICKS.