

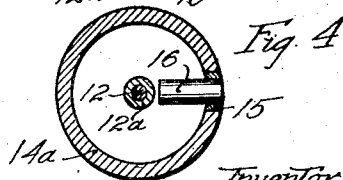
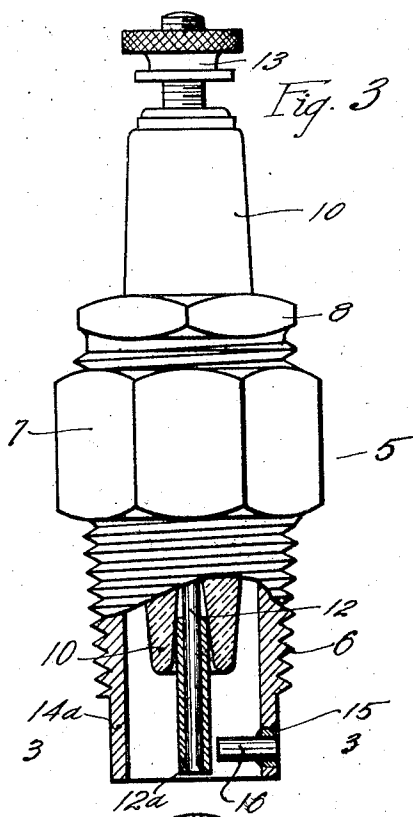
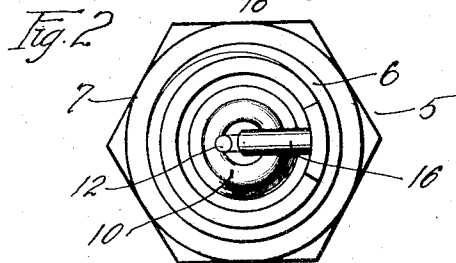
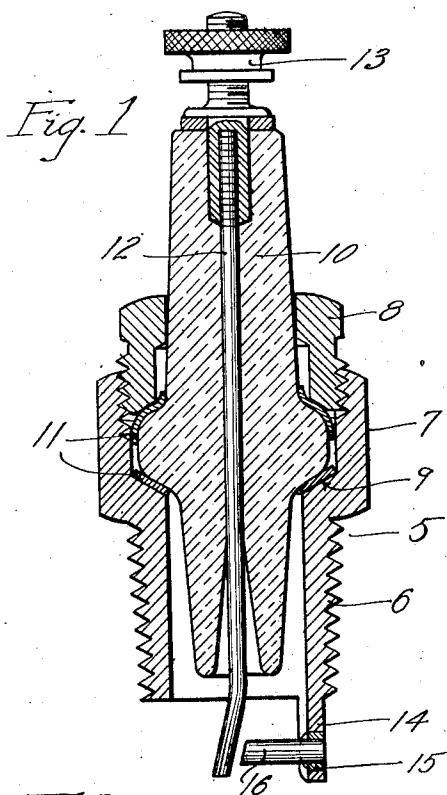
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J. W. GANTNER

SPARK PLUG

Filed April 9, 1925



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UNITED STATES PATENT OFFICE.

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SPARK PLUG.

Application filed April 9, 1925. Serial No. 21,789.

My invention relates to a spark plug for internal combustion engines. Generally speaking it is the object of the invention to provide a spark plug which will fire under conditions under which ordinary spark plugs fail; that is, when the spark electrodes and associated parts are more or less covered with oil or oil and carbon.

My improved spark plug is principally characterized by the fact that its grounded electrode, or electrode point, is in the form of a relatively small permanent magnet which is supported by or in the grounded shell of the plug in such a way that even after long continued service it does not lose its magnetism because of heating, or because of its association with other metal parts of less magnetic retentivity. I have found that this permanently magnetic grounded electrode, or electrode point, particularly when employed in connection with an insulated electrode of non-magnetic material, such as copper or brass, will cause a hot fat spark to pass between it and the insulated electrode when a proper high tension sparking current is applied to the plug in the usual manner,—this even though one or both of the electrodes may be covered with oil or oil and carbon to a degree sufficient to prevent the functioning of ordinary spark-plugs now in general use.

In the accompanying drawing,

Figure 1 is an axial sectional view of a spark plug embodying my invention;

Fig. 2 is a bottom plan view thereof;

Fig. 3 is a view partly in elevation, and partly in axial section, illustrating a slightly modified construction; and

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3 and looking in the direction indicated by the arrows.

Similar characters of reference refer to corresponding parts throughout the several views.

In the drawing, reference number 5 indicates the conventional hollow spark-plug shell or grounded electrode body, preferably formed of steel, which is provided with the portion 6 for screw-threaded reception in the spark-plug opening of an engine cylinder. The shell comprises the usual hexagonal nut-portion 7, which has threaded into its upper portion the usual externally threaded clamping bushing 8. Between the lower end of the bushing 8 and the internal

shoulder 9 of shell 5, is the enlarged central portion of the usual insulator 10, which is formed of porcelain, mica, or the like. Any suitable packing means, such as the metal gaskets indicated at 11, may be interposed between the insulator and the parts between which it is clamped and held. Carried by and extending through the insulator 10 is the usual insulated electrode 12, which, as is customary, is provided at its upper end with terminal means indicated at 13. The axial passage through insulator 10 flares at its lower end to permit adjustment of the lower end of the insulated electrode toward and away from the permanently magnetic grounded electrode point presently to be described.

As thus far described, the spark plug of my invention need not differ in any essential respect from various types of spark plugs now in general use, except that I prefer that the insulated electrode 12 shall be formed of a non-magnetic electricity-conducting material such as copper or brass.

Formed integral with the lower end of the steel shell 5 is a lug 14 having a transverse bore in which a bushing 15 of good heat-conducting non-magnetic material has a snug driven fit. Bushing 15 is conveniently formed of copper or brass. At 16 is illustrated a relatively small and preferably cylindrical piece of magnetized high-speed steel, one end of which has a snug driven fit in the aforesaid non-magnetic bushing 15. The other end of the small permanent magnet lies adjacent to, but spaced from, the lower end of the cooperating electrode 12, the end face of the magnet which is presented to the electrode 12 preferably being formed oblique to the axes of both the magnet and the insulator 10. The spark gap is adjusted by moving the lower end of electrode 12 toward and away from the aforesaid oblique end face of the magnet.

The construction illustrated in Figs. 3 and 4 need differ from the construction shown in the preceding figures only in some or all of the following respects: The insulated electrode of Figs. 3 and 4 is conveniently formed of steel, but has its lower end covered by a non-magnetic sleeve 12^a of copper or brass. In this modification the magnet-supporting heat-conducting non-magnetic bushing 15 is carried in an annulus or skirt 14^a, which is integral with and constitutes the lower ex-

tremity of the steel sleeve 5. In this embodiment of my invention, the end face of the magnet which lies adjacent the sleeve 12^a occupies a plane normal to the axis of the magnet.

As hereinbefore stated the magnetic grounded electrode, or electrode point, greatly improves the operation of the plug, affording a good fat spark under all operating conditions, even when the electrodes and associated parts of the spark plug are more or less covered with oil, or oil and carbon. Since, in my construction, the sleeve 15 and the portion of the insulated electrode which lies adjacent to the small permanent magnet, are formed of non-magnetic material, there is practically no tendency for the small magnet 16 to lose its magnetism, notwithstanding its rather close association with metal parts of less magnetic retentivity. While sleeve 15 is non-magnetic, it is a good conductor of heat, as a result of which the temperature of the magnet 16 is never substantially in excess of the temperature of the shell 5 and the wall of the engine cylinder by and in which said shell is carried. Under normal operating conditions, the magnet 16 never attains a temperature approaching red heat. A high speed steel magnet is not materially affected by any temperature less than a red heat. Consequently it follows that the magnet 16, which is adapted to be kept cool by the medium which cools the engine cylinder, does not lose its magnetism due to any heating incidental to normal engine operation.

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

1. A spark plug comprising insulated and grounded electrodes, the grounded electrode comprising a point in the form of a small permanent magnet presented to and spaced from the other electrode.

2. A spark plug comprising insulated and grounded electrodes, the grounded electrode carrying as a part thereof an electrode point in the form of a small permanent magnet presented to and spaced from the other electrode, and non-magnetic means spacing the permanent magnet from the other parts by which it is carried.

3. A spark plug comprising insulated and grounded electrodes, the insulated electrode having a non-magnetic spark-emitting extremity, said grounded electrode comprising an electrode point in the form of a small permanent magnet presented to and spaced

from the said spark-emitting extremity of the insulated electrode.

4. A spark plug comprising a first or grounded electrode in the form of a shell adapted to be fitted into an engine cylinder, a second electrode carried by and insulated from the first electrode, an electrode point for said grounded electrode in the form of a small permanent magnet presented to and spaced from the second electrode, and a bushing of non-magnetic heat-conducting material by means of which said magnet is supported by and in the grounded electrode.

5. A spark plug comprising a first or grounded electrode in the form of a steel shell adapted to be fitted into an engine cylinder, a second electrode carried by and insulated from the first electrode, and having at least its spark-emitting portion formed of non-magnetic material, an electrode point for said grounded electrode in the form of a small permanent magnet presented to and spaced from the second electrode, and a non-magnetic bushing of heat-conducting material by means of which said permanent magnet is rigidly supported by and in said steel shell.

6. A spark plug comprising a steel shell adapted to be fitted into an engine cylinder and to constitute a grounded electrode, a second electrode carried by said shell and insulated therefrom, a non-magnetic metallic bushing fitted into the wall of said shell adjacent its lower extremity and a permanent magnet received within said bushing and spaced thereby from the said shell, whereby the magnetism in said permanent magnet cannot be transmitted to said steel shell and dispersed thereby.

7. A spark plug comprising a metallic shell, an electrode mounted within said shell in spaced and insulated relation thereto for carrying a high tension current, a second electrode comprising a permanently magnetized pin projecting interiorly from said metallic shell, a non-magnetic metallic bushing fitted in the said shell adjacent its lower edge adapted to seat said magnetized pin whereby the cooling effect on the engine cylinders and metallic shell is conducted thereto to prevent overheating, while at the same time dispersion of the magnetic effect of said pin to said metallic shell is prevented by said non-magnetic bushing.

In witness whereof, I hereunto subscribe my name this 6th day of April, 1925.

JOHN W. GANTNER.