

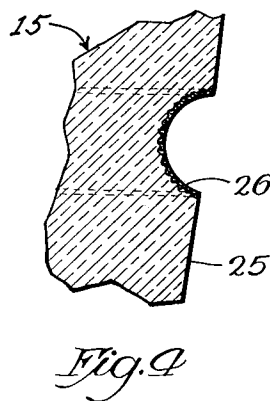
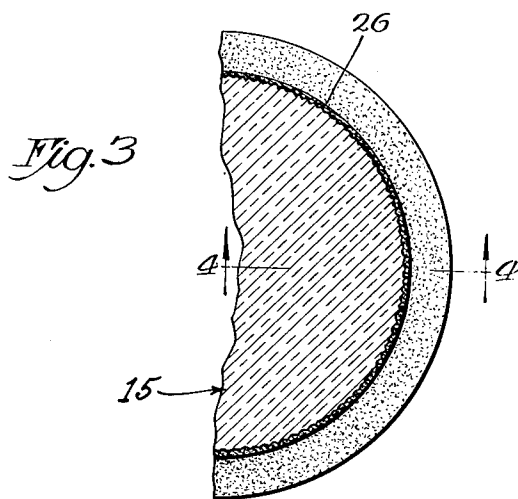
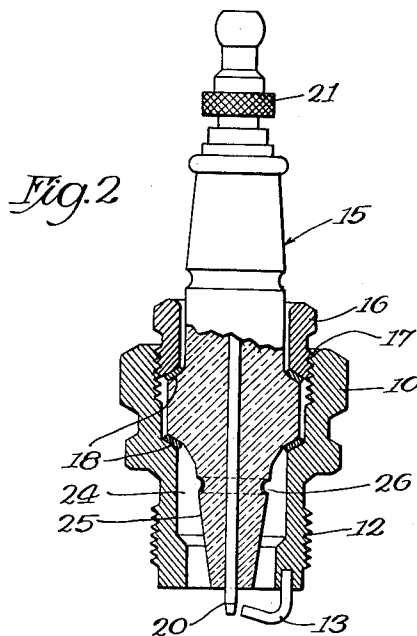
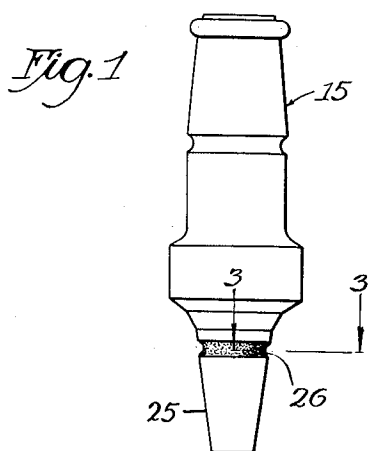
Aug. 30, 1938.

A. M. FAIRCHILD

2,128,457

SPARK PLUG

Filed Dec. 14, 1936



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UNITED STATES PATENT OFFICE

2,128,457

SPARK PLUG

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Application December 14, 1936, Serial No. 115,707

7 Claims. (Cl. 123-169)

My invention relates to spark plugs for use in internal combustion engines.

It is not uncommon for spark plugs of the usual type to become fouled with carbon, especially when a poor grade of motor fuel is employed, or when the carburetor is improperly adjusted, etc. Such fouling results in short circuiting of the spark plug, thus reducing the power of the motor.

In Harding Patent No. 1,275,020, patented August 6, 1918, there is disclosed a spark plug containing a ceramic catalyst which is said to function to produce flameless catalytic combustion of part of the explosive vapor and thus keep the parts, especially the insulator, free from deposits of carbon.

An object of my invention is to provide an improved spark plug having a catalyst which will function to prevent the deposition of carbon and consequent short circuiting of the plug.

A further object is to devise such a device which will utilize a substantially standard form of spark plug, modified only slightly and at very little expense, in order to accomplish the objects of my invention.

In accordance with a preferred embodiment of my invention, in a spark plug comprising a core portion and a shell portion, I provide a continuous zone of catalytic material on the surface of the insulator and spaced from the electrodes or sparking points and integral with the insulator, so that said points can never be short circuited. This zone is in the porcelain core and may be formed in various ways, as described in more detail below.

Referring now to the drawing forming a part of this specification and illustrating a preferred embodiment of my invention,

Fig. 1 is a plan view of the core element of a spark plug embodying my invention,

Fig. 2 is a similar view of a complete spark plug embodying my invention, parts of the same being shown in longitudinal section,

Fig. 3 is a transverse half section taken substantially long the line 3-3 of Fig. 1, and

Fig. 4 is a fragmentary sectional view taken substantially along the line 4-4 of Fig. 3.

Although I have illustrated my invention as applied to a particular design of spark plug, it will be understood that said invention is applicable to various other designs and constructions.

In the embodiment shown, there is a substantially cylindrical shell portion 10 which is externally screw threaded as at 12 for threaded engagement in a cylinder of an internal combustion engine. Said shell portion is usually formed of a

metal which is a good electrical conductor, thus serving to ground the parts electrically when screwed into the cylinder. Seated in the end of the shell 10 is an electrode or sparking point 13.

Seated within the shell 10 is a core element or insulator 15 which may be formed of porcelain or other suitable insulating material. Said element may be retained in shell 10 by means of a nut or bushing 16, the latter being threaded into the shell as at 17, and suitable expansion rings being provided as at 18, 18. An electrode 20 is seated in the core element 15 and arranged axially thereof, said electrode 20 being electrically connected to a terminal 21, whereby an electrical conductor from a source of electricity may be attached.

The core element 15 is tapered adjacent the exposed or sparking end of electrode 20 to provide a substantially frusto-conical portion 25, defining a channel 24 between the core and shell. It will be apparent that this portion of the insulator may have other shapes. On the outer surface of portion 25 of the insulator I provide an annular zone 26 of catalytic material capable, when heated, of producing flameless catalytic combustion of a portion of the combustible vapor introduced into the cylinder.

The catalytic material to which I refer belongs to a class which is well known and is described in Harding Patents 1,275,020, dated August 6, 1918; 803,534, dated October 31, 1905, and 1,067,983, dated July 22, 1913. Said catalytic structures are composed principally of the rare earth metals, such as thorium, uranium, etc., or oxides thereof, together with a member or members of the platinum group. The preparation of such catalytic material is well known to those skilled in the art.

In the manufacture of spark plugs embodying my invention, it is my object, as stated above, to apply a continuous zone of catalytic material without deviating substantially from standard plug design. I accordingly apply said catalytic material in the form of a solution of the chloride or nitrate of the desired elements to the plug, as by painting or otherwise applying the same, preferably on the frusto-conical stud portion 25 of the core 15, as indicated at 26.

I have found that the catalytic solution adheres best to the core and makes a firmer bond therewith if the surface of the core is abraded so as to provide a more or less toothed surface. It appears that the solution penetrates into the ceramic material to a slight extent, said solution carrying the catalytic salts which thus impregnate the ceramic body. However, whether or

not there is any actual penetration is immaterial, the important point being merely that the catalytic material does obtain an improved footing by reason of the roughing or grinding of the surface. In the embodiment shown, the stud portion 25 is ground away to a slight extent to provide an annular groove of slight depth and the catalytic solution is applied to said groove as shown at 26. After the catalytic solution has been applied as described above, the material is hydrated by exposure to NH_3 gas, the liquid is evaporated off and the article is then fired at a relatively high temperature, say about 2600 degrees F., in order to convert the salts into the metallic state, and the article is then ready for use.

The action of my improved spark plug is as follows: When a charge of fuel is introduced into the cylinder a portion thereof enters the space between the stud portion 25 of the core 15 and the shell 10. A portion of said fuel may be compounds of relatively high molecular weight which are not completely combustible under the normal temperatures and other operating conditions present in the cylinder, and, being slow moving due to the dead end of said space, normally tend to deposit carbon therein, which would eventually short circuit the spark plug. The catalytic zone 26 tends to produce flameless catalytic combustion within the channel 24, thus scavenging said products out of said space. At any rate, it is found that plugs embodying my invention do not become fouled with carbon and thus have a much longer effective life than ordinary spark plugs.

I may apply the coating 26 of catalytic material in one or several coats or applications. In some cases, I find that the material makes a firmer bond with the ceramic material when a base coat is applied and dried and another coat then applied.

Various other changes coming within the spirit of my invention may suggest themselves to those skilled in the art and hence I do not wish to be limited to the specific forms shown or uses mentioned, except to the extent indicated in the appended claims, which are to be interpreted as broadly as the state of the art will permit.

I claim:

1. A spark plug insulator having an integral

annular zone of catalytic material for preventing deposition of carbon, said zone being spaced a substantial distance from the electrode end of said insulator.

2. A spark plug insulator having a stud portion with an electrode projecting therefrom, said portion being provided with a continuous peripheral roughened area and said area being impregnated with rare earth catalytic substances capable of preventing the deposition of carbon.

3. A spark plug insulator having a stud portion with an electrode projecting therefrom, said portion being provided with an annular groove bearing catalytic substances capable of preventing deposition of carbon, said groove being spaced a substantial distance from both ends of said stud portion.

4. The method of producing an article of the class described, comprising abrading the surface of a spark plug insulator to provide an annular zone thereon, and applying to said zone a catalytic substance in the form of a solution whereby said insulator becomes impregnated with said substance.

5. A spark plug insulator having a catalytic zone of radio-active elements integral with said insulator and spaced a substantial distance from the electrode end thereof, said zone serving to scavenge the slow moving gases by breaking up and eliminating from the surface of said insulator by catalysis the carbon forming unburned gaseous compounds.

6. A spark plug insulator having a stud portion with an electrode projecting therefrom, said portion being provided with a continuous peripheral roughened area and said area being impregnated with rare earth catalytic substances capable of preventing the deposition of carbon, said area being spaced a substantial distance from the electrode end of the insulator.

7. A spark plug insulator having a catalytic zone of radio-active elements impregnating a continuous peripheral roughened area spaced a substantial distance from the electrode end of said insulator, said zone serving to scavenge the slow moving gases by breaking up and eliminating from the surface of said insulator by catalysis the carbon forming unburned gaseous compounds.

Alice M. Fairchild.

CERTIFICATE OF CORRECTION.

Patent No. 2,128,457.

August 30, 1938.

Alice M. Fairchild.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 44, for "long" read along; and second column, line 50, for "care" read core; page 2, second column, line 45, claim 7, for the article "a" read to; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of October, A. D. 1938.

Henry Van Arsdale

(Seal)

Acting Commissioner of Patents.