

Oct. 15, 1935.

A. E. ANDERSON

2,017,364

SPARK PLUG WITH SUPPORTED GAP

Filed Aug. 3, 1934

Fig. 1.

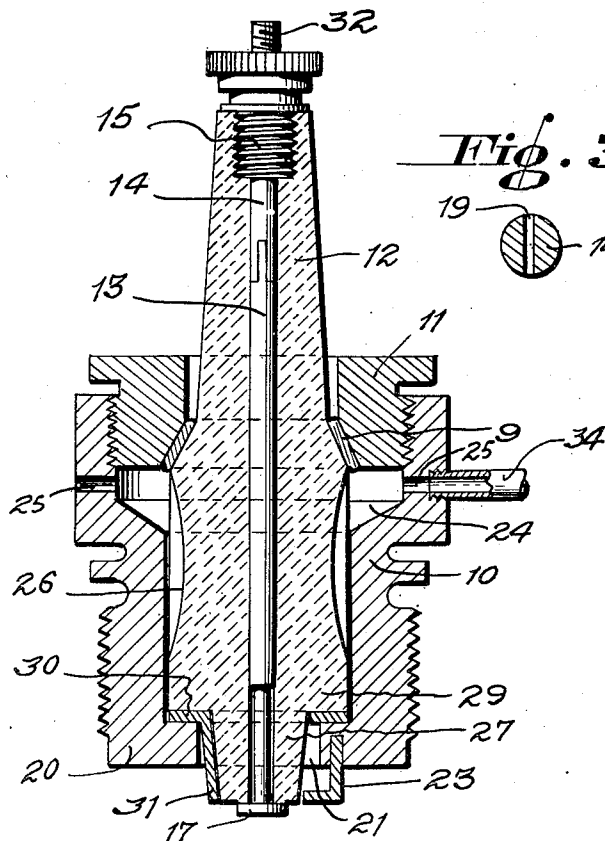


Fig. 2.

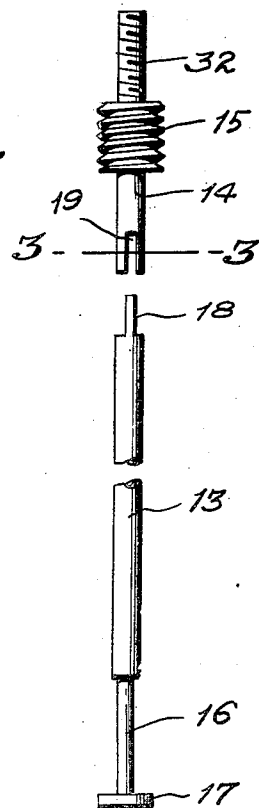


Fig. 3.



Fig. 4.

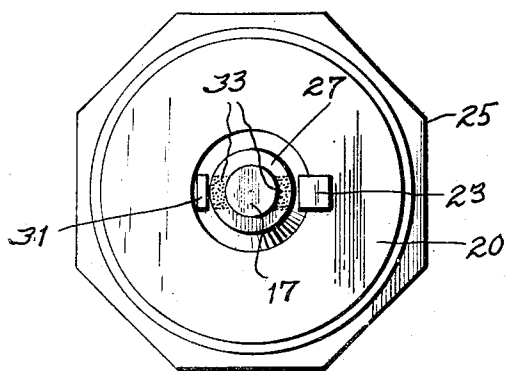
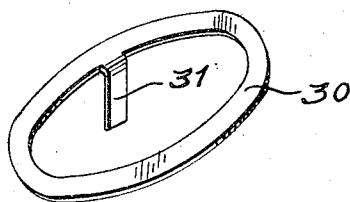


Fig. 5.



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2,017,364

SPARK PLUG WITH SUPPORTED GAP

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Application August 3, 1934, Serial No. 738,345

4 Claims. (Cl. 123—169)

This invention relates to spark plugs for internal combustion engines, and more particularly is an improvement upon the device and construction described in my Patent No. 1,905,957, patented April 25, 1933.

One object of my invention is to provide a moderate deposit of carbon on the electrodes and I have made extensive tests to prove that this is not a detrimental factor to the good performance of a spark plug, as some manufacturers and inventors assume, and therefore have taken precaution to keep the electrodes free from carbon, thereby weakening the electrodes to a point of preignition, from poorly constructed and devised electrodes which preignition is very damaging to an internal combustion engine, sometimes proving fatal.

In my drawing and specification a good construction of electrodes is described and shown for collecting a medium amount of carbon which is a good sign that they are free from preignition, and that the carbon so collected has a value in cutting down the resistance in my supported spark gap, thereby giving a hotter spark and longer life to the electrodes and spark plug itself. There is no danger of the collected carbon on the electrodes making a short or close circuit in the spark gap, as the electrical action of the spark will burn away any excess of such deposits in the gap.

Tests have been made by putting my novel spark plug with supported gap in parallel with other makes of spark plugs and this has proved my plug to have a full, fat spark at all times, while there was not a sign of any sparks from the other spark plugs so tested in parallel with mine.

Another object of my invention is to cool the inner middle portion of the spark plug. This is accomplished by furnishing an open space between the insulator or porcelain and the housing with suitable vents in the latter for circulating cooling air around the porcelain. Water or other liquid may also be used for this purpose, when pipe connection to the vents from a suitable source is provided.

By collecting a medium amount of carbon on the electrodes, the carbon so collected will cut down the resistance in the electrical current, thereby eliminating certain radio interferences in radio equipped cars. I have found that a medium amount of collected carbon with my novel arrangement of the spark gap, has proved to be of such good advantage that it is not necessary to equip a car with the usual suppressors or shielding of the wires, that cars equipped with conventional spark plugs must have.

Still another object is to design the central or main electrode in such a way that when assembling the same into the porcelain insulator, time

will be cut to a minimum and the porcelain cement will be more evenly distributed along the full length of the electrode thereby making a good gas-tight assembly.

A further object of the arrangement of the main electrode head in conjunction with the supported porcelain gap is that the center porcelain surrounding the central electrode may be made of greater dimensions and still retain the proper size gap, depending upon the size of the main electrode head, which is enlarged and forms one of the spark points. The ground electrode may be the usual hooked one secured in the metal housing or else made in the form of a gasket with a bent down spark point. Both may be used together.

I prefer to provide a gasket placed at the lower end, or at the hottest part of the insulator to prevent the porcelain from cracking and carrying the heat to the shortest cooling path. And I also find that the compression leak becomes less by placing a gasket in this manner.

Another object is to construct a central electrode with a smaller diameter at the point where the smallest part of the porcelain is located, and the heat is the greatest. A central electrode constructed in this manner as shown in the drawing will prevent the porcelain from cracking at this point. By placing a gasket at the lower end of the insulator makes it possible to construct the porcelain in a fashion so as to leave a space for air circulation around the inner part of the porcelain insulator, thereby cooling the same.

With a gasket at the lower end of the porcelain insulator, the same may serve as ground electrode with a spark point made integral therewith as above described and shown on the drawing, thereby eliminating the conventional grounded electrode secured in the lower part of the spark plug housing.

A very important object of my spark plug with supported gap is that the action of the electrical current traveling on top of the porcelain or insulated support and across the gap between the points of the electrodes, places a deposit of a non-conducting substance forming a path that when mixed with the compressed gas charge, has a tendency to materially help to produce a hotter spark with less resistance. This feature cannot be produced with any other conventional type of spark plug with an open non-supported gap.

My invention is illustrated in the accompanying drawing in which:

Figure 1 shows a longitudinal, axial section of my spark plug;

Fig. 2 a detail in larger scale of the central electrode;

Fig. 3 a transverse section along 3—3 of Fig. 2;

Fig. 4 an end view of the lower portion of the

spark plug with two spark points and spark gaps, and

Fig. 5 is a perspective view of the combined gasket and ground electrode spark point.

In the drawing reference numeral 10 represents the metal housing with a securing nut 11 threaded therein to hold the dielectric or porcelain insulator 12 in position therein. A metal gasket 9 is inserted between the nut and a shoulder formed on the porcelain. The lower end of the porcelain is seated on an annular ledge 20 formed at the threaded lower or inner end of the housing 10 with a metal gasket 30 inserted between them. It will thus be seen that the porcelain is held firmly between the two gaskets 9 and 30 when the nut 11 is tightened down.

The porcelain 12 terminates with a sleeve or skirt 27 projecting below the ledge 20 of the housing. Between the ledge 20 and the skirt 27 is formed an annular space or groove 21 for cooling the skirt.

The central or main electrode, as best seen in Fig. 2 is formed by two metal rods 13 and 14 which, when assembled, fit in the axial bore formed through the entire length of porcelain 12. The upper or outer end of the electrode portion 15 is threaded in the porcelain and terminates with a smaller thread shank 32 for attaching the wire. The cylindrical inner end of the electrode portion 14 is bifurcated or provided with a longitudinal slit 19 adapted to receive the flattened tongue 18 on the upper end of the other electrode portion 13. When assembling the electrode 13, 14 in the base of the porcelain, cement is first poured in from the threaded end of the bore and the main electrode portion 14 screwed down tight therein. The portion 13 is thereupon pushed up in the bore until the tongue 18 engages the slit 19 and the enlarged head 17 abuts against the end of the sleeve or skirt 27. The cement will then surround the electrode in the bore and particularly fill in the space around the constricted part 16 thereof to hold it firmly in place. Any excess cement around the head 17 is thereupon scraped off. This head is smaller in diameter than the end of the skirt 27, so as to form the supported insulated gap between ground and central electrode as in Fig. 4.

The ground electrode 23 may in the usual manner be secured in the end of the housing 10 as indicated in Fig. 1, but my preferred construction is best shown in Fig. 5, where the ground electrode is constituted by the gasket 30 with the spark point 31 as a finger bent down from the inner edge of the metallic gasket 30 which is held in position against the ledge 20 by the end 29 of the porcelain, when the parts are assembled. Both spark points 23 and 31 may be used together as seen in Fig. 1. They preferably abut against the side of the skirt but do not project beyond its end.

It should be noted that the end 29 of the porcelain substantially fills the space above the ledge 20 in order to firmly hold the porcelain in the housing.

At 24 an air chamber is formed in the housing 10 around the porcelain 12 communicating with the atmosphere through apertures 25 in the side of the housing 10. By diminishing the diameter of the porcelain below this chamber, or by furnishing longitudinal grooves as at 26, the cooling air can circulate around the greater portion of the body of the porcelain. In the event of the use

of liquid cooling medium a suitable conduit from the source to the vents or apertures 25 may be utilized, as for instance by pipes 34.

When the current is on, a small deposit of carbon, as at 33, Fig. 4, forms in the spark gap on the exposed end of the skirt 27 of the porcelain, between the central electrode head 17 and the ground electrode points 23 and 31 respectively. Any excess of such deposit is consumed during the explosions. This deposit of carbon provides a rough surface or path in the spark gap which has the function of reducing the resistance between the electrodes. It should be noted that the spark points 23 and 31 substantially contact with the free end of the porcelain skirt without any open space between them. This construction helps in cutting down interference in radio equipped cars.

It should be understood that my invention is not limited to the detail and construction here shown and disclosed but that those may be varied widely without departing from the spirit of the invention as defined by the claims.

I claim:

1. In a spark plug having a metal housing member, an insulator core member seated therein, main and ground electrodes, an annular ledge at the inner end of said housing member forming a seat for said insulator core member and a metal gasket between the core member and the ledge, a skirt forming an axial extension on the inner end of said core member and extending beyond the end of said housing member, a bore being provided through the core member and said skirt, the main electrode being mounted in said bore, an enlarged head on the main electrode seated against the end of said skirt, the main electrode being constituted by two rods adapted for assembling in said bore from opposite ends of the core member and provided with interengaging elements at their juncture and being cemented in position in said bore, a projection on said gasket terminating substantially level with said head and forming a horizontal spark gap therewith.

2. In a spark plug having a metal housing member, an insulator core member seated therein of substantially cylindrical shape with a flat shoulder at its inner end, a tapering skirt forming an axial extension from said shoulder and extending beyond the end of said housing member, a bore being provided through the core member and the skirt, a main electrode mounted in said bore, an enlarged head on the main electrode seated against the end of said skirt but being flat faced and of smaller diameter than the skirt, an annular flat faced ledge at the extreme inner end of said housing member forming a seat for said shoulder, and a compressible, flat metal gasket between said shoulder and the ledge and provided with a spark point adapted to give a horizontal spark gap with said head.

3. A spark plug according to claim 2, in which said spark point is constituted by a finger bent down from the inner edge of said gasket and terminating substantially level with said head.

4. A spark plug according to claim 2, in which a cooling chamber is provided in said housing member and communicating with a recessed portion in the core member and extending substantially to said gasket, and an annular space between the ledge and the skirt.

AUGUST EUGENE ANDERSON.