

# United States Patent

Scherenberg

[15] 3,680,538

[45] Aug. 1, 1972

[54] SPARK PLUG FOR INTERNAL  
COMBUSTION ENGINES

[72] Inventor: Hans O. Scherenberg, Stuttgart-Heumaden, Germany

[73] Assignee: Daimler-Benz Aktiengesellschaft, Stuttgart-Unterturkheim, Germany

[22] Filed: Feb. 19, 1970

[21] Appl. No.: 12,632

[30] Foreign Application Priority Data

Feb. 22, 1969 Germany .....P 19 08 971.5

[52] U.S. Cl. ....123/169 PB, 123/8.09, 123/8.11,  
313/11.5

[51] Int. Cl. ....F02p 1/00, F02b 53/00

[58] Field of Search .....123/169; 128/8.09, 8.11

[56] References Cited

UNITED STATES PATENTS

1,099,365 6/1914 Henderson .....123/169  
1,432,214 10/1922 Sperry .....313/11.5

1,290,780	1/1919	Radtko.....	123/169 PB
1,364,262	1/1921	Faber.....	313/11.5
1,430,964	10/1922	Faber.....	313/11.5
1,662,724	3/1928	Tansill.....	123/169
1,667,960	5/1928	Theis.....	174/162
3,155,085	11/1964	Jones et al. ....	123/169

FOREIGN PATENTS OR APPLICATIONS

732,674	6/1932	France.....	313/11.5
139,632	11/1933	Germany .....	313/11.5

Primary Examiner—Laurence M. Goodridge

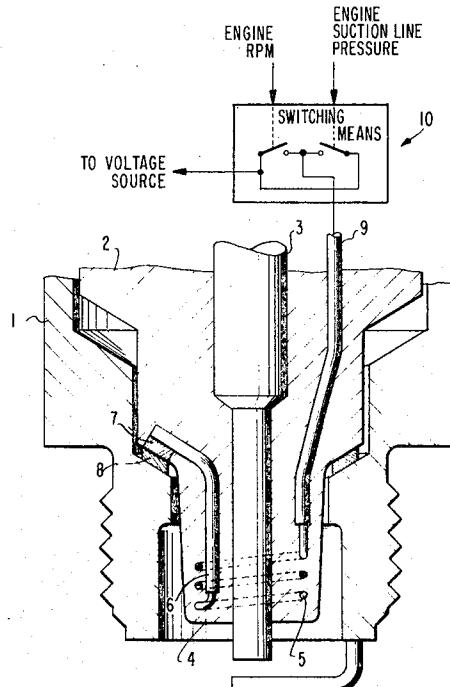
Assistant Examiner—Ronald B. Cox

Attorney—Craig, Antonelli and Hill

[57] ABSTRACT

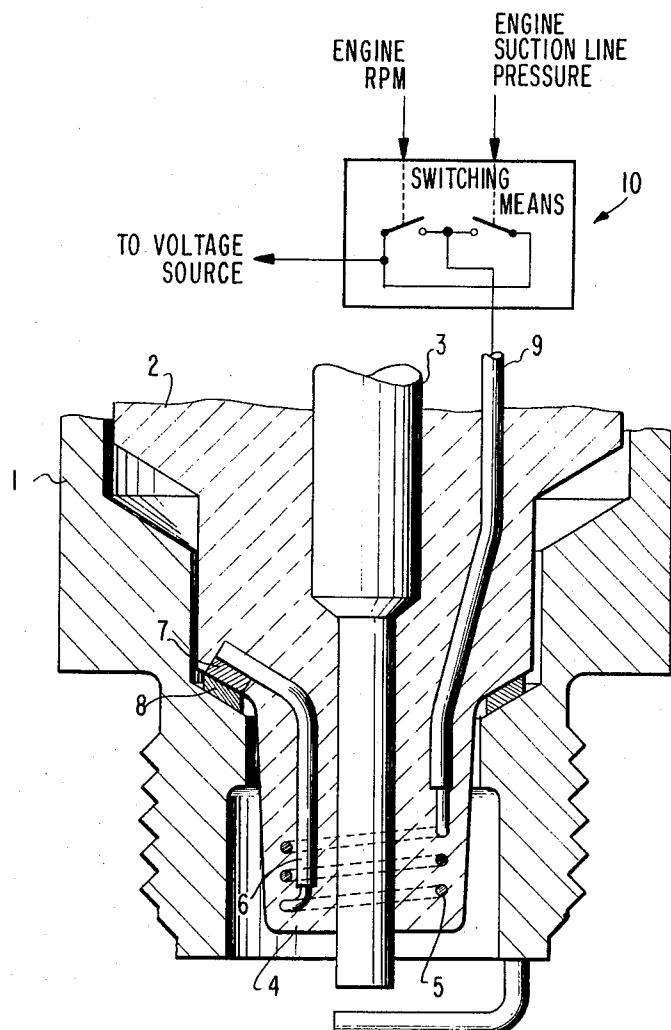
A spark plug for an internal combustion engine, especially for rotary piston internal combustion engines of trochoidal construction, in which the end of the insulating body surrounding the center electrode which faces ignition, is adapted to be heated to achieve self-cleaning under all operating conditions.

8 Claims, 1 Drawing Figure



PATENTED AUG 1 1972

3,680,538



INVENTOR  
HANS O. SCHERENBERG

BY  
Craig, Antonelli, Stewart & Hill  
ATTORNEYS

## SPARK PLUG FOR INTERNAL COMBUSTION ENGINES

The present invention relates to a spark plug for internal combustion engines, especially for rotary piston internal combustion engines of trochoidal construction, with an insulating body surrounding the center electrode and arranged in a spark plug housing.

All attempts to find for rotary piston internal combustion engines of trochoidal construction a spark plug which satisfies all requirements have proved unsuccessful heretofore. This is primarily due to the fact that with these internal combustion engines, an ignition takes place during each rotation of the eccentric shaft, that no fresh gas scavenging occurs and that the spark plug cannot be cooled by gas sweeping past the same. Additionally, the temperature of the housing part, in which the spark plug has to be arranged set-back, is higher than, for example, the temperature in the cylinder head of a reciprocating-piston internal combustion engine. If now the construction of a spark plug for a rotary piston internal combustion engine is so designed that the spark plug has a sufficient length of life and satisfies all requirements at high rotational speeds and in the full load range, its insulating body does not reach a temperature at lower rotational speeds and in the lower partial load range that suffices for a self-cleaning of the spark plug. The consequence thereof is that deposits form at the end of the insulating body on the ignition side thereof stemming from the fuel and from the lubricating oil which impair a proper and orderly functioning of the spark plug. Especially during the operation of the internal combustion engine in a motor vehicle in city traffic, a coating of lead stemming from the lead tetraethyl in the fuel forms at the insulating body which in a relatively short time leads to a shunt or leakage connection, causes misfirings and leads to a complete failure of the spark plug.

The present invention is predicated on the aim to eliminate the aforementioned shortcomings. The underlying problems are solved according to the present invention in that means are provided at the spark plug in order to heat the end of the insulating body on the ignition side thereof. As a result of the heating, the insulating body can be brought to a temperature during starting operations or during drives in city traffic at which a deposit of especially lead no longer takes place. The spark plug remains fully operative in its function.

In an advantageous construction of the present invention, a glow or heating wire spiral may be arranged in the insulating body within the area of the ignition end, by means of which takes place the heating of the insulating body. Furthermore, switching means may be provided, by means of which the glow or heating wire spiral is energized or turned on in dependence on the rotational speed and on the load of the internal combustion engine at lower rotational speeds or at a high vacuum.

Accordingly, it is an object of the present invention to provide a spark plug for internal combustion engines, especially for rotary piston internal combustion engines of trochoidal construction, which avoids in a simple and operationally reliable manner the aforementioned shortcomings and drawbacks.

Another object of the present invention resides in a spark plug for rotary piston internal combustion en-

gines which assures proper operation and self-cleaning under all driving conditions inclusive starting and city traffic.

A further object of the present invention resides in a spark plug for internal combustion engines, especially for rotary piston internal combustion engines of trochoidal construction which minimizes the danger of harmful deposits at its end exposed to ignition.

Still a further object of the present invention resides in a spark plug for internal combustion engines, especially for rotary piston internal combustion engines of trochoidal construction which excels by relatively long length of life.

These and further objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing, which shows, for purposes of illustration only, one embodiment in accordance with the present invention, and wherein:

The single FIGURE is a partial longitudinal cross-sectional view through a spark plug in accordance with the present invention.

Referring now to the single FIGURE of the drawing, reference numeral 1 indicates the spark plug housing, within which is arranged the insulating body 2 that surrounds the center electrode 3. In order to be able to increase the temperature of the insulating body 2 during the starting operations or during partial load operation of the internal combustion engine for which the spark plug is intended, a glow or heating wire spiral 5 is arranged in the ignition end 4 of the insulating body 2. This heating wire spiral 5 which has several windings or turns, is connected, on the one hand, by means of the electrically conductive connecting rail 6 and the contact body 7 connected therewith by way of the metallic seal 8 for the insulating body 2 with the spark plug housing 1 and is connected, on the other, by way of the electrically conductive connecting rail 9 with a current source. Switching means illustrated only schematically and generally designated by reference numeral 10 are provided, which are of any conventional construction, and by means of which the current supply to the heating wire spiral 5 is engaged automatically only when the internal combustion engine rotates at low rotational speeds or if a higher vacuum prevails in the suction pipe or intake manifold of the internal combustion engine, i.e., if the temperature at the spark plug drops below the self-cleaning temperature. With increasing rotational speed or decreasing vacuum, the switch means automatically interrupt the current supply to the heating wire spiral 5. Since such switching means are known, per se, in the prior art and form no part of the present invention, a detailed showing and description thereof is dispensed with.

While I have shown and described only one embodiment in accordance with the present invention, it is obvious that the same is not limited thereto but is susceptible of numerous changes and modifications as known to those skilled in the art, and I therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. A spark plug arrangement for internal combustion engines, especially for engines of the type utilizing rotary pistons of trochoidal constructions; said arrangement comprising: spark plug housing means, an insulating body arranged in said housing means, a spark plug center electrode arranged in said insulating body and having an ignition end extending out of said insulating body, electrical heating means in said insulating body for heating the insulating body, air pressure detecting means for detecting engine air suction line pressure, engine speed detecting means for detecting the rotative speed of the engine, first switch means responsive to said air pressure detecting means so as to close when said pressure is in a predetermined range, second switch means responsive to said engine speed detecting means so as to close when said engine speed is in a predetermined range, and actuating means responsive to the closing of either of the first or second switch means for actuating the heating means, whereby sufficient heating of the spark plug is provided to assure self-cleaning thereof during partial load conditions.

2. A spark plug arrangement according to claim 1, characterized in that the spark plug is arranged in the housing of a rotary piston internal combustion engine of trochoidal construction.

3. A spark plug arrangement according to claim 1, characterized in that said heating means includes to a heating wire spiral embedded within the insulating body within the area of the ignition end thereof.

4. A spark plug arrangement according to claim 3, characterized in that said first switch means closes at a relatively high vacuum compared to normal engine

operation and said second switch means closes at a relatively small rotational speed compared to normal engine operation.

5. A spark plug arrangement according to claim 1, characterized in that said heating means includes a heating wire spiral arranged in and surrounded by the insulating body within the area of the ignition end thereof, with said heating wire spiral disposed in said insulating body radially outwardly from its inner surface surrounding said central electrode and radially inwardly of the outer surfaces thereof to assure good heat transfer between said wire and said insulating body.

6. A spark plug arrangement according to claim 1, characterized in that the heating means includes a heating wire spiral adapted to be connected with a voltage source by way of a metallic seal means between the insulating body and the housing means, and in that both said spark plug housing and said insulating body are provided with complementary inwardly and 20 downwardly inclined shoulder surfaces with the metallic seal means disposed therebetween.

7. A spark plug arrangement according to claim 5, characterized in that the heating wire spiral is adapted to be connected with a voltage source by way of a 25 metallic seal means between the insulating body and the spark plug housing.

8. A spark plug arrangement according to claim 7, characterized in that both said spark plug housing and said insulating body are provided with complementary 30 inwardly and downwardly inclined shoulder surfaces with the metallic seal means disposed therebetween.

\* \* \* \* \*

35

40

45

50

55

60

65