Jan. 25, 1944. G. S. WEINERTH 2,340,091

SPARK PLUG

Filed May 3, 1941

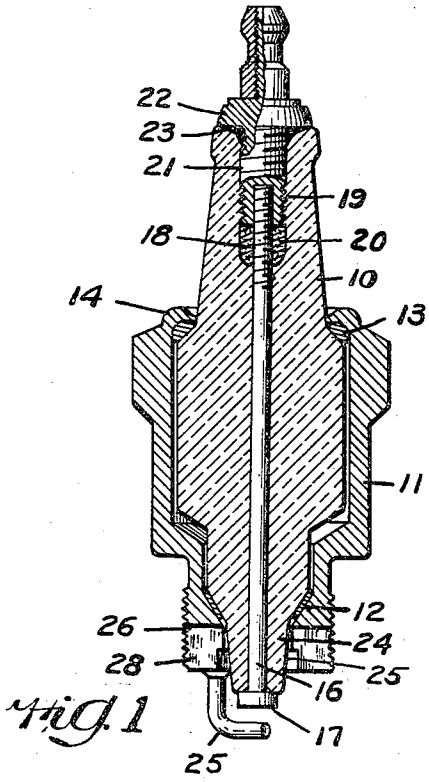


Fig. 1

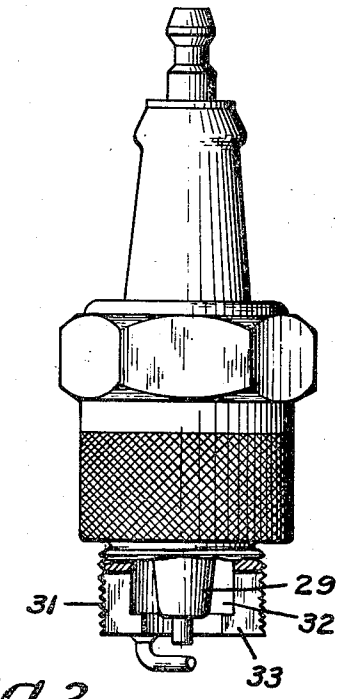


Fig. 2

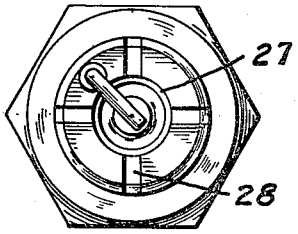


Fig. 3

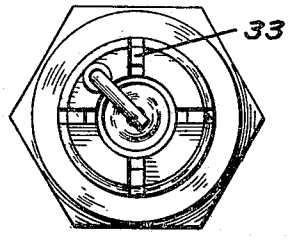


Fig. 4

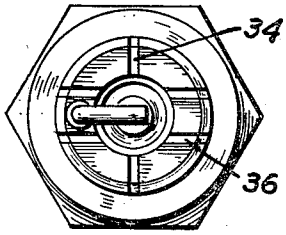


Fig. 5

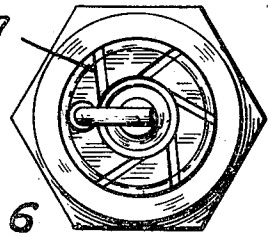


Fig. 6

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SPARK PLUG

George S. Weinerth, Reading, Pa.

Application May 3, 1941, Serial No. 391,665

3 Claims. (Cl. 123—169)

This invention relates to spark plugs, and more particularly to improved means for maintaining the firing end of a spark plug including the tip and side walls of the insulator clear of carbon deposit and the like whereby the life and efficiency of the plug is substantially increased.

The present invention is an improvement over spark plugs shown and described in my United States Patent 2,188,166, which issued January 23, 1940, and in a co-pending application Serial No. 313,036, filed January 9, 1940, although the invention is not limited to spark plugs of the type shown in the aforesaid patent and application, and may be applied to numerous type spark plugs in present day use.

It is common practice to space the insulator from the metal shell at the firing end of a spark plug to prevent the spark jumping directly to the shell, and a pocket is thus provided between the insulator and shell. This pocket tends to accumulate carbon and accelerates the deposit of carbon on the electrodes which results in impaired efficiency of the plug.

A primary object of the present invention is to provide a spark plug having improved means for maintaining the firing end of the plug including the tip and side walls of the insulator clear of carbon deposit and the like.

Another object of the invention is to provide a spark plug which will have a high degree of efficiency over a relatively long period.

Another object of the invention is to provide a spark plug wherein a tubulent action occurs at the firing end of the plug, thereby maintaining the insulator tip and side walls clear of carbon deposit so as to insure a fixed hot spark at all times.

Another object of the invention is to provide a spark plug of the above type having relatively few parts, and wherein improved means are provided for assembling and sealing the central or positive electrode with the insulator.

According to the invention, the firing end of the metal shell is provided with slots extending through the walls thereof to the pocket formed intermediate the insulator and shell whereby combustion gases are forced through said slots resulting in a turbulent action at the firing end of the shell. I have found that this turbulent action, wherein the combustion gases are forced into turbulent contact with the insulator tip and side walls, maintains the insulator tip and side walls free of carbon deposit, thereby insuring a fixed hot spark at all times, and resultingly increasing the efficiency and life of the plug. Also the central electrode is mechanically interlocked with the insulator and sealed therewith in an improved manner.

The drawing illustrates embodiments of the invention and the views therein are as follows:

Figure 1 is a vertical sectional view of a spark plug constructed in accordance with my invention, and wherein the insulator extends outwardly of the firing end of the shell,

Figure 2 is an elevational view, partially in section, showing the invention applied to a conventional spark plug wherein the insulator terminates inwardly of the firing end of the shell,

Figure 3 is a bottom plan view of the spark plug illustrated in Figure 1,

Figure 4 is a bottom plan view of the spark plug illustrated in Figure 2, and

Figures 5 and 6 are bottom plan views illustrating modified arrangements of slots which I may employ.

Referring now to the drawing, and particularly to Figure 1, I have illustrated my invention applied to a spark plug of a type generally illustrated in my said co-pending application Serial No. 313,036. An insulator 10 extends through a metallic shell 11, the shell and insulator being provided with inclined shoulders at the lower portions thereof which receive a metallic sealing gasket 12 therebetween. A second sealing gasket 13 is supported on oppositely inclined shoulders at the upper portion of the insulator, and the shell is assembled with the insulator by crimping the upper peripheral edge of the shell over gasket 13, as indicated at 14.

The manner of assembling the central or positive electrode indicated at 16 with the insulator will now be described. Electrode 16, at its lower end, is provided with an enlarged headed portion 17 which abuts the lower end or tip of the insulator. The upper portion 18 of the central electrode has relatively fine threads formed thereon. The upper portion of the insulator is provided with an enlarged threaded recess 19 to engage a threaded terminal 21. The external threads on the terminal are coarse relative to threaded portion 18 of electrode 16. Terminal 21 has an encircling flange 22 having a planar lower surface which may be brought into wedging engagement with the upper end of the insulator. The upper end of the insulator has a concave depression 23 therein for receiving cement, and providing an effective seal at this zone.

A suitable amount of cement is disposed in depression 23 and also in the bottom of recess

19, as indicated at 20, and terminal 21 is threaded into sealing engagement with the insulator. The central electrode is then projected through the insulator and threadedly engaged with the terminal, whereby the terminal and electrode are mechanically interlocked and the insulator is gripped intermediate headed portion 17 of the electrode and the terminal flange 22. The cement disposed in the base of recess 19 and in depression 23 is thus subjected to a squeezing or wedging action and thereby providing an effective dual seal.

The electrode 16 may be rotated in any suitable manner, as by the use of a rubber chuck, and it will be apparent that due to the difference in pitch of the terminal threads engaging the insulator and the central electrode that the terminal cannot be rotated or moved in a slight axial direction to disturb the seal after the parts are assembled. This provides a relatively simple and very effective means of sealing the electrode with the insulator.

The headed portion of the electrode is illustrated as being integrally formed with the stem of the electrode, but it is understood that a separately formed disk may be brazed or otherwise suitably secured to the stem of electrode 16. The ground electrode 25 has its horizontal arm extended across portion 17 of the positive electrode so that a broad spark area is provided.

The lower end 24 of the insulator is spaced from the shell lower portion 26 to form a pocket therebetween, indicated at 27. Radial slots 28 are formed at the lower end of the shell, and extend through the shell walls to pocket 27. Shell portion 26 is threaded into the engine head and the lower portion of the insulator together with the slotted lower portion of the shell extend into the compressed gas chamber so that when combustion occurs the combustion gases may freely contact the side walls 25 and tip of the insulator in a turbulent manner to maintain the side walls and tip of the insulator free of carbon deposit.

I have found that the provision of slots as above described and the resultant self-cleaning action effects a considerably increased efficiency of the plug.

Referring now to Figure 2, I have illustrated a conventional spark plug wherein the insulator end portion 29 terminates axially inwardly of the end of shell portion 31, the insulator and shell being in spaced relation at the lower end of the plug and providing a pocket 32 therebetween. Slots 33 extend radially inwardly through the shell walls to pocket 32 whereby a turbulent action is provided as described in connection with the spark plug illustrated in Figures 1 and 3.

I preferably make slots 28 and 33 relatively deep so that the pocket formed intermediate the lower end of the insulator and the lower end of the shell is largely destroyed and a considerable area of the side walls of the insulator are exposed. Of course, a sufficient number of threads are left intact to maintain a proper seal.

Figure 5 illustrates a modification of my invention wherein the number of slots is increased, and slots indicated at 34 extend radially inwardly, and slots indicated at 36, extend in generally parallel relation.

Figure 6 illustrates a further modification of my invention wherein slots 37 provided in the end of the shell are angularly disposed and approach a tangential direction. Thus, a swirling turbulent action is imparted to the combustion gases contacting the insulator tip and side walls.

Although I have shown and described preferred forms of my invention, I contemplate that numerous and extensive departures may be made therefrom without departing from the spirit of the invention and the scope of the appended claims.

The invention is hereby claimed as follows:

1. A spark plug comprising a metallic shell, an insulator, a central electrode projected through the insulator and terminating outwardly of the shell at the firing end, a ground electrode integral with the shell having a portion spaced axially outwardly beyond the shell firing end and central electrode, said portion terminating in substantially axial alignment with the central electrode whereby sparking occurs generally in an axial direction and said shell having a plurality of spaced slots extending from the firing end thereof towards the terminal end of the plug a distance sufficient to expose at least a portion of the insulator tip laterally, whereby combustion gases contacting the side walls of said tip may be directed laterally through the slots.

2. A spark plug comprising a metallic shell, an insulator, a central electrode projected through the insulator and terminating outwardly of the shell at the firing end, a ground electrode having a generally transverse portion disposed outwardly of the shell at the firing end and terminating in axially spaced relation to the central electrode, whereby sparking will occur beyond the shell and substantially axially of the central electrode, the shell being spaced from the insulator tip to form a pocket therebetween, and the shell having a plurality of spaced slots extending through the shell wall at the firing end and in lateral alignment with the insulator tip, whereby combustion gases in said pocket may be directed laterally through the slots.

3. A spark plug comprising a metallic shell, an electrode extending axially beyond the shell firing end, a central electrode projected through the insulator having an enlarged head abutting the insulator at the firing end, a generally L shaped ground electrode secured to the shell having a transverse portion extending at least partially across said head in spaced relation thereto whereby sparking will occur in a generally axial direction, said shell being spaced from the insulator tip to form a pocket therebetween, and the shell having a plurality of spaced slots extending through the shell wall at the firing end whereby combustion gases in said pocket may be directed laterally through the slots.

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