Dec. 31, 1940. T. DUKELOW 2,226,711

SPARK PLUG

Filed Jan. 2, 1940

Fig. 1.

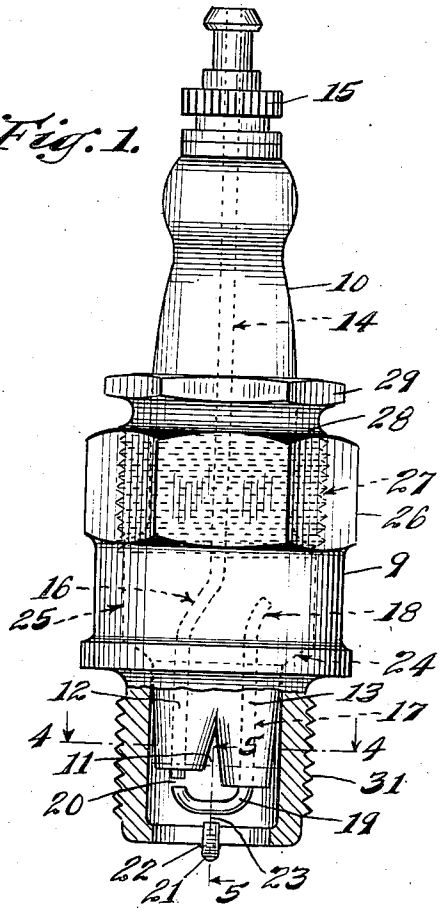


Fig. 2.

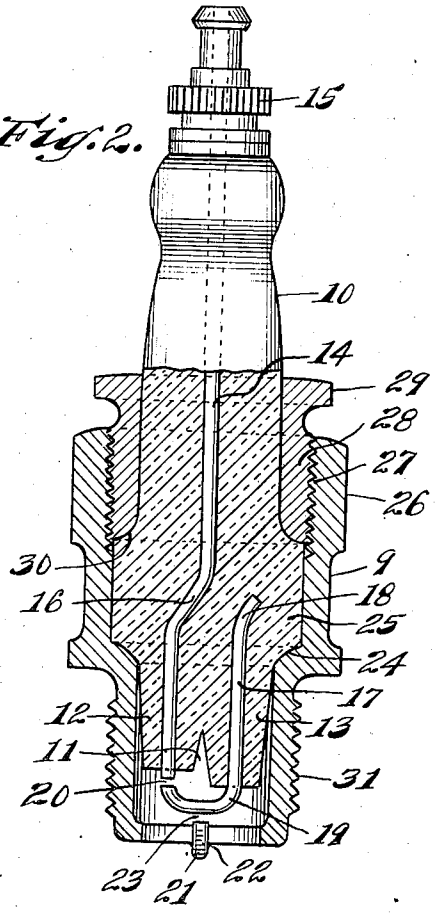


Fig. 3.

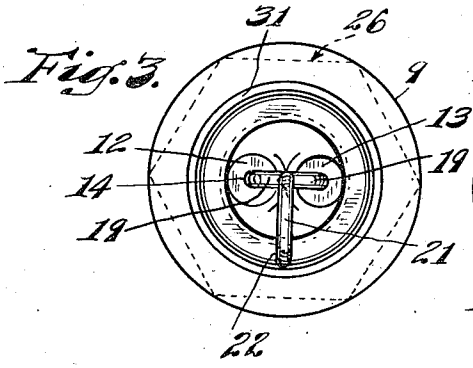


Fig. 4.

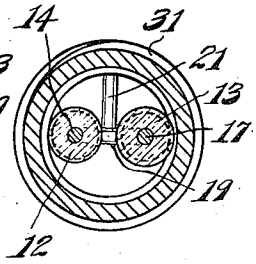
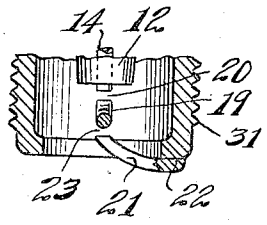


Fig. 5.



Witnesses:
E. E. Wessels
Janet McKay

Inventor:
Thomas Dukelow,
By Joshua R. H. Potts
his Attorney.

Patented Dec. 31, 1940 2,226,711

UNITED STATES PATENT OFFICE

2,226,711

SPARK PLUG

Thomas Dukelow, Chicago, Ill.

Application January 2, 1940, Serial No. 312,077

5 Claims. (Cl. 123—169)

This invention relates to spark plugs for internal combustion engines and the object thereof is to provide a novel, simple, practical and economical spark plug having greater efficiency and which provides two separate spark gaps that operate simultaneously and insure ignition of the compressed gases within a combustion cylinder.

Another object of the invention is to provide a spark plug with an insulator having two firing ends, each having a metal electrode which are insulated from each other to form a spark gap and one of which is so positioned as to form a spark gap in conjunction with an electrode or point carried by the metallic shell of the plug so as to give a double spark and insure operation of the plug as well as the ignition of the gases even if one of the spark gaps should be fouled or shorted, in that the other one will produce the necessary ignition spark.

A still further object of the invention is to provide a spark plug which is an improvement upon the device shown in my prior Patent No. 2,136,206, of November 8, 1938, in that the same is adapted to better withstand the heat ranges to which subjected in modern automobile engines or the like.

Further objects and advantages will appear and be brought out more fully in the following specification, reference being had to the accompanying drawing, in which:

Fig. 1 is a side elevation of a spark plug embodying the invention, the same being partly in section;

Fig. 2 is a central longitudinal section view through a portion of the device;

Fig. 3 is a bottom view; and

Figs. 4 and 5 are sectional views taken on the lines 4—4 and 5—5 of Fig. 1.

Referring more particularly to the drawing, the spark plug is shown as comprising the usual metallic shell 9 with a cylindrical bore adapted to take a porcelain or other dielectric insulator 10, preferably of cylindrical cross-section and split at the firing end as at 11 or bifurcated to provide two cylindrical or otherwise formed firing ends 12 and 13, one of which is shorter than the other. In the form shown, the end 12 is shorter than the end 13 so that the latter projects slightly beyond the former within the firing end of the shell 9.

The insulator 10 has an axial internal longitudinal bore adapted to take an electrode 14, which is thus insulated and connected to a binding terminal 15 by which connection is made to a source of current supply in the usual manner. In order to dispose the electrode 14 in the end portion 12, the bore and the electrode are both offset or bent laterally, as indicated at 16 and then extended parallel to the axis centrally through the end portion 12 to provide a firing point. Another electrode 17 is merely anchored in a bore in the porcelain parallel to the adjacent end portion of the electrode 14 centrally in the firing end 13 and may be anchored by disposing the bore and inner end thereof in a laterally curved direction as indicated at 18 and also to maintain the space and insulation between the two electrodes to prevent short-circuiting or jumping of the spark between the electrodes within the insulator. The other end of the electrode 17 projects beyond the firing end 12 and this outer end extends or curves as at 19 over the space between the firing ends and terminates in an axial direction spaced from the adjacent firing end of the electrode 14 to provide a spark gap 20.

An electrode or firing point 21 is anchored at 22 to the end portion of the metallic shell 9 in the customary way and extends over the curved portion 19 and in spaced relation thereto in a radial direction to provide a spark gap 23 so that a double spark gap is thus provided giving a double interruption with two firing ends and two electrodes, each insulated from the other so that if one is not operating, due to shorting or fouling from carbon deposit or otherwise, the other will provide the necessary spark as insurance against fouling and thereby maintain ignition and combustion of the compressed gases within the cylinder provided with the plug. This device will ordinarily give a hotter, cleaner and whiter spark and will take care of all heat ranges to which ordinarily subjected in a modern gasoline motor or internal combustion engine, especially where high test and lead treated or ethyl gasoline is used.

While the shell and other parts of the plug may be of any desirable construction, the insulator is preferably so formed that the firing end which is provided with a plurality, preferably two, spaced individual portions for each electrode, is of reduced size relative to the intermediate portion, thus forming a shoulder 24 abutted by a corresponding shoulder of the insulator at its enlarged portion 25. The end portion 26 is formed with a wrench surface and is internally threaded as at 27 to take the externally threaded portion 28 of a sleeve nut 29, thus securing the parts in assembled relation owing to the engagement of the inner end of the portion 28 with the shoulder 30 of the insulator. The threaded end 31 is designed to anchor the spark plug in a cylinder head with a suitable interposed packing or gasket.

The operation of the invention is believed to

be obvious but it may be explained that the provision of two firing ends, each of which has a metallic electrode in the center, produces a spark gap between said electrodes and an additional spark gap is produced between one of these electrodes and that carried by the shell, all of which are insulated from each other. In the normal spark gap of the device, it will be seen that two gaps are at once provided for the spark and the resulting operation is such that a much more efficient and hotter spark is provided. Furthermore, upon the failure of either gap to function due to shorting or fouling, the plug will continue to operate efficiently inasmuch as the remaining gap is certain to become operative and thus the life is greatly extended and its efficiency materially improved. Also, by eliminating the necessity of employing bushings, the structure is simplified and made more economical and will better withstand the heat ranges to which spark plugs are subjected in modern engines since the parts are better insulated from each other particularly within the insulator and at the electrodes or firing ends.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

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

1. In a spark plug, including a shell, an insulator in the shell, a central electrode extending through the insulator offset adjacent its firing end and projecting therefrom at its firing end, another electrode anchored in the insulator at its firing end in spaced relation to the first electrode and extending diametrically to provide a spark gap therebetween where the first electrode projects from the insulator, and an electrode carried by the shell in spaced relation to one of said first named electrodes to provide an additional spark gap.

2. In a spark plug, an insulator adapted to be received within a metallic shell and having diametrically spaced firing ends spaced apart at the center of the plug and insulator, one projecting beyond the other, electrodes in said firing ends, one of said electrodes extending through the insulator and having means for connection with a source of electrical energy, both electrodes being off center in the insulator at the portion thereof adjacent the firing end and another electrode mounted on the shell and extending in spaced relation to one of the first named electrodes to provide a second spark gap.

3. A spark plug including a metallic shell, an insulator therein having spaced firing ends positioned side by side, one projecting beyond the other, an electrode extending through the insulator and offset to project through one firing end, another electrode extending partially into the insulator and extending in close proximity to the aforesaid electrode to provide a spark gap, and another electrode on the shell extending substantially normally to the second mentioned electrode to provide a second spark gap.

4. A spark plug comprising a metallic shell having a first electrode in a side portion thereof, a second central electrode insulated from said shell and adapted to be connected to a source of potential and forming a spark gap with said first electrode, a third single auxiliary electrode having a portion positioned in said spark gap in spaced relation to said first and second electrodes, and a mounting for said auxiliary electrode insulated from said first and second electrodes, said mounting including an insulator having laterally spaced end portions receiving the second and auxiliary electrodes therethrough within said shell.

5. A spark plug comprising a metallic cylindrical shell having an electrode extending radially inwardly adjacent the cylindrical end thereof, a dielectric having spaced firing ends, a central bore and a cylindrical exterior portion adapted to fit within said shell, an electrode in one firing end of said dielectric having an end portion spaced from said first mentioned electrode and a single auxiliary electrode of uniform small diameter also in said dielectric in the other firing end in insulated spaced relation to the second electrode and having its end portion terminating between said first and second electrodes, said shell and dielectric having correlated shoulders adapted for interfitting engagement.

THOMAS DUKELOW.