

UNITED STATES PATENT OFFICE

2,497,862

SPARK PLUG FOR CONTROLLING
HEAT RANGESNicholas Chuy, Detroit, Mich., assignor to Herb-
nick Manufacturing and Engineering Co., Inc.,
Detroit, Mich.

Application June 18, 1948, Serial No. 33,687

2 Claims. (Cl. 123-169)

1

This invention relates to an improved construction of spark plugs particularly adapted for controlling heat range and provided with means whereby the various components of the plugs may be individually replaced without the necessity of replacing the entire plug.

There are five conventional sizes of spark plugs, considered with respect to the threads for fitting in motors, each of which sizes has several heat ranges necessitating a differently dimensioned insulator for controlling each heat range and which, in turn, requires a specially matching shell for enclosing the insulator, resulting in an enormous expenditure of money in the manufacture of such plugs.

Accordingly, it is a primary object of the present invention to provide a spark plug equipped with interchangeable means for controlling the heat range thereof for the purpose of prolonging the life of the plug and to prevent premature combustion resulting from an overheating of the plug.

Another object of the invention is to provide a spark plug capable of being readily adjusted for controlling the heat range to suit varying climatic or seasonal changes in temperatures.

Another object of the invention is to provide a plug equipped with a replaceable cathode and anode which may be removed and replaced very readily at very slight cost to thereby provide the equivalent of a new plug and to readily overcome the inefficiency resulting from the use of such parts which have been deteriorated due to high temperatures resulting from excessive consumption of the thermal energy resulting from an overworked condition of the motor.

A further object of the invention is to provide a plug formed of readily detachable parts having means for effecting a positive central assembly of the insulator relatively to the shell and for preventing rupture of the insulator resulting from heat expansion.

Still a further object of the invention is to provide a plug having means for positively sealing the space between the insulator and shell to prevent leakage of the combustive fluid.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawing, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a side elevational view of a fully assembled spark plug constructed in accordance with the invention;

2

Figure 2 is a substantially central sectional view thereof;

Figure 3 is an end view of the plug looking from the bottom end thereof as seen in Figure 1;

Figure 4 is a side elevational view of the anode of the plug, shown removed;

Figure 5 is a plan view of a retaining element of the plug;

Figures 6 and 7 are central sectional views of interchangeable bushings of the plug, and

Figure 8 is a perspective view showing the spark plug cathode removed.

Referring more specifically to the drawing, the novel spark plug in its entirety is designated generally 10 and includes a metal shell 11 of substantially conventional external shape having an externally threaded lower end 12 for mounting of the plug in a spark plug opening of a cylinder head, not shown. As best seen in Figure 2, the shell 11 is provided with an internally threaded lower end 13 and an upper internally threaded end 14 which is larger than the end 13. The shell 11 is hollow from end-to-end thereof forming a bore extending longitudinally therethrough the end portions of which are formed by the internally threaded ends 13 and 14 and which includes an intermediate bore portion 15 of slightly smaller diameter than the internally threaded upper end 14 and having a tapered restricted portion 16 at its lower end and of a diameter reduced substantially to that of the internally threaded lower end 13.

A bushing 17 is provided with a threaded shank 18 for threadedly engaging in the threaded end 13 of the shell 11 and is provided with a recess 19 opening outwardly of its outer end and extending into the shank 18 and forming a heat chamber. The recess 19 is enlarged adjacent the outer end of the bushing 17 to provide an outer chamber 20 having an annular outwardly tapered wall, for a purpose which will hereinafter be described. The shank 18 is provided with a bore 21 extending from the free or inner end thereof and communicating with the inner end of the recess 19 and which is frusto-conical and tapered toward the recess 19. An insulator 22 of electrical insulating material is demountably supported in the shell 11 and projects from the upper end thereof and includes an enlarged portion adjacent one of its ends which is disposed in the bore portion 15 but spaced therefrom. The insulator 22 is provided with a restricted portion beneath said enlarged portion and which is disposed in and spaced from the restricted bore portion 16 and terminates at its lower end in a frusto-conical

portion or stem 23 adapted to fit snugly in the bushing bore 21 and of a length greater than said bore 21 so that the terminal portion of the end 23 of the insulator 22 extends into the chamber 19. The insulator 22 is provided with an annular shoulder disposed around its end 23 and at a right angle to its axis which is provided with an annular, substantially semicircular groove 24 to register with a groove 25 formed in the free end of the bushing shank 18 and upon which said annular shoulder rests. The aligned annular grooves 24 and 25 combine to form a seat for a ring 26, preferably formed of brass and which functions to axially align and center the insulator 22 relatively to the shell 11 so that the insulator body will be out of contact with and spaced uniformly from the bore portions 15 and 16 of the shell, for a purpose which will hereinafter become apparent.

An annular gland nut 27 threadedly engages in the threaded portion 14 of the shell 11 and has a bore of a size to loosely accommodate a portion of the insulator 22 which extends upwardly therethrough and which is spaced therefrom. The gland nut 27 is provided at its lower end with a tapered shoulder 28 disposed parallel to an upwardly facing annular inclined shoulder 29 of the insulator 22. An annular sealing gasket 30 is interposed and clamped between the shoulders 28 and 29 to afford additional means for centrally locating the insulator 22 relatively to the shell 11 and which also functions in combination with the ring 26 and the snug fitting engagement of the insulator stem 23 with the bore 19 to seal the space between the shell 11 and insulator 22 to positively prevent the escape of a combustible fluid or gases through the plug between its shell and insulator.

The insulator 22 is provided with a central bore 31 extending longitudinally therethrough for accommodating an electrode rod 32 having an enlarged threaded portion 33 for engagement in the enlarged threaded upper end 34 of said bore 31. The electrode rod 32 is provided with an annular flange 35 beyond its threaded portion 33 which seats against the upper end of the insulator 22. The electrode rod 32 terminates at its upper end in a threaded portion 36 extending above the flange 35 and adapted to receive a threaded cap 37 for clamping an electric conductor wire, not shown, between said cap and the flange 35 to provide an electrical connection with the electrode rod 32. The rod 32 terminates in spaced relationship to the opposite end of the bore 31 which bore, a distance from said end of the rod 32, is restricted as seen at 38.

As seen in Figure 4, a readily demountable anode, designated generally 39 is provided including a disk portion 40 from one side of which projects the anode tip 41 and having two or more spring fingers 42 projecting from its opposite side and in outwardly diverging relationship to one another and which are provided with outwardly bowed free end portions 43. The spring fingers 42 are adapted to be compressed at their free ends 43 and forced inwardly through the restricted end 38 of the bore 31 until said outwardly bowed portions are in contact with the lower end of the electrode rod 32, in which position said portions 43 are disposed in the enlarged lower end of the bore 31 to permit their expansion therein to frictionally retain the anode 39 applied as illustrated in Figure 2 and with its flange 40 abutting against the terminal of

the stem 23 and within the chamber 19 and with the tip 41 projecting downwardly therefrom.

Referring to Figure 8, the spark plug 10 is provided with a cathode 44 in the form of a disk having a central opening 45 and a scalloped periphery forming therebetween outwardly tapered teeth or projections 46. The cathode 44 is detachably mounted in the recess 20 of the bushing 17 and is retained detachably therein by a split spring ring 47 which is mounted in the recess 20 outwardly of the cathode 44 and which bears against the tapered annular wall of said recess and is yieldably held in engagement therewith for demountably supporting the cathode 44 in the bushing 17. The outer end of the bushing 17 is provided with a radial groove 48, as seen in Figure 3, which opens outwardly thereof and into the recess 20 for receiving an outturned terminal 49 of the spring ring 47 and by which said spring ring may be readily engaged for extracting it from the recess 20 to remove the cathode 44.

From the preceding detailed description of the construction of the spark plug 10, a description of its operation and use is considered unnecessary. However, it might be stated that it will be readily apparent that the insulator 22 is supported in spaced relationship to the shell 11 with the space therebetween effectively sealed, as previously described, so that relative expansion of the shell and insulator cannot result in rupturing of the insulator, thus enabling the use of insulators of different sizes with a shell of a given size for fitting a conventional spark plug opening. It will also be readily apparent that the anode and cathode may be readily removed and replaced at very little expense when such parts become deteriorated as the result of heat caused by excessive consumption of thermal energy.

Figures 6 and 7 illustrate alternate bushings 17a and 17b, respectively, which are interchangeable with the bushing 17 and which differ therefrom only in that the bushing 17a is provided with a smaller heat chamber 19a while the bushing 17b is provided with a larger heat chamber 19b than that of the chamber 19. Likewise, it will be obvious that the bore 21a of the bushing 17a will be longer than the bore 21 while the bore 21b of the bushing 17b will be shorter than said bore 21.

To provide an additional seal between the insulator 22 and shell 11, the lower end of the shell and the inwardly facing annular shoulder of either the bushing 17, 17a or 17b are provided with annular grooves 50 for accommodating an additional sealing ring 51, preferably formed of brass and similar to the ring 26.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. A spark plug comprising a shell having a bore extending longitudinally therethrough, an insulator demountably disposed in said bore and sized to fit loosely therein, means to demountably support said insulator in said shell and for positioning the insulator in axial alignment with the shell and for sealing the space between the shell and insulator, an anode demountably supported in the insulator and projecting from the lower end thereof, a cathode demountably supported by a portion of said means beneath and adjacent said

5 anode, said means including a bushing having a heat chamber into which said anode projects, said heat chamber having an enlarged outwardly opening end provided with an outwardly tapered annular wall, said cathode being disposed in the enlarged portion of said heat chamber, and a split retaining ring for detachably engaging said annular tapered wall for demountably supporting the cathode in the heat chamber.

2. A spark plug comprising a shell having a bore extending longitudinally therethrough, an insulator demountably disposed in said bore and sized to fit loosely therein, means to demountably support said insulator in said shell and for positioning the insulator in axial alignment with the shell and for sealing the space between the shell and insulator, an anode demountably supported in the insulator and projecting from the lower end thereof, a cathode demountably supported by a portion of said means beneath and adjacent said anode, said means including a bushing having a heat chamber into which said anode projects, said heat chamber having an enlarged out-

6 wardly opening end provided with an outwardly tapered annular wall, said cathode being disposed in the enlarged portion of said heat chamber, and a split retaining ring for detachably engaging said annular tapered wall for demountably supporting the cathode in the heat chamber, said cathode comprising a disk having a central opening located beneath and adjacent the depending tip of the anode and being provided with circumferentially spaced tapered projections forming the peripheral portion thereof and which are engaged by said retaining ring.

NICHOLAS CHUY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

20 Number	Name	Date
1,375,807	Watts	Apr. 26, 1921
1,604,484	Rubert	Oct. 26, 1926
1,892,355	Markowski	Dec. 27, 1932