

March 2, 1948.

M. PERELES

2,436,973

SPARK PLUG

Filed April 10, 1943

Fig. 1

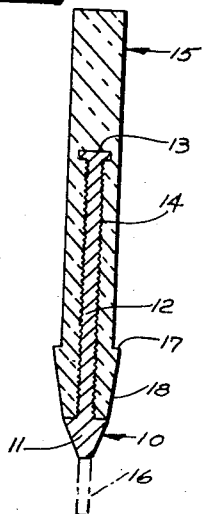


Fig. 2

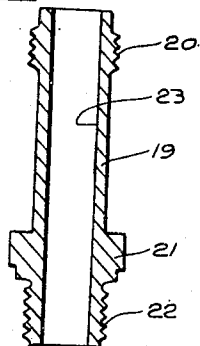


Fig. 3

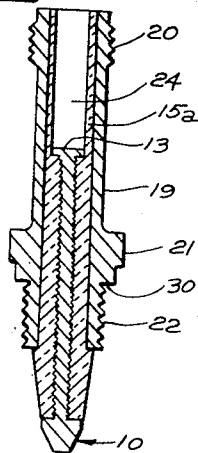


Fig. 4

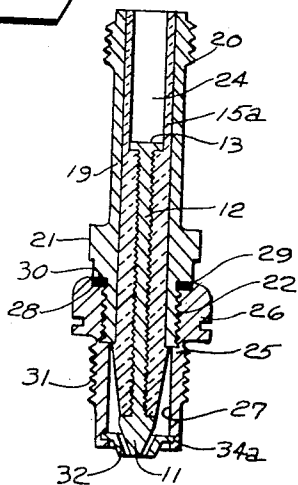


Fig. 6

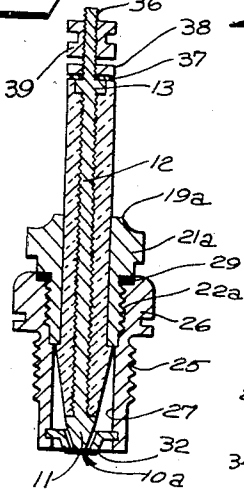


Fig. 7

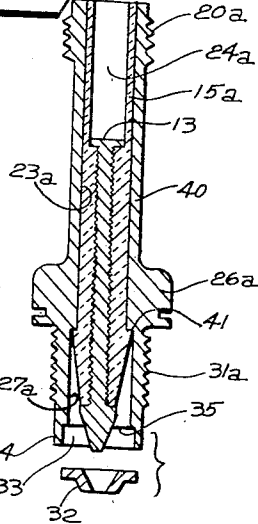
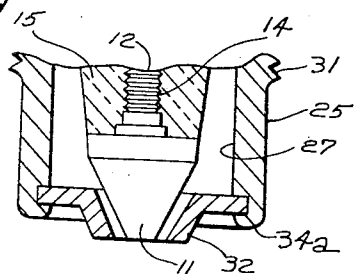


Fig. 5



INVENTOR.
MAURICE PERELES
BY
Vau Deventer + Grier
ATTORNEYS

UNITED STATES PATENT OFFICE

2,436,973

SPARK PLUG

Maurice Pereles, East Orange, N. J.

Application April 10, 1943, Serial No. 482,551

2 Claims. (Cl. 123—169)

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This invention relates to improvements in spark plugs and has for an object the provision of a spark plug of the ceramic type in which the heat transfer between the center or live electrode and the ceramic is greatly increased over that of existing plugs. In my new and improved spark plug, I increase the surface contact between the metal of the electrode and the ceramic by forming on the electrode a continuous series of grooves and thereby increase the length of its surface in the neighborhood of threefold. I may also increase the surface area by knurling the same with either criss-cross knurling or by straight knurls.

Another object of the invention is the provision of a spark plug in which the seal between the ceramic and the metal portion of the shell thereabout is effected by shrinking the metal onto the ceramic.

A further object of the invention is the provision of a shielded or well type spark plug in which the chances of flashing over between the electrode and the shell, via the thin wall of insulation is minimized. This is accomplished by forming that portion of the ceramic insulator, above the electrode, solid and thereafter drilling the well into the ceramic and down to the electrode after the ceramic has been assembled into the shell.

Other objects and advantages of the invention will be apparent to those skilled in the art upon a study of this specification and the accompanying drawings, in which—

Figure 1 is a sectional elevation of the core, the electrode having been molded into the ceramic;

Figure 2 is a sectional elevation of the upper portion of the shell;

Figure 3 is a sectional elevation of the shell of Figure 2 with the core shown in Figure 1 in assembled relation;

Figure 4 is a cross sectional elevation of the assembly of Figure 3 after it has been combined with the lower portion of the shell carrying the ground electrode;

Figure 5 is an enlarged fragmentary section of the lower portion of the plug shown in Figure 4;

Figure 6 is a sectional elevation of a modified form of the invention as applied to an open type spark plug; and

Figure 7 is a sectional elevation of a spark plug of the shielded type having a one piece shell.

The live electrode 10 has a sparking end 11, which may be made in any desired shape, a shank 12, and a contact head 13, adapted to receive current from a source of high tension current. The shank 12, as may clearly be seen in Figure 5,

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is provided with a series of grooves 14 which provide greater surface area in contact with the ceramic insulator.

I contemplate molding the ceramic around the electrode 10, and may provide the electrode with a shank 16 (shown in dot-dash lines) for positively locating the electrode in the mold.

In molding the electrode into the ceramic, I prefer to use a vitreous material containing mica or micaceous minerals which are in a finely divided state throughout the ceramic. Such ceramics are disclosed in U. S. Patent No. 1,394,973, dated October 25, 1921. I do not limit myself to the exact ceramic or process of making the same, but merely give this by way of example.

A suitable mold having been formed, the electrode is positioned in the mold and is held in axial alignment with the bore of said mold by means of the locating shank 16 above referred to. The ceramic 15 has a straight cylindrical wall, which may terminate in a shoulder 17, and a tapered surface 18 thereof extends from the shoulder 17 to the electrode end 11. The shoulder 17 may serve for locating the ceramic in the shell, as will presently be described. After the ceramic-electrode assembly is taken from the mold, the locating shank 16 may then be machined off.

In Figure 2 is shown the upper portion of a two-part shell for a shielded type aircraft spark plug. It consists of a body portion 19 which includes a threaded portion 20 near the upper end thereof to be engaged by a threaded nut connected to the shielding on the spark plug cable (not shown). The body portion 19 also includes a hexagonal portion 21, and a second threaded portion 22 which threadedly engages the lower portion of the shell, to be presently described.

The bore 23 in the body 19 is so proportioned to the diameter of the ceramic 15 that the two members may be assembled with a shrink fit suitable for effecting a fluid tight seal between the ceramic 15 and the body 19. I pre-heat the body 19 and, with the molded insulator at room temperature, the body 19 is quickly pushed on the straight shank of the insulator 15 until the bottom of the threaded end 22 comes to rest against the shoulder 17. Then the assembly is allowed to cool down to room temperature.

The assembly may then be placed in the jig and a hole 24 is drilled in the insulator down to and uncovering the head 13 of the electrode 10. At this stage, the assembly has the appearance shown in Figure 3. By drilling the well 24 in after the ceramic has been assembled into the body 19, I eliminate chances of cracking the thin

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wall 15^a of the insulator, particularly in the neighborhood of the head 13, and thereby eliminate chances of the spark jumping from the head 13 via such cracks into the interior wall 23 of the body 19.

The lower portion of the shell consists of a body 25 having an upper hexagonal portion 26 and a bore 27 extending therethrough. The upper portion of the bore 27 is threaded, and a recess 28 at the upper end thereof is adapted to receive a sealing gasket 29, which gasket lies between the shoulder 30, formed on the body 19, so that when the threaded portion 22 of the body 19 is screwed into the shell 25, a fluid tight seal is effected between the body 19 and the body 25.

The body 25 is provided with threads 31 which engage a threaded hole in the cylinder head of the engine. A ground electrode 32 is secured in the lower end of the body 25, and when the spark plug is assembled, the sparking end 11 of the electrode 10 is in concentric relation to the ground electrode 32 with the proper sparking gap therebetween.

The ground electrode may be "spun in," in the usual manner, which consists of counterboring the lower end of the shell, in the manner shown at 33 in Figure 7, leaving a thin annular wall 34 thereabout. Then the ground electrode 32 is positioned in the counterbored portion 33 and up against the shoulder 35. Then the thin annular wall 34 is spun or curled over, such as is shown at 34^a in Figure 4.

In the modification shown in Figure 6, which is for an open type spark plug, the electrode 10^a has a sparking end 11 and a grooved shank 12 similar to the corresponding parts described in connection with the electrode 10. The upper end of the electrode 10^a, however, is modified as follows: Above the head 13 is provided a threaded shank 36 which carries a lock washer 37 against which a nut 38 bears. The threaded shank 36 may also carry a suitable nut or fitting 39 adapted to be engaged by a clip or terminal on the ignition cable.

The body 19^a is foreshortened and has a hexagonal portion 21^a and a lower threaded portion 22^a which engages the threads in the upper portion of the bore 27 in the shell member 25. Sealing between the members 19^a and 25 is likewise effected by means of a gasket 29.

In the modification shown in Figure 7, the shell 40 is formed of one piece of material. It includes a straight shank portion 40, an upper threaded portion 20^a, a lower threaded portion 31^a adapted to engage a threaded hole in the engine cylinder, and a hexagonal portion 26^a to be engaged by a suitable wrench for applying the plug to or removing the plug from the engine. A bore 23^a formed therein has an enlarged portion 27^a formed therebetween a shoulder 41 which forms a stop to be engaged by the shoulder 17 on the insulator when the insulator is assembled in the shell.

In assembling the insulator in the shell, the shell may be pre-heated, and with the insulator at room temperature the shell is applied thereto, as described above in connection with Figures 1, 2 and 3.

Since the insulator enters the shell from the lower or firing end, the ground electrode 32 is

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omitted until after the insulator has been assembled into the shell. Then the ground electrode is pressed into the counterbored recess 33 against the shoulder 35, and the annular rim 34 is spun over to retain the ground electrode in position therein. The well 24^a is drilled in the same manner as described above in connection with Figure 3.

Although I have herein described a spark plug and the method of making the same and two modifications thereof, it is obvious that other types of spark plugs may be made in the manner herein described, and changes may be made in the order of the steps taken in carrying out the invention, without departing from the spirit thereof as set forth in the following claims.

What is claimed is:

1. In a spark plug an electrode having a sparking tip, a contact head, and a portion of reduced diameter therebetween, said portion having been serrated to increase its normal surface, and a ceramic body molded on to said electrode and including an annular portion integral therewith and extending beyond said head.

2. In a spark plug a one piece electrode having a sparking tip, a contact head and a portion therebetween of reduced diameter threaded or serrated to increase its surface, a ceramic molded on to said electrode and extending from said sparking tip to a point beyond said contact head, the portion of said ceramic beyond said head being solid, said ceramic intimately contacting said threaded or serrated portion, thereby providing maximum heat transfer relation between said ceramic and said portion, a shell assembled on to said ceramic, and a well formed in said solid portion of said ceramic after assembly, said well extending down to and uncovering said head.

MAURICE PERELES.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,214,472	Jeffery	Jan. 30, 1917
1,331,091	Becker	Feb. 17, 1920
1,360,814	Storms	Nov. 30, 1920
1,494,099	Cole	May 13, 1924
1,525,453	Littleton	Feb. 10, 1925
1,564,981	Smith	Dec. 8, 1925
1,635,186	Littleton	July 12, 1927
1,708,634	Rees	Apr. 9, 1929
1,837,723	McGraw	Dec. 22, 1931
1,837,754	Calmus et al.	Dec. 22, 1931
1,843,045	Schupp	Jan. 26, 1932
1,940,324	Rabazzana	Dec. 19, 1933
2,020,966	Rohde	Nov. 12, 1935
2,178,774	Bogoslowsky	Nov. 7, 1939
2,223,013	De Chard	Nov. 26, 1940
2,238,397	Rabazzana	Apr. 15, 1941
2,254,082	Meyer	Aug. 26, 1941
2,272,210	King	Feb. 10, 1942
2,355,443	Jeffery	Aug. 8, 1944

FOREIGN PATENTS

Number	Country	Date
339,325	Germany	July 21, 1921