Sept. 1, 1925. 1,552,274

A. CHAMPION

SPARK PLUG

Filed Oct. 10, 1921

Fig. 1

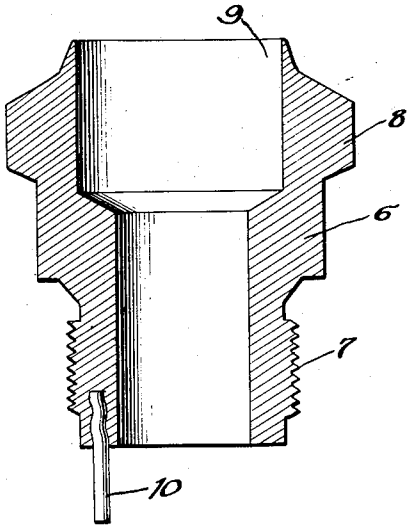
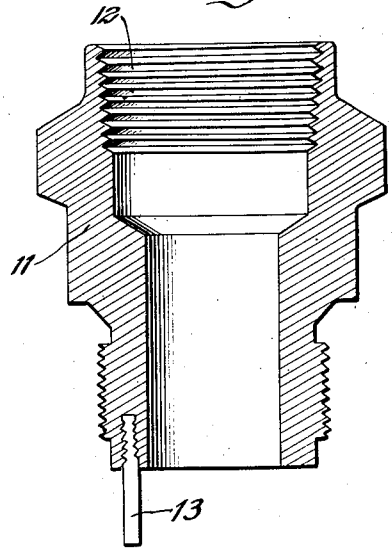


Fig. 3



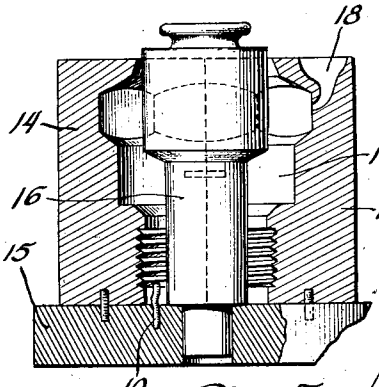


Fig. 5

Fig. 2

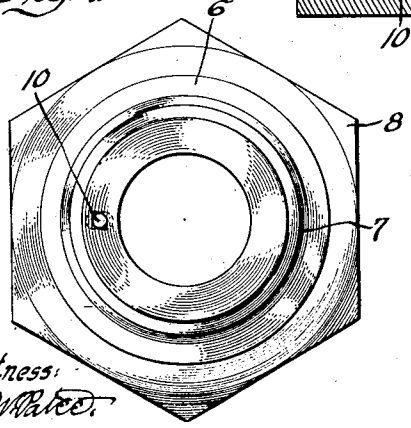
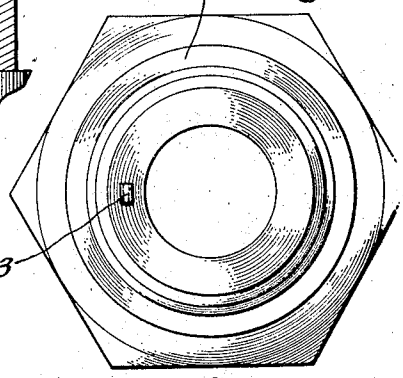


Fig. 4



Inventor

Albert Champion

By his Attorneys

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Witness:

L. M. Reed.

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UNITED STATES PATENT OFFICE.

ALBERT CHAMPION, OF FLINT, MICHIGAN, ASSIGNOR TO A C SPARK PLUG COMPANY, OF FLINT, MICHIGAN, A CORPORATION OF MICHIGAN.

SPARK PLUG.

Application filed October 10, 1921. Serial No. 506,820.

To all whom it may concern:

Be it known that I, ALBERT CHAMPION, a citizen of the French Republic, and a resident of Flint, county of Genesee, and State of Michigan, have invented certain new and useful Improvements in Spark Plugs, of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawings, which form a part of this specification.

My invention relates to spark plugs designed for use with internal combustion engines to ignite the combustible mixture supplied to and burned within the cylinder thereof; and particularly to the metallic shell or casing of the plug which screws into an opening provided for it in the cylinder wall, and within which casing the insulating member and central electrode are held in place in the finished plug.

Heretofore the external shells or casings of spark plugs have commonly been made from rod or bar stock of cross-sectional area as great or greater than the greatest area in cross-section of the finished casing, by the use of a suitable machine of the turret lathe, screw machine or similar type; which has resulted in great waste of material, and has rendered the shell inordinately expensive both because of such waste and because of the expense incident to the attendance, upkeep and operation of the machine, as well also as because of its high initial cost. The shells thus produced are to be sure satisfactory as articles of manufacture, and perform their intended function effectively and efficiently; but their cost is out of proportion to that of the rest of the plug and is greater than should be the cost of a single part of an article which is often used for but a short time, and which has to be sold at a price sufficiently low to permit its frequent replacement.

My invention contemplates and its principal object or end is the making of such shells or casings from cast metal in metal molds and in accordance with the process or art commonly referred to as die casting; the shell being thus produced without waste of material, and the labor cost and fixed charge based upon the initial cost of machines and apparatus suitable for the production of such shells being reduced to a minimum; while the shells thus produced perform the function required of them in spark plugs effectively, and are in all respects satisfactory for the purpose for which they are designed and for the service required of them.

Die cast metal is softer and more brittle than mild steel which is the material heretofore most usually employed in the making of spark plug shells, and a satisfactory welded joint cannot be formed between the shell of that material and the usual grounded or shell electrode of the plug; and my invention in addition to contemplating the making of a spark plug from die cast metal in accordance with the die casting art, contemplates a shell in which the outer or shell electrode is embedded in the metal from which the shell is formed, the said electrode being placed within the mold space into which the molten metal enters before the shell is formed, and properly held in place as the metal enters the mold cavity and solidifies to form the finished casing.

My invention includes a spark plug shell or casing made from die cast metal and having a grounded or shell electrode embedded therein as the shell is formed, as well also as the method or process of producing such a shell by casting the same in a metal mold, in similitude with the production of other articles in accordance with the die casting art.

In the drawing accompanying and forming a part of this specification:

Figure 1 is a view showing a section upon a central vertical plane of a spark plug shell made in accordance with my invention.

Figure 2 is a view showing the same as seen from a position below the shell.

Figure 3 is a view similar to Figure 1, but showing a shell and shell electrode somewhat different from those shown in Figures 1 and 2,

Figure 4 is a view showing the shell shown in Figure 3 from a position below the same looking up.

Figure 5 is a sectional view showing a metal mold suitable for use in producing my improved spark plug casing.

Referring to the drawing, the reference numeral 6 designates a spark plug shell or

casing made from cast metal in a metal mold in accordance with the practice in the die casting art; said shell having a threaded portion 7 designed to screw into a threaded opening in an internal combustion engine cylinder, a hexagonal wrench receiving portion 8, and an annular ridge or flange 9 adapted to be turned over a shoulder of the insulator which is supported within the shell to thereby hold the same in place; said several parts being produced by suitably formed portions of a metal mold into which fluid metal is poured, and the resulting shell being finished when taken from the mold as no machine work has to be performed thereupon other than the turning inward of the flange 9 when the insulator is assembled with the casing to form a single piece spark plug. The shell or grounded electrode, or rather the upper or inner end thereof is preferably embedded in the metal of the shell during the casting operation; in which case the same is placed within the mold cavity of the mold employed in producing the shell before fluid metal is poured thereinto, as will be appreciated. The said electrode may, however, be separate from the shell and suitably fastened thereto after the shell is formed, as my invention regarded in its broader aspect contemplates a shell or casing made from die cast metal in accordance with the die casting art; although a better joint between the shell and electrode, and a more secure and permanent union between the parts will be secured when the electrode in question is embedded in the shell as hereinbefore pointed out. The electrode 10 is shown as made from round wire, and its upper and embedded end as crimped to thereby secure a strong and lasting joint between the same and the shell or casing.

Figures 3 and 4 show a shell or casing 11 likewise made from die cast metal and in which an interior thread 12 at the upper end thereof, is formed as the shell is cast, so that the insulator may be held in place by means of a gland nut should it be desired to produce a spark plug having a gland nut as distinguished from an integral inturned flange, for holding the parts thereof in assembled relation with one another. In this form, the shell electrode 13 is shown as rectangular in section, and as notched at its embedded end to provide a secure hold of the metal of the shell thereupon; which are obvious variations of the electrode features illustrated in Figures 1 and 2, as will be appreciated.

Figure 5 illustrates a metal mold which may be used in producing spark plug shells in accordance with my invention the same comprising two upper sections 14, 14, recessed and so shaped that when placed together they will provide an internal chamber having an outer wall of such form as to provide the threads 7, the wrench receiving portion 8, the annular flange 9, and other external surfaces of the shell or casing to be produced. The open lower end of the hollow space enclosed by the sections 14, 14 is closed by a bottom section 15 having a hole in which the electrode 10 is shown in place; and a core 16 having an exterior surface corresponding with that of the interior of the shell within which the insulator of the plug is placed lies within the hollow space aforesaid and completes the formation of a mold cavity or space 17 corresponding in form with the form of the shell or casing to be produced. After thus assembling the mold parts molten metal of suitable kind or composition is poured into the mold cavity through the passage 18 whereupon a shell will be formed having the shell electrode embedded therein which may be removed by taking the mold apart, and which will ordinarily require no finishing operation to be performed thereupon as the surfaces will be sufficiently smooth, and the dimensions of the parts of the casing sufficiently uniform and accurate for spark plug purposes.

The molten metal from which the spark plug casing is made may be any of the alloys at present used in the die casting art, so long as the shell produced is of the strength and has the other qualities necessary in a spark plug shell or casing. As an example of a tin base alloy suitable for use in my invention, an alloy comprising sixty per cent of tin, ten percent of copper, thirty percent of zinc, and a small amount of antimony, may be employed, although various other alloys and compositions of the zinc base type wherein zinc is the predominating metal may be employed; the idea in each case being that the resulting shell or casing shall have the requisite strength, comparatively high melting point and other characteristics essential in a spark plug casing. The stronger and better class of these alloys, characterized ordinarily by a comparatively high percentage of tin and copper, are preferred by me, and such alloys are sufficiently ductile to permit the flange 9 of the shell to be turned inward and into holding engagement with the insulating member, it being appreciated that the turning in process is one in which the flange will be subjected to continual pressure, thus tending to compact the metal rather than to stretch and rupture it.

Having thus described and explained my invention I claim and desire to secure by Letters Patent:

1. A spark plug shell or casing made from die cast metal and having a grounded or shell electrode embedded therein.

2. A spark plug shell or casing made from die cast metal and having a grounded or

shell electrode embedded in and projecting beyond the end thereof.

3. The method of making a spark plug shell or casing which consists in providing a metal mold having a cavity or chamber corresponding in form with the form of the shell to be formed; placing a shell electrode within said mold cavity; and pouring molten metal into said mold cavity whereby said electrode becomes embedded in the shell or casing produced.

In testimony whereof I affix my signature.

ALBERT CHAMPION.