March 13, 1934. D. H. CORBIN 1,950,596

SPARKING PLUG FOR INTERNAL COMBUSTION ENGINES

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Fig. 1.

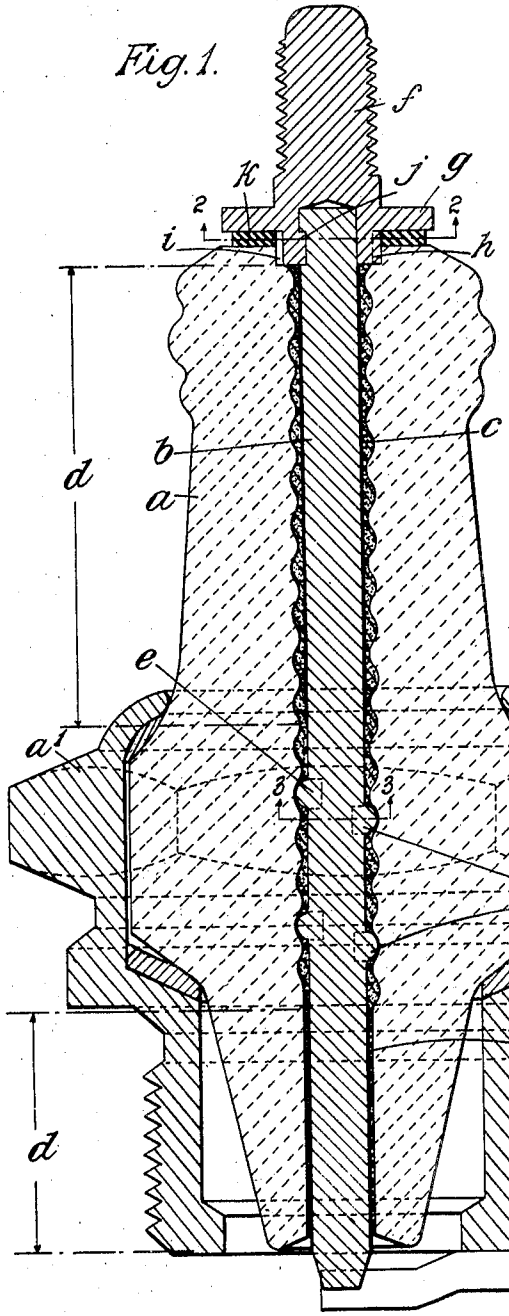


Fig. 2.

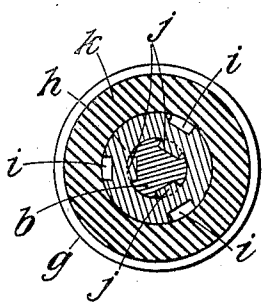
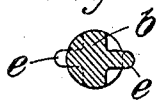


Fig. 3.



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Fig. 4.

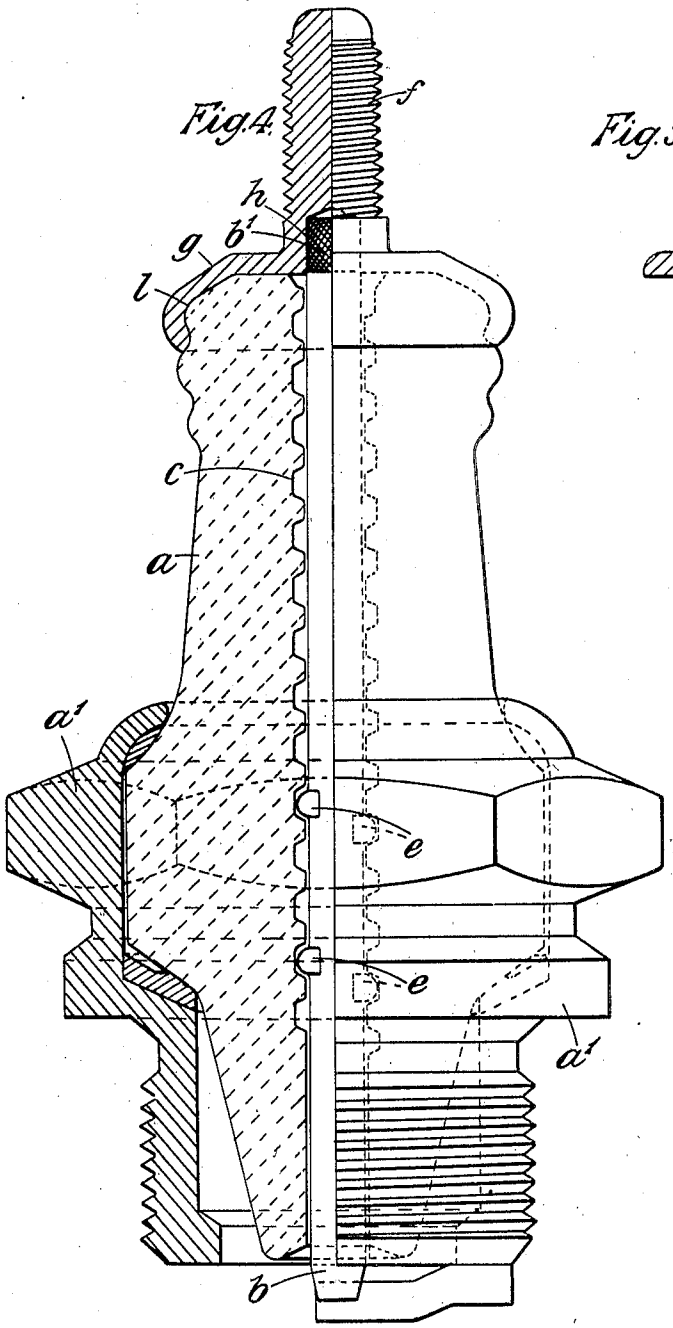
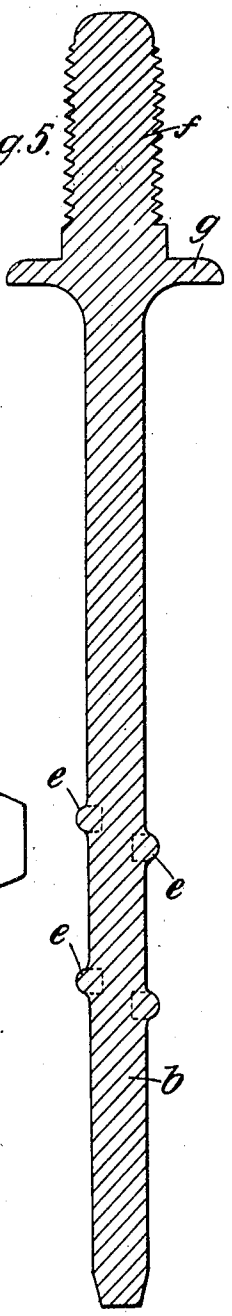


Fig. 5.



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SPARKING PLUG FOR INTERNAL COMBUSTION ENGINES

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Application February 23, 1932, Serial No. 594,487
In Great Britain April 13, 1931

5 Claims. (Cl. 123—169)

This invention relates to the central electrode and insulating sleeve therefor of sparking plugs for internal combustion engines.

The object of the invention is to secure the central electrode in the insulating sleeve of a sparking plug in a manner which avoids undue strains being imposed on the insulating sleeve as a result of differential temperature-induced expansion of these parts. The invention also avoids imposing undue stresses on a weak portion of the insulating sleeve, and undue recessing and weakening of this latter. Moreover the invention facilitates manufacture of the respective portions of the sparking plug.

With the form of sparking plug which the invention is designed to improve, hitherto the central wire rod electrode has been secured to a coaxial terminal screw extension of larger diameter, which screws into a screw-threaded enlargement of the respective end portion of the axial bore of the usual porcelain insulating sleeve. The screw threaded interconnection of these two parts is therefore located at the respective somewhat unsupported outer end of the insulating sleeve, which end is already weakened by the enlargement of the bore thereof. The terminal screw cannot be extended a considerable distance into the sleeve without weakening the sleeve by the consequent extension of the enlargement of the bore thereof, and without introducing difficulty in keeping the screw thread of the sleeve reasonably accurate to fit a long length of screw, and other difficulties of manufacture. Moreover, by the anchoring of the central electrode at the outer end of the insulating sleeve, differential expansion, under increase of temperature, of the sleeve and central electrode, involves a displacement of the central electrode relatively to the sleeve which cumulatively increases along the length of the electrode. The present invention enables this cumulatively increasing relative displacement to be considerably reduced.

Now according to the main feature of the present invention, whilst the bore of the insulating sleeve of a sparking plug is of a diameter to fit the central wire rod electrode, such small bore is formed with a screw thread extending along a considerable length of the bore, and the central wire rod electrode is indented, for instance at two or more situations, so as to emboss lateral projections helically situated as portions of an interrupted screw thread on the rod and engaging with the screw thread in the bore, at a portion of the length of the sleeve which becomes enclosed within and therefore supported by the metal housing of the sparking plug.

The screw thread in the bore of the sleeve is of comparatively steep pitch to match the necessarily somewhat coarse interrupted screw thread constituted by the projections.

Preferably the indented-embossed interrupted screw thread projections on the rod are closely adjacent and extend along only a small portion of the length of the rod, thus leaving the major portion of the rod smooth.

The indented-embossed projections on the rod may be located approximately at the mid-length of the insulating sleeve. In such case, the cumulatively increasing relative displacement, due to expansion, is considerably reduced, as it proceeds outwards from the middle anchorage towards both ends of the sleeve, instead of from one end thereof along the entire length of the sleeve.

The bore of the sleeve is cemented. According to a further feature of the invention, which is capable of employment also in existing types of sparking plugs, for instance those in which the central electrode is anchored in the outer end of the insulating sleeve by a terminal screw as above described, the smooth portions of the length of the central rod electrode are shielded by a coating of lacquer or other suitable adhesion-preventing substance, such as paraffin wax, paraffine oil or the like, from firm adhesion in the cemented bore of the sleeve.

By shielding with lacquer or other suitable adhesion-preventing substance the smooth portions of the rod, whilst leaving the portion bearing the projections exposed, only this portion and the projections will become firmly adherent to the cemented bore of the sleeve. Consequently, on differential expansion occurring, relative displacement of the sleeve and rod can take place without straining the sleeve.

Representative examples of the invention are illustrated on the accompanying drawings, in which:—

Fig. 1 is a longitudinal section through the insulating sleeve, central wire electrode and terminal screw of a sparking plug.

Fig. 2 is a transverse section along the line 2—2 of Fig. 1, and

Fig. 3 is a cross section of the central wire rod electrode at one of the indented-embossed projections thereof.

Fig. 4 is a broken longitudinal sectional elevation showing a modified form of attachment of the terminal screw.

Fig. 5 is a longitudinal section of a central wire electrode with an integral terminal screw.

Referring more particularly to Fig. 1, a^1 is the metal housing of a sparking plug, in which is the insulating sleeve a of the sparking plug. b is the central wire rod electrode of the sparking plug.

The insulating sleeve a is formed throughout its length with a bore c of a diameter to fit the wire rod electrode b, and the bore c is steeply screw threaded from the outer end of the sleeve a to beyond the mid-length thereof.

At about its mid-length the wire rod electrode b is indented at intervals to form projections e thereon. These projections e are located to constitute portions of an interrupted screw thread on the wire rod b, whereby the latter can be screwed into and held in the bore c of the insulating sleeve a, by engagement with the screw thread of the bore.

The rod b is thus held in the insulating sleeve a at a portion thereof within and protected by the usual metal housing a^1 of the sparking plug. Moreover, on differential expansion taking place, the smooth portions of the rod b on each side of the portion bearing the projections e can displace themselves outwards away from the anchorage by the projections e, whereby the relative displacement between the sleeve a and rod b is rendered small.

The rod b is permanently secured in the bore c by cement. However, the outer smooth portions of the rod b may be coated with lacquer or other suitable adhesion-preventing substance so that the cement does not attach them to the bore c of the insulating sleeve a. These smooth portions of the rod b are therefore free to become displaced by expansion without any restraint other than that imposed by friction against the cemented bore c.

The lacquered lengths of the rod b extend for example along d, d. f is the terminal screw of the central wire rod electrode b. In the construction illustrated in Fig. 1, the terminal screw f formed with a collar g, has a short tubular socket h, into the bore of which the end of the rod b is inserted. The tubular socket h is indented at i, which forces the metal of the socket h into corresponding indentations j in the portion of the rod b inserted in the sleeve h. The rod b and screw f are thus permanently rigidly united.

k is a fibre washer interposed between the collar g and the respective end of the insulating sleeve a.

In the alternative arrangement illustrated in Fig. 4, the end of the rod b is knurled at b^1 to facilitate its being screwed into the bore c of the insulating sleeve a, and to promote metallic contact and therefore electrical continuity with the terminal screw f. Also the collar g of the terminal screw f is of a diameter to extend wider than the end of the insulating sleeve a and at its periphery is rolled and clinched over a bead l on the insulating sleeve a. The knurled end b^1 of the rod b merely fits in the bore of the socket h of the terminal screw f.

In the construction shown in Fig. 5, the terminal screw f and collar g are formed integrally on the wire rod b, by a cold heading operation, or alternatively in a machine which gathers the wire at the same time as it heats it electrically.

As usual, the insulating sleeve a is of porcelain. The screw thread in the bore c of the insulating sleeve a can be formed by a tap advanced into the clay blank whilst the external surface thereof is subjected to the usual turning operation.

I claim:

1. In a sparking plug, a metal housing, an insulating sleeve in said housing and having a coarsely screw threaded bore of substantially uniform diameter, a smooth central wire rod electrode extending along said bore, and closely mutually adjacent embossed lateral projections on and extending along only a small portion of the mid-length portion of said rod and helically situated as portions of an interrupted screw thread engaged with said screw threaded bore at a portion of the length of said insulating sleeve enclosed by said metal housing.

2. In a sparking plug, a metal housing, an insulating sleeve in said housing and having a coarsely screw threaded bore of substantially uniform diameter, a smooth central wire rod electrode extending along said bore, and closely adjacent embossed lateral projections upon and located between the ends of said rod and which projections engage with the thread in said screw threaded bore approximately at the mid-length of said insulating sleeve.

3. In a sparking plug, a metal housing, an insulating sleeve in said housing and having a bore, a central wire rod electrode fitting and secured in said bore, a terminal screw, and a socket of said terminal screw fitted over an indented end of said central rod, said terminal screw being secured to said rod by indenting said socket into said indentations of said rod.

4. In a sparking plug, a metal housing, an insulating sleeve in said housing and having a bore, a bead on said insulating sleeve, a central wire rod electrode fitting and secured in said bore, a terminal screw, a socket of said terminal screw fitted over an end of said rod, and a collar on said terminal screw clinched over said bead on said insulating sleeve.

5. In a sparking plug, a metal housing, an insulating sleeve in said housing and having a coarsely screw threaded bore of substantially uniform diameter, a smooth electrode extending along said bore, and closely adjacent embossed lateral projections upon and located between the ends of said electrode, and which projections engage with the screw thread within said screw threaded bore approximately at the mid-length of said insulating sleeve, said electrode being cemented in place within said coarsely threaded bore.

DOUGLAS HAYNES CORBIN.