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(54) **Spark plug device**

Zündkerzenvorrichtung

Arrangement de bougie d'allumage

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US-A- 2 458 121
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Description

The present invention relates to a spark plug device for a DOHC (double overhead camshaft) type gasoline engine or the like which has an ignition cable connected to a spark plug body and, more particularly, to a spark plug device capable of effectivelv preventing degradation of a plug cap by corona discharge.

An example of spark plug devices for DOHC type gasoline engines is shown in Figs. 2 and 3.

The spark plug device of Fig. 2 comprises a terminal fixture 53 shown in Fig. 3 which has a crimp-fixing portion 53a crimped and fixed to an end of an ignition cable 51 for electrical connection between the terminal fixture 53 and the ignition cable 51, and a front end portion 53b fitted to a terminal portion of a spark plug body 52 for electrical connection between the spark plug body 52 and the ignition cable 51.

The connected portion from the ignition cable 51 to the spark plug body 52 is covered with a relatively long tubular plug cap 54 made of synthetic resin. A rain cover 55 to be fitted to a plug hole of an engine is mounted on the plug cap 54 at its one end on the ignition cable side, and a rubber cap 56 is mounted on the plug cap 54 at its other end on the spark plug body side.

The above-mentioned spark plug device has a gap between the outer peripheral surface of the terminal fixture 53 and the inner peripheral surface of the plug cap 54. When the spark plug has a high discharge voltage (for example, more than 30 kV), a potential gradient at a surface of the plug cap 54 of synthetic resin is not less than 3 kV/mm, which is prone to corona discharge in the air adjacent the terminal fixture 53, resulting in the likelihood of not only lowering of insulation of the plug cap 54 with degradation thereof by corona discharge but also pin holes due to dielectric breakdown.

US-A-2 458 121 shows a spark plug device for connecting an ignition cable to a spark plug body having a terminal, wherein a plug cap for covering a spark plug body together with the ignition cable is provided and wherein an insulating filler material is provided between the outer peripheral surface of terminal fixture means and the inner peripheral surface of the plug cap. The filler material is for preventing ingress of moisture and air to the contacting portion between the ignition cable and the terminal of the spark plug body. US-A-2 458 121 teaches that an insulating filler material should be used. Such an insulation filler is e.g. a suitable liquid resin, which is filled into the place in question and is subsequently cured and hardened, a suitable rubber, silicon or the like. Common to all these insulation filler materials is that air bubbles are present within the filler material, the magnitude and quantity thereof depends on the filling method and the filler material used. Such air bubbles, however, are shortening the life time and if such air bubbles are not completely embedded, i.e. are open to the outside of the filler material, corona discharges can occure very likely.

An object of the present invention is to provide a spark plug device which prevents corona discharge adjacent a terminal fixture and has excellent durability and reliable insulation.

According to the present invention, a spark plug device comprises: an ignition cable; a spark plug body having a terminal; a terminal fixture connected to an end of said ignition cable and fitted to the terminal of said spark plug body; a tubular plug cap for covering said spark plug body through to said ignition cable; and a filler material for filling a gap formed between the outer peripheral surface of said terminal fixture and the inner peripheral surface of said plug cap for preventing discharges between these surfaces, wherein said filler material being of a conductive material.

Since the filler material is used for filling the gap between the outer peripheral surface of the terminal fixture and the inner peripheral surface of the plug cap, there is no layer of air between the terminal fixture and the plug cap to thus avoid corona discharge. This effectively prevents lowering of insulation of the plug cap with degradation thereof by the corona discharge and the pin holes due to dielectric breakdown. The present invention is furthermore characterized in that a conductive material is used as filler material for preventing corona discharge between the outer peripheral surface of the terminal fixture and the inner peripheral surface of the plug cap. By means of a conductive filler material a tight contact with the respective wall surfaces is ensured, so that corona discharge is prevented.

Further aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a sectional view of a preferred embodiment according to the present invention;
Fig. 2 is a sectional view of the prior art; and
Fig. 3 is a perspective view of a terminal fixture of the prior art.

As shown in Fig. 1, a terminal fixture 12 is crimped and fixed to an end of an ignition cable 11 for electrical connection between the ignition cable 11 and the terminal fixture 12. A front end of the terminal fixture 12 is fitted to a terminal portion of a spark plug body 13 for electrical connection between the ignition cable 11 and the spark plug body 13.

The ignition cable 11 and spark plug body 13 electrically connected to each other through the terminal fixture 12 are covered with a plug cap 14 of elongated, tubular configuration like the prior art made of synthetic resin such as PBT (polybutylene terephthalate) and UP (unsaturated polyester resin). A rubber cap 15 is fitted in and on the plug cap 14 at its one end or lower end. A rain cover 16 made of rubber or the like is fitted over the plug cap 14 at its other end or upper end, and an air bent

hole 16a is formed exteriorly of the rain cover 16.

A cylindrical cover 17 made of a conductive material having elasticity is fitted in the inner periphery of the plug cap 14 in a portion corresponding to the terminal fixture 12 to fill the gap external to the terminal fixture 12.

Thus, almost no layer of air external to the terminal fixture 12 prevents corona discharge adjacent the terminal fixture 12 if the discharge voltage of the spark plug 13 is high. This also prevents lowering of insulation of the plug cap 14 made of synthetic resin with degradation thereof by corona discharge and pin holes due to dielectric breakdown.

In this preferred embodiment, as above described, the separate cover 17 is fitted in the plug cap 14. However, the inner peripheral surface of the plug cap 14 may be integrally coated with the same conductive material. Otherwise, the gap between the terminal fixture 12 and the plug cap 14 may be filled with a conductive material.

While the invention has been shown and described in detail, the foregoing description is in all aspects illustrative and not restrictive. It is therefore understood that numerous modifications and variations can be devised without departing from the invention, as defined in the appendend claim.

Claims

1. A spark plug device comprising:

an ignition cable (11);
a spark plug body (13) having a terminal;
a terminal fixture (12) connected to an end of said ignition cable (11) and fitted to the terminal of said spark plug body (13);
a tubular plug cap (14) for covering said spark plug body (13) through to said ignition cable (11); and
a filler material (17) for filling a gap formed between the outer peripheral surface of said terminal fixture (12) and the inner peripheral surface of said plug cap (14) for preventing discharges between these surfaces,

characterized in that
said filler material (17) being of a conductive material.

Patentansprüche

1. Eine Zündkerzenvorrichtung mit:

einem Zündkabel (11);
einem Zündkerzenkörper (13) mit einem Anschluß;
einer Anschlußbefestigung (12), die mit einem Ende des Zündkabels (11) verbunden ist und mit dem Anschluß des zündkerzenkörpers (13) verbunden ist;
einer rohrförmigen Kerzenkappe (14) zum Abdecken des Zündkerzenkörpers (13) durchgehend bis zu dem Zündkabel (11); und
einem Füllmaterial (17) zum Ausfüllen eines Spaltes, der zwischen der äußeren Umfangsoberfläche der Anschlußbefestigung (12) und der inneren Umfangsoberfläche der Kerzenkappe (14) ausgebildet ist, um Entladungen zwischen diesen Oberflächen zu verhindern,

dadurch gekennzeichnet, daß
das Füllmaterial (17) aus einem leitfähigen Material ist.

Revendications

1. Dispositif de bougie d'allumage comprenant :

un câble d'allumage (11) ;
un corps de bougie d'allumage (13) ayant une borne ;
une fixation de borne (12) connectée à une extrémité du dit câble d'allumage (11) et montée sur la borne du dit corps de bougie d'allumage (13) ;
un capuchon de bougie tubulaire (14) pour recouvrir le dit corps de bougie d'allumage (13) complètement jusqu'au dit câble d'allumage (11) ; et
une matière de remplissage (17) pour remplir un intervalle formé entre la surface périphérique extérieure de la dite fixation de borne (12) et la surface périphérique intérieure du dit capuchon de bougie (14) afin d'empêcher des décharges entre ces surfaces,

caractérisé en ce que
la dite matière de remplissage (17) est une matière conductrice.

FIG. 1

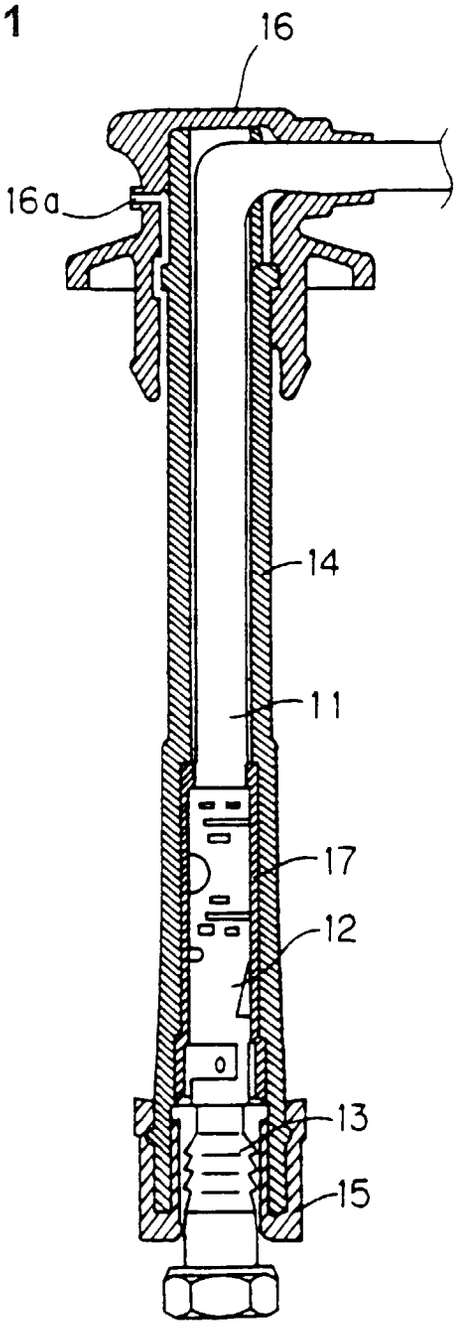


FIG. 2 (Prior Art)

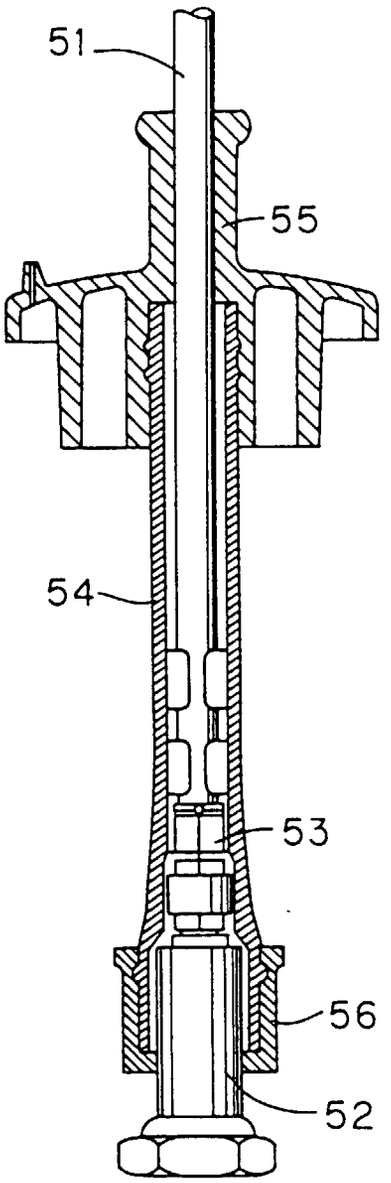


FIG. 3 (Prior Art)

