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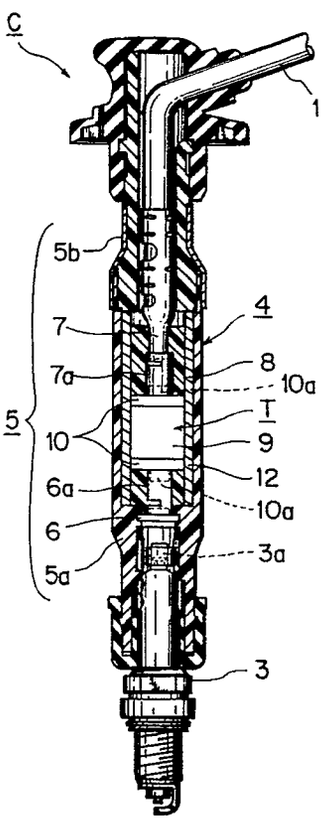
(54) High tension cable device.

(57) According to the present invention, in a high tension cable device including a casing having at one end portion a connecting terminal capable of being engaged with a terminal of an ignition plug and at the other end portion a power supply terminal connected to a high tension cable which communicates with a power supply side, and a series gap-forming discharge tube incorporated in the casing and connected to both the connecting terminal and power supply terminal, there is provided an improvement characterized in that at least on the inner periphery of the casing there is formed an insulating layer using an electrical insulating material which insulating layer covers the connecting terminal, the power supply terminal and the discharge tube incorporated in between these terminals.

FIG. 1



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HIGH TENSION CABLE DEVICE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a high tension cable and more particularly to high tension cable suitable for an ignition system with series gap in an automobile engine or the like. Description of the Prior Art

Heretofore there has been known an ignition system in an automobile or the like wherein a so-called series gap is provided in series with an ignition plug to prevent sputtering of the ignition plug and thereby keep the ignition timing constant. It has been proposed to form the above series gap using a so-called discharge tube.

Fig. 2 shows a high tension cable device C suitable for the above ignition system. A plug cap 4 is mounted at one end to a front end portion of a high tension cable 1 which communicates with a power supply side and is fitted removably at the other end thereof on an ignition plug 3 which is threadedly engaged with a cylinder head 2 of an engine. The plug cap 4 has a hollow cylindrical casing 5 which is constituted by assembling both a first casing 5a having a connecting terminal 6 engageable with a terminal 3a of the ignition plug 3 and a second casing 5b having a power supply terminal 7 connected to the high tension cable 1. Into the casing 5 is incorporated a discharge tube T which is connected to the connecting terminal 6 and the power supply terminal 7 through joint terminals 6a and 7a, respectively, and forms a series gap. Further, a filler 8, e.g. a thermosetting resin, is charged into the casing 5 to firmly hold the thus-incorporated discharge tube T. For example, the discharge tube T is constituted by sealing both open ends of an insulating tube 9 with a pair of flanged electrodes 10, 10 having discharge electrodes oppose to each other. An inert gas, e.g. argon, is sealed into the discharge tube T and the space between the above discharge electrodes forms a predetermined series gap.

The plug cap 4 portion of the high tension cable device C thus constructed is guided and inserted into a metallic pipe 11 embedded in the cylinder head 2 of the engine and is fitted on the ignition plug 3.

In the above conventional high tension cable device C, however, the plug cap 4 portion is guided and inserted into the metallic pipe 11 which is at the same potential as the cylinder head 2 which is at the earth potential, and the discharge tube T incorporated in the interior of the plug cap 4 is in proximity to the metallic pipe 11 which is at the earth potential through the casing 5 which constituted the plug cap 4. Besides, since the discharge tube T is in a potential wise floating state with respect to the ground (earth) by the portion of the ignition plug 3, a so-called corona discharge D is likely to be generated from both-end electrodes 10 of the discharge tube T which is an electrifying portion of the high tension cable device C, also from the connecting terminal portions 6, 6a and the power supply terminal portions 7, 7a which are connected to the discharge tube T, toward the metallic pipe 11 which is at the earth potential. As a result of this corona discharge D, the casing 5 portion around the discharge tube T may be deteriorated, and in the worst case there is a fear of dielectric breakdown of the casing 5.

Further, in the event the plug cap 4 gets wet, the potential of the outer surface of the casing 5 with water drops thereon becomes the earth potential, so that the corona discharge D becomes easier to be initiated and the foregoing dielectric breakdown also results more easily.

SUMMARY OF THE INVENTION

The present invention has been accomplished in view of the above-mentioned points and it is the object thereof to provided a high tension cable device capable of preventing the corona discharge caused by a potential difference between a discharge pipe incorporated in a plug cap serving as an electrifying portion of the high tension cable device as well as its connections and a earth potential member positioned around the plug cap, thereby preventing the deterioration of the assembly.

According to the present invention, in order to achieve the above-mentioned object, in a high tension cable device including a casing having at one end portion a connecting terminal capable of being engaged with a terminal of an ignition plug and at the other end portion a power supply terminal connected to a high tension cable which communicates with a power supply side, and a series gap-forming discharge tube incorporated in the casing and connected to both the connecting terminal and supply terminal, there is provided an improvement characterized in that at least on the inner periphery of the casing there is formed an insulating layer using an electrical insulating material which insulating layer covers the connecting terminal, the power supply terminal and the discharge tube incorporated in between these terminals.

Thus, according to the present invention, at least on the inner periphery of the casing of the

plug cap which constitutes the high tension cable device there is formed an insulating layer of an electrical insulating material which covers the connecting terminal and the power supply terminal both provided in the casing and also covers the discharge tube mounted between both these terminals, so even in the event of corona discharge from the discharge tube or its connections, the corona discharge is cut off by the above insulating layer, and hence there is no fear of deterioration of the assembly positioned around the discharge tube which would cause dielectric breakdown.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a high tension cable device according to an embodiment of the present invention; and

Fig. 2 is a sectional view showing a conventional high tension cable device which is in use.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

An embodiment of the present invention will be described in detail hereinunder with reference to Fig. 1, in whioh the same portions as in the prior art are indicated by the same reference numerals.

In Fig. 1, which illustrates an embodiment of the present invention, a plug cap 4 mounted to a front end portion of a high tension cable 1 and fitter removably on a terminal 3a of an ignition plug 3 is constituted by a casing 5 which is substantially in the shape of a hollow cylinder. The casing 5 is constituted by assembling a first casing 5a having a connecting terminal 6 capable of being engaged with the terminal 3a of the ignition plug 3 and a second casing 5b having a power supply terminal 7 connected to the high tension cable 1 which communicated with the power supply side. Both-end female type joint terminals 6a and 7a are fitted at one ends thereof to the connecting terminal 6 and the power supply terminal 7, respectively. The connecting terminal 6 and the joint terminal 6a constitute a connecting terminal portion, while the power supply terminal 7 and the joint terminal 7a constitute a power supply terminal portion. Further, support metal fittings 10a, 10a formed on both-end electrodes 10, 10 of a discharge tube T which constitutes a so-called series gap are fitted in and contacted with the other end portions of the thus-fitted joint terminals 6a and 7a, whereby the discharge tube T is mounted within the casing 5. For example, the discharge tube T comprises an insulating tube 9 having both open ends and a pair of flanged electrodes 10, 10 having discharge electrodes opposed to each other, both ends of the insulating tube 9 being sealed with the flanged electrodes 10, 10. An inert gas, e.g. argon, is sealed into the discharge tube T, and the space between both said discharge electrodes forms the series gap referred to above.

Along the inner peripheral portion of the casing 5 there is provided a hollow cylindrical protective pipe 12 as an insulating layer which covers all of the connecting terminal portions 6, 6a, the power supply terminal portions 7, 7a and the discharge tube T mounted between both these terminals. The protective pipe 12 is formed using an inorganic insulating material such as, for example, alumina ceramics, crystallized glass, or Pyrex glass. Further, the interior of the protective pipe 12 is filled with a filler 8 such as a thermosetting resin so as to firmly hold the discharge tube T mounted within the casing 5 and covered with the protective pipe 12.

Thus, in this embodiment, along the inner peripheral portion of the casing 5 of the plug cap 4 which constitutes the high tension cable device C, there is provided the protective pipe 12 of an electrical insulating material which covers the connecting terminal portions 6, 6a, the power supply terminal portions 7, 7a and the discharge tube T mounted between both these terminals, which are provided within the casing 5. For example, therefore, even in the case where the plug cap 4 portion of the high tension cable device C is embedded in the cylinder head of the engine and corona discharge is generated from the discharge tube T as an electrifying portion of the high tension cable device C or from its connections 6, 6a, 7, 7a toward the cylinder head side which is at the earth potential, the corona discharge is cut off by the protective pipe 12, so there is no fear of deterioration and dielectric breakdown of the assembly such as the casing 5 positioned around the discharge tube T. Consequently, the voltage resistance of the high tension cable device C is improved and the reliability thereof is remarkably improved.

The present invention is not limited to the above embodiment, and various modifications may be made. Even if a foil-like insulating layer comprising a ceramic paper or a ceramic coating material is formed on the inner and outer peripheral surfaces of the casing 5, in place of the protective pipe 12, there can be attained the same function and effect as above.

In the high tension cable device of the present invention, as set forth hereinabove, at least on the inner peripheral portion of the casing of the plug cap which constituted the high tension cable device, there is formed an insulating layer of an electrical insulating material covering the connecting terminal, the power supply terminal and the discharge tube mounted therebetween, which are provided within the casing. Therefore, even in the event of corona discharge from the discharge tube or its connections, the corona discharge is cut off

by the above insulating layer, so it is possible to prevent deterioration and dielectric breakdown, caused by the corona discharge, of the assembly positioned around the discharge tube. Further, the voltage resistance of the high tension cable device can be improved and the reliability thereof can be remarkably improved.

Claims

1. In a high tension cable device including a casing having at one end portion a connecting terminal capable of being engaged with a terminal of an ignition plug and at the other end portion a power supply terminal connected to a high tension cable which communicates with a power supply side, and a series gap-forming discharge tube incorporated in said casing and connected to both said connecting terminal and said power supply terminal, the improvement characterized in that at least on the inner periphery of said casing there is formed an insulating layer using an electrical insulating material, said insulating layer covering said connecting terminal, said power supply terminal and said discharge tube mounted between both said terminals.

2. The high tension cable according to claim 1, wherein said insulating layer is provided in the form of a protective pipe.

FIG. 1

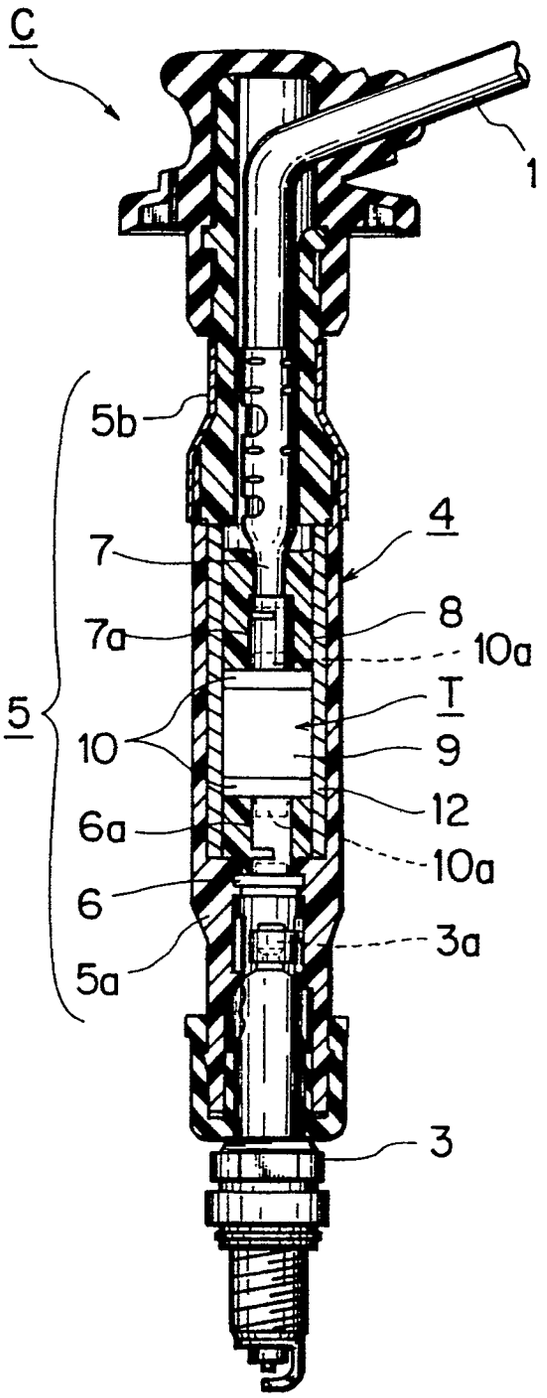
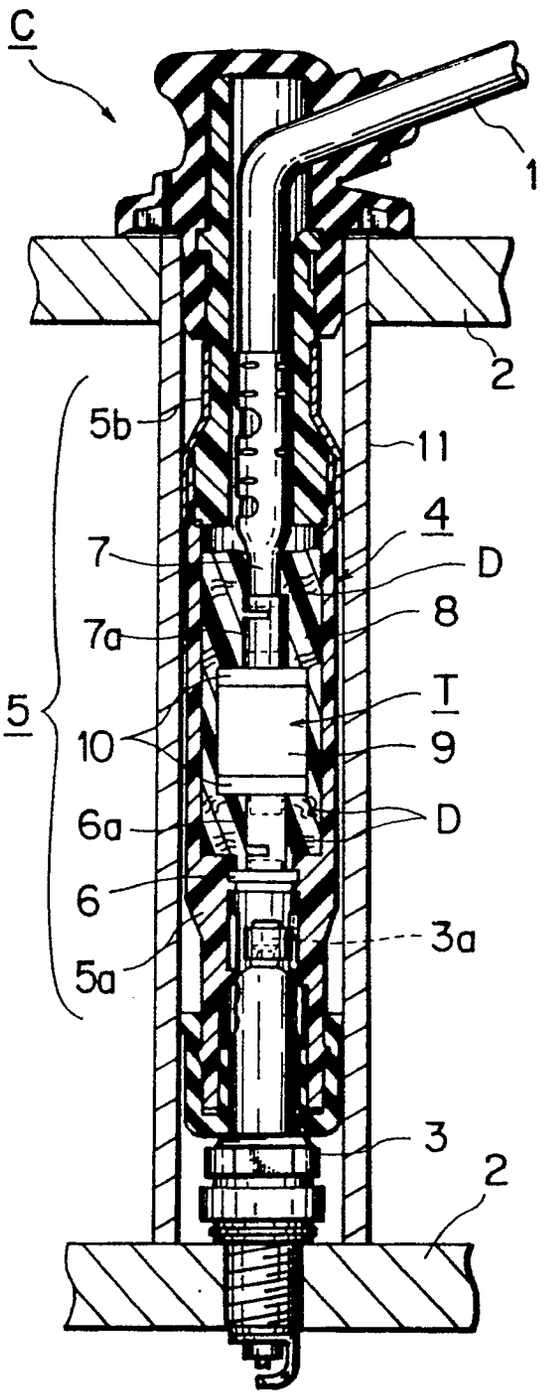


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number

EP 90 12 3981

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-2 114 370 (BOSCH) * Figure 2; page 6, lines 5-21 *	1,2	H 01 T 13/46
X	DE-A-3 737 781 (TOYOTA) * Figure 2; column 5, lines 53-60 *	1,2	
A	FR-A-8 306 24 (BOSCH) * Page 2, lines 3-19; figure 1 *	1,2	
A	FR-A-2 268 372 (SIEMENS AG) * Figure 2; page 3, line 39 - page 4, line 22 *	1,2	
A	DE-A-1 439 995 (BERU-WERK)		
A	DE-A-1 464 044 (BERU-WERK)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H 01 T
F 02 P

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	18 February 91	LEROY C.P.

CATEGORY OF CITED DOCUMENTS

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