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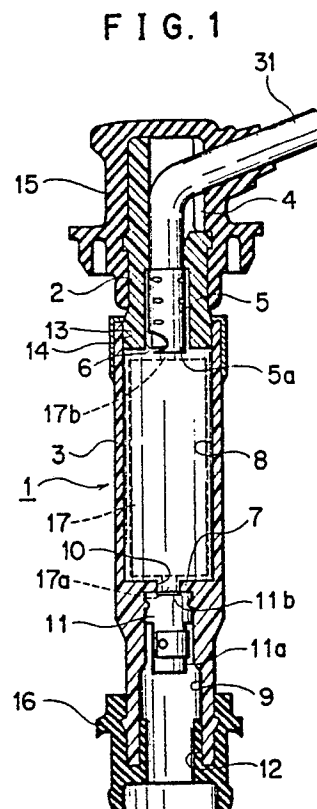
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⑤4 High tension cable device.

(57) A high tension cable device which has an ignition plug fitted at one end thereof and connected to a power source side at another end portion thereof to apply a high voltage to the ignition. The device comprises a dividable plug cap attached to the ignition plug; an empty chamber defined within the dividable plug cap, with the empty chamber having first and second longitudinal ends and being adapted to receive an additional function part therein; a first electrode terminal provided at the first longitudinal end for connection with the high tension cable; and a second electrode terminal provided at the second longitudinal end for connection with the ignition plug, with the first and second electrode terminals defining a series gap therebetween.



HIGH TENSION CABLE DEVICE

BACKGROUND OF THE INVENTION

This invention relates to a high tension cable, and more particularly to a high tension cable suitable for use with an ignition device to which an additional function part is added such as an ignition device with a series gap.

A high tension cable device for applying a high voltage boosted by an ignition coil to an ignition plug therethrough is commonly known. In recent years, an additional function part of various types is often accommodated in a plug cap which fits with an ignition plug. For example, an ignition device with a series gap has been proposed wherein a so-called series gap is provided at a portion of a high tension cable immediately before an ignition plug to prevent smoking of the ignition plug.

FIG. 4 shows such an ignition device C with a series gap therein as described above. In the ignition device C, a discharge tube 33 acting as a series gap S is incorporated between a high tension cable 31 connected to a power source side and an ignition plug 32. The discharge tube 33 has a needle electrode 34 at an end portion thereof at which it is connected to the high tension cable 31, and has a flat plate electrode 35 at the other end thereof at which it is connected to the ignition plug 32. The distance between the electrodes 34 and 35 defines the series gap S mentioned above.

And, as the discharge voltage of the discharge tube 33 is maintained sufficiently high and the voltage is almost applied to the ignition plug 32 after discharging, so-called smoking of the ignition plug, that is, electric current leaks by way of carbon or the like sticking to a central electrode portion 32a of the ignition plug 32 to disable a necessary ignition voltage to be obtained is prevented.

However, with the ignition device C having a series gap described above, the high tension cable 31 and the discharge tube 33 which serves as a series gap are connected directly to each other, and actually, attention is not paid very much to assembling facility or productivity in assembling the discharge tube or universal use or the like of the cable.

SUMMARY OF THE INVENTION

Thus, it is an object of the present invention to provide a high tension cable device which eliminates such problems of the prior art described above and allows an additional function part such as a so-called series gap to be incorporated very readily at a portion of an ignition device, particu-

larly of an ignition device with a series gap, immediately before an ignition plug.

In order to attain the object, according to the present invention, a high tension cable device which has an ignition plug fitted at an end portion thereof and is connected at the other end portion thereof to a power source side to apply a high voltage to the ignition plug is constituted such that a plug cap for fitting with the ignition plug has a split structure and has formed therein an empty chamber for incorporating an additional function part such as a series gap therein, and an electrode terminal for engaging with a terminal of the ignition plug is disposed at an end portion of the empty chamber while an electrode terminal connected to the high tension cable is disposed at the other end portion of the empty chamber.

Since the plug cap for fitting with the ignition plug has a split structure and the empty chamber for incorporating an additional function part such as a series gap therein is formed in the plug gap, the assembling facility and productivity of such additional function part are improved very much, and also the universal use of the cable can be attained.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIGS. 2 and 3 are sectional views showing modifications wherein part of the embodiment is modified; and

FIG. 4 is a sectional view showing an ignition device with a series gap which employs a conventional high tension cable device.

DETAILED DESCRIPTION OF EMBODIMENTS

In the following, an embodiment of a high tension cable device according to the present invention will be described with reference to the drawings. It is to be noted that like parts to those of the prior art are denoted by like reference numerals.

Referring to FIG. 1, reference numeral 1 denotes a plug cap substantially in the form of a hollow cylinder mounted at an end portion of a high tension cable 31 and made of a PBT material, an unsaturated polyester material or the like. The plug cap 1 is divided into two longitudinal parts and is thus composed of an upper plug cap member 2 and a lower plug cap member 3.

The high tension cable 31 is inserted in the upper plug cap member 2 by way of a hole 4

formed at an upper end portion of the cap. An electrode terminal 5 is securely mounted to an end portion of the high tension cable 31 by caulking such that a lower end portion 5a of the electrode terminal may be projected a little from a lower end opening 6 of the upper plug cap member 2.

Meanwhile, the inside of the lower plug cap member 3 is divided into two longitudinal parts thereof by a partition wall 7 such that an empty chamber 8 for performing therein an additional function part such as a series gap between opposite longitudinal ends thereof which will be hereinafter described is formed on the upper side of the partition wall 7 while a plug chamber 9 for fitting with a head portion of an ignition plug not shown is formed on the lower side of the partition wall 7. Further, the partition wall 7 has a small hole 10 formed therein for establishing communication between the empty chamber 8 and the plug chamber 9. A plug terminal 11 having a contact portion 11a at an end portion thereof for engaging with a terminal of the ignition plug is fitted in the plug chamber 9 by way of a lower end opening 12 of the lower plug cap member 3 such that a terminal plate 11b formed at the other end portion of the plug terminal 11 by bending is positioned at an end of the small hole 10 on the plug chamber 9 side.

And, if, after insertion of an additional function part into the empty chamber 8 as hereinafter described, the upper plug cap member 2 is fitted into an upper opening 13 of the lower plug cap member 3 and then the fitting portion is molded from the outer side with a resin material 14 such as a PBT (polybutylene terephthalate) material or an unsaturated polyester material to integrate the upper plug cap member 2 and the lower plug cap member 3 with each other, then the plug cap 1 having a sufficient durability is formed.

It is to be noted that the upper plug cap member 2 is covered from above over a substantially entire portion thereof except the fitting portion with the lower plug cap member 3 with a rain cover 15 made of an EPDM (ethylene-propylene copolymer rubber) material or a silicon or oil-containing silicon material to prevent water from entering the plug cap 1 after assembly. Similarly, another rain cover 16 is fitted around a lower end portion of the lower plug cap 3 so that, when the plug cap 1 is fitted with the terminal of the ignition plug, water may not enter a location around the ignition plug mounted on a cylinder head not shown.

Thus, if the plug cap 1 is assembled such that, for example, a discharge tube 17 acting as a series gap is inserted into the empty chamber 8 of the lower plug cap member 3 by way of the upper end opening 13 of the plug cap member until an external terminal 17a of one of electrodes of the dis-

charge tube 17 enters the small hole 10 and is contacted with the terminal plate 11b of the plug terminal and then the upper plug cap member 2 is telescopically inserted into the lower plug cap member 3 until the electrode terminal 5 at the leading end portion of the high tension cable 31 is contacted with an external terminal 17b of the other electrode of the discharge tube 17, then a high tension cable device having a series gap between the electrode terminals 5 and 11 in the inside therein is constructed thereby. Then, if the high tension cable device having a series gap is assembled to an ignition plug, then an ignition device with a series gap is constructed as a whole, and with the ignition device, an effective ignition voltage can be obtained whereas smoking of its ignition plug can be prevented.

Meanwhile, if, for example, a noise suppresser is inserted in the empty chamber 8, then a high tension cable can be obtained which is provided with a countermeasure for radio noises, and the high tension cable can effectively cope with radio faults caused by a rise of a required voltage or the like involved in employment of a microcomputer in an automobile and improvement in performance of an engine in recent years.

Further, an electric element such as an LCR circuit assembled on a printed circuit board or the like can also be inserted into the empty chamber 8, and by employing the split structure for the plug cap 1 in this manner, the assembling facility of various elements to the high tension cable device is improved very much and the productivity is improved.

FIGS. 2 and 3 show modifications wherein the coupling manner between the upper plug cap member 2 and the lower plug cap member 3 of the high tension cable device described hereinabove is changed.

In the case of the modification of FIG. 2, a male thread portion 18 is formed on an outer periphery of a lower end portion of an upper plug cap member 2 while a female thread portion 19 is formed on an inner periphery of an upper end portion of a lower plug cap member 3, and a plug cap 1 is assembled by threaded engagement between the upper plug cap member 2 and the lower plug cap member 3. And, the fixing performance and the sealing performance between the upper plug cap member 2 and the lower plug cap member 3 are assured by a bonding agent 20 of the silicon type or the fluorine type applied to the engaging portion between the upper and lower plug cap members 2 and 3.

To the contrary, in the case of the modification of FIG. 3, a recessed groove 21 is formed at a lower end face of an upper plug cap member 2 in a concentric relationship with an opening 6 of the

plug cap, and a plurality of arresting holes 22 are formed at a lower end wall of the plug cap member 2 such that they communicate with the recessed groove 21 and are opened to an outer circumferential face of a lower end portion of the upper plug cap member 2. Meanwhile, a fitting portion 23 is formed at an upper end face of a lower plug cap member 3 for fitting into the recessed groove 21, and a plurality of hooks 24 are provided projectingly at locations of an outer periphery of the fitting portion corresponding to the arresting holes 22. And, an O-ring 25 is interposed between the recessed groove 21 and the fitting portion 23. Thus, the plug cap 1 is assembled by engagement between the arresting holes 22 of the upper plug cap member and the hooks 24 of the lower plug cap member to snap fit the two members and the sealing performance is assured by the O-ring 25.

It is to be noted that, in the case of the devices of FIGS. 2 and 3 described above, if the coupling portion between the upper plug cap member 2 and the lower plug cap member 2 is molded from the outside with a resin material or the like, then the plug cap member 1 which is further improved in durability can be obtained.

As apparent from the foregoing description, according to the present invention, a high tension cable device is constituted such that a plug cap for fitting with an ignition plug has a split structure and has formed therein an empty chamber for incorporating an additional function part such as a series gap therein, and an electrode terminal for engaging with a terminal of the ignition plug is disposed at an end portion of the empty chamber while an electrode terminal connected to the high tension cable is disposed at the other end portion of the empty chamber. Accordingly, an additional function part such as a series gap can be assembled very readily at a location immediately before the ignition plug, and the high tension cable device which is superior in assembling facility, productivity and universal use of the cable can be obtained.

Claims

1. A high tension cable device which has an ignition plug fitted at one end portion thereof and connected to a power source side at another end portion thereof to apply a high voltage to said ignition plug, said high tension cable device comprising
a dividable plug cap attached to said ignition plug;
an empty chamber defined within said dividable plug cap, said empty chamber having first and second longitudinal ends and being adapted to receive an additional function part therein;
a first electrode terminal provided at said first lon-

gitudinal end for connection with a high tension cable; and

a second electrode terminal provided at said second longitudinal end for connection with the ignition plug, said first and second electrode terminals defining a series gap therebetween.

2. A high tension cable device according to claim 1, wherein said plug cap includes first and second plug cap members.

3. A high tension cable device according to claim 2, wherein said first plug cap member is telescopically inserted into said second plug cap member and sealed from outside thereof by means of synthetic resin.

4. A high tension cable device according to claim 2, wherein said first plug cap member is screwed into said second plug cap member and sealed therebetween by means of adhesive.

5. A high tension cable device according to claim 2, wherein said first and second plug cap members are snap fitted with each other and sealed by means of an O-ring provided therebetween.

FIG. 1

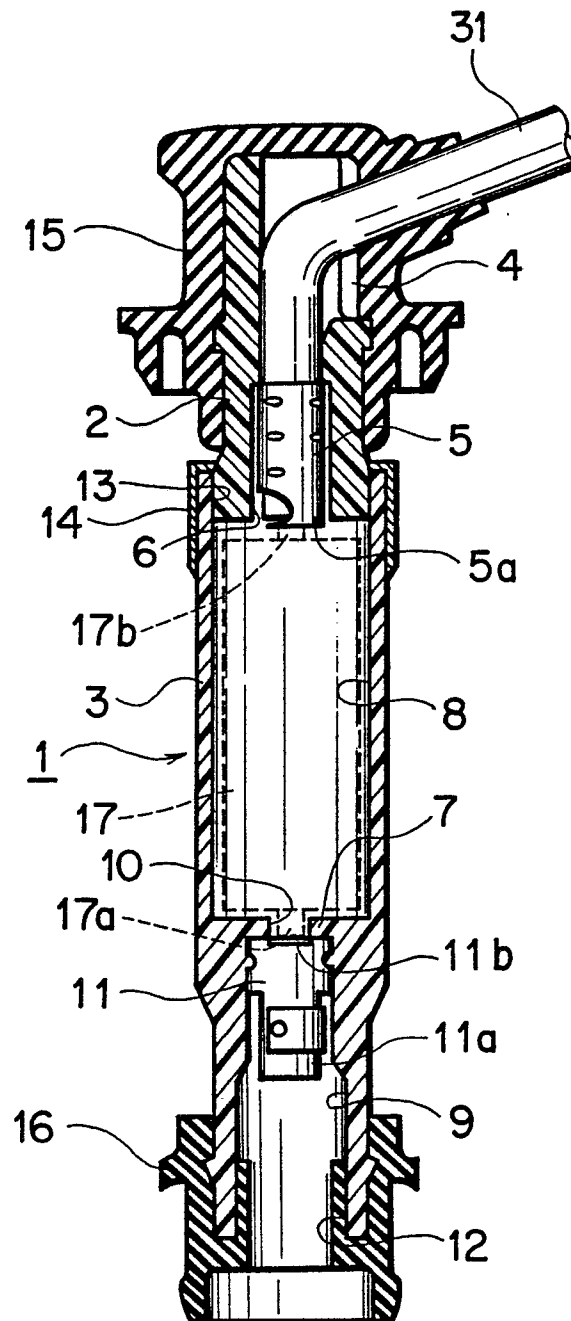


FIG. 4

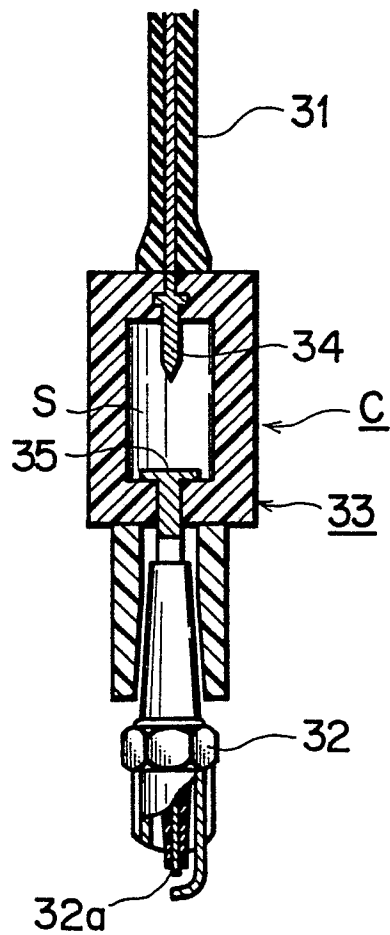


FIG. 2

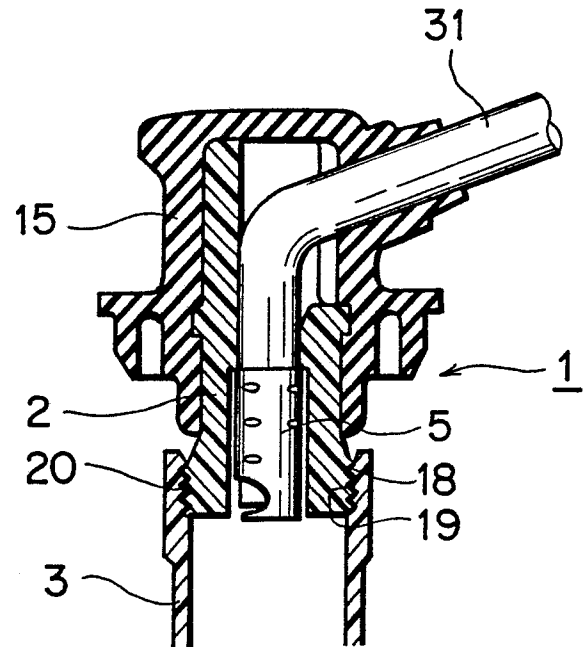
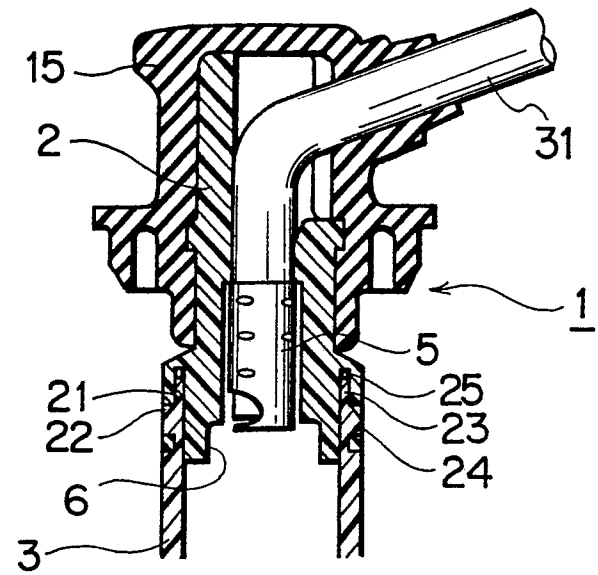


FIG. 3





DOCUMENTS CONSIDERED TO BE RELEVANT			EP 89118264.4
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4 5)
X	<u>DE - A1 - 2 206 215</u> (BOSCH) * Claims; page 3, paragraph 3 - page 5; fig. 1 * ---	1-3	H 01 T 13/04 H 01 R 13/506
X;Y	<u>GB - A - 1 358 670</u> (GUTEHOFFNUNGSHÜTTE) * Page 2, lines 11-69; fig. 1-4 * ---	1-3;4	
Y	<u>US - A - 3 995 183</u> (LECHNER et al.) * Column 3, lines 10-37; fig. 2 * ---	4	
X	<u>DE - A1 - 3 436 628</u> (BERU) * Page 7, line 30 - page 9, line 30; fig. 1,2 * ---	1,2	
A	<u>US - A - 4 580 341</u> (CHAPELOT) * Abstract; fig. 2,4,6 * ----	1,5	TECHNICAL FIELDS SEARCHED (Int. Cl. 4 5) H 01 T 13/00 H 01 R 13/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 22-12-1989	Examiner KUTZELNIGG
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			