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(54) Title: CONNECTION TERMINAL FOR HIGH-VOLTAGE CABLE

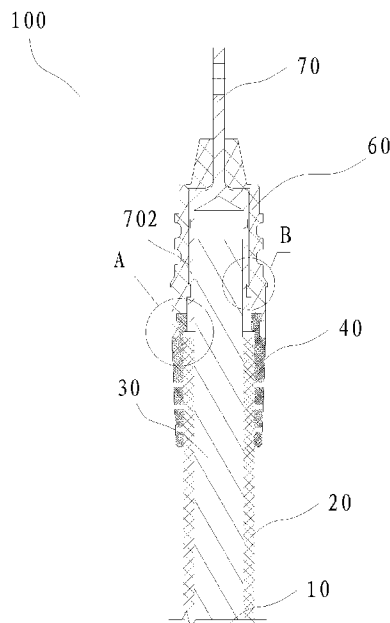


Fig. 2

(57) Abstract: A connection terminal (100) of a high-voltage cable comprises a connector (70), a cable (10) having a conductive core (30) and an insulating layer (20) surrounding the conductive core (30), a first plastic layer (40) surrounding at least one part of the end of the connector (70) and at least one part of the insulating layer (20), and a second plastic layer (60) surrounding at least one part of the first plastic layer (40) and at least one part of the end of the connector (70). The conductive core (30) is coupled to the free end (702) of the connector (70). The two plastic layers solve the problems of waterproof and insulation, and also reduce cost.



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ML, MR, NE, SN, TD, TG).

— *with international search report (Art. 21(3))*

CONNECTION TERMINAL FOR HIGH-VOLTAGE CABLE

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to, and the benefit of Chinese Patent Application No. 200920131244.8, filed on April 30, 2009 to State Intellectual Property Office, PRC, the entire contents of which are incorporated herein by reference.

FIELD

The present invention relates to terminal, more particularly to a connection terminal of a high-voltage cable.

BACKGROUND

At present, the high-voltage terminal has been widely used and developed, especially on pure electric or hybrid vehicle systems. The difference of pure electric or hybrid vehicle with a traditional fuel vehicle lies in that the pure electric or hybrid vehicle need for high-voltage cables to transmit high-current and high voltage power. The waterproof insulation issues of the high-voltage terminal have been a big problem for the manufacturer.

SUMMARY

In viewing thereof, the present invention is provided to solve at least one problem as mentioned above. Accordingly, a connection terminal of a high-voltage cable is provided, which can overcome high cost with low quality in the art. Further, the insulating and waterproof performance may be greatly enhanced.

According to an aspect of the invention, a connection terminal of a high-voltage cable may be provided. The connection terminal may comprise a connector having a plug end and a free end connected with the plug end; a cable having a conductive core and an insulating layer surrounding the conductive core. The conductive core may be coupled to a free end of the connector. The connection terminal may further comprise: a first plastic layer surrounding at least a part of the free end of the connector and at least a part of the insulating layer; and a second plastic layer surrounding at least a part of the first plastic layer and at least a part of the end of the connector.

According to an embodiment of the invention, the second plastic layer may be formed with at least a groove or protrusion on an outer surface where the first and second surrounding layers are overlapped with each other.

According to an embodiment of the invention, the entire connector is enveloped by the second plastic layer with the connecting end penetrating therethrough.

According to the connection terminal of the present invention, a pair of plastic layers are formed at the connecting portions between the insulating layer of the cable and the connector, waterproof and insulation may be enhanced tremendously, which not only reduces manufacturing cost but also increase performance of high temperature resistance and high pressure resistance.

Other variations, embodiments and features of the presently disclosed permanent magnetic materials will become evident from the following detailed description, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned features and advantages of the invention as well as additional features and advantages thereof will be more clearly understood hereinafter as a result of a detailed description of embodiments when taken in conjunction with the drawings, in which:

Fig. 1 shows a schematic view of a connection terminal according to an embodiment of the invention;

Fig. 2 shows a cross sectional view of Fig. 1;

Fig. 3A, 3B show an enlarged view of a portion A indicated in Fig. 2 respectively; and

Fig. 4A, 4B show an enlarged view of a portion B indicated in Fig. 2 respectively.

DETAILED DESCRIPTION

It will be appreciated by those of ordinary skill in the art that the present disclosure can be embodied in other specific forms without departing from the spirit or essential character thereof. The presently disclosed embodiments are therefore considered in all respects to be illustrative and not restrictive.

One embodiment of the present disclosure discloses a connection terminal 100 of a high-voltage cable as shown in Figs.1 and 2, which comprises a connector 70, a cable 10 having a conductive core 30 and an insulating layer 20 surrounding the conductive core 30. The connector 70 may have a connecting end 701 and a free end 702 connected therewith.

As shown in Fig 1, the connector 70 is coupled to the conductive core 30; and insulating material layers, i.e. a first plastic layer 40 and a second plastic layer 60 are surround the cable 10 to seal the connector 70 and the insulating layer 20. The first plastic layer 40 surrounds at least a part of the free end 702 of the connector 70 and at least a part of the insulating layer 20. The second plastic layer 60 surrounds at least a part of the first plastic layer 40 and at least a part of the end of the connector 70.

The conductive core 30 may be coupled to the connector 70, and the connector 70 may be connected to a working device (not shown). Then the cable 10 can transmit current or voltage signal to the working device via the conductive core 30 and the connector 70 respectively.

In one embodiment, the free end 702 may have a hollowed chamber 703. The conductive core 30 can be placed or inserted therein directly. During assembling, the conductive core 30 may be press fitted into the hollowed chamber 703, so that there is a tight and reliable connection between the connector 70 and the cable 10.

To ensure waterproof and insulation of the connection terminal, the first plastic layer 40 is formed to surround at least a part of the free end 702 of the connector 70 and at least a part of the insulating layer 20, as shown in Fig. 2. The first plastic layer 40 may be injection molded onto the connector 70 and the insulating layer 20. Then, the second plastic layer 60 may be formed to surround at least a part of the first plastic layer 40 and at least a part of the free end 702 of the connector 70. As shown in Fig. 2, the entire connector 70 may be enveloped by the second plastic layer 60 with the connecting end 701 penetrating therethrough.

In the following, the manufacturing method may be described as follows. In one embodiment, the second plastic layer 60 has an injection moulding temperature higher than that of the first plastic layer 40. That is to say, insulating material having a lower injection moulding temperature is used to form the first plastic layer 40, in one instance, the insulating material having a lower injection moulding temperature of about 120°C to about 160°C. Then insulating material having a higher injection moulding temperature is used to form the second plastic layer 60, in one instance, the insulating material having a higher injection moulding temperature of about 160°C to about 220°C.

To reinforce the binding force between the plastic layers 40, 60 and the connected connector 70 and cable 10, mating features may be formed on the connector 70, the first plastic layer 40 and/or the second plastic layer 60.

Fig. 3A, 3B show an enlarged view of a portion A indicated in Fig. 2 respectively. And Fig. 4A, 4B show an enlarged view of a portion B indicated in Fig. 2 respectively, showing the mating structures respectively.

As shown in Fig. 3A, the first plastic layer 40 is formed with at least a protrusion 401 (two shown in Fig 3A), so that when the second plastic layer 60 is formed, such as by injection moulding, onto the first plastic layer 40, the melt plastic material of the second plastic layer 60 is bound tightly onto the first plastic layer 40, thus further enhancing the reliability of the connection terminal 100.

According to another embodiment of the invention, the first plastic layer 40 may be further formed with at least a groove 401' (one shown in Fig 3A), so that when the second plastic layer 60 is formed, such as by injection moulding, onto the first plastic layer 40, the melt plastic material of the second plastic layer 60 is bound tightly onto the first plastic layer 40, thus further enhancing the reliability of the connection terminal 100.

Alternatively, for enhancing the binding force between the connector 70 and the second plastic layer 60, the outer surface of the free end 703 of the connector 70 is formed with at least a groove or protrusion. In Fig. 4A, three grooves 704 are formed on the outer surface 705, so that when the second plastic layer 60 is formed, such as by injection moulding, onto the free end 703, the melt plastic material of the second plastic layer 60 is bound tightly onto the connector 70, thus further enhancing the reliability of the connection terminal 100. According to another embodiment of the invention, three grooves 704' are formed on the outer surface 705, which may also enhance the reliability of the connection terminal 100.

The thickness and length of the insulating material layers 40, 60 may be designed practically, such as the current or voltage to be transmitted by the cable 10 etc.

In some embodiments, the first plastic layer 40 is made from insulating material such as PVC (polyvinyl chloride) or TPU (thermoplastic polyurethane). The second plastic layer 60 may be made of insulating material, such as PA (Polyamide) or PBT (Polybutylene terephthalate).

Although the present disclosure have been described in detail with reference to several embodiments, additional variations and modifications exist within the scope and spirit as described and defined in the following claims.

WHAT IS CLAIMED IS:

1. A connection terminal of a high-voltage cable comprising:
a connector having a connecting end and a free end connected with the connecting end;
a cable having a conductive core and an insulating layer surrounding the conductive core, with the conductive core being coupled to a free end of the connector;
a first plastic layer surrounding at least a part of the free end of the connector and at least a part of the insulating layer; and
a second plastic layer surrounding at least a part of the first plastic layer and at least a part of the free end of the connector.
2. The connection terminal according to claim 1, wherein the free end of the connector has a hollowed chamber with the free end of the connector being inserted therein.
3. The connection terminal according to claim 1, wherein the entire connector is enveloped by the second plastic layer with the connecting end penetrating therethrough.
4. The connection terminal according to claim 1, wherein the second plastic layer is formed with at least a groove or protrusion on an outer surface where the first and second surrounding layers are overlapped with each other.
5. The connection terminal according to claim 1, wherein the outer surface of the free end of the connector is formed with at least a groove or protrusion.
6. The connection terminal according to claim 1, wherein the second plastic layer has an injection moulding temperature higher than that of the first plastic layer.
7. The connection terminal according to claim 6, wherein the first plastic layer is made from an insulating material having an injection moulding temperature of about 120°C to about 160°C.
8. The connection terminal according to claim 7, wherein the second plastic layer is made of insulating material having an injection moulding temperature of about 160°C to about 220°C.
9. The connection terminal according to claim 7, wherein the first plastic layer is made of insulating material of Polyvinyl chloride or Thermoplastic Polyurethane.
10. The connection terminal according to claim 8, wherein the second plastic layer is made from an insulating material of Polyamide or Polybutylene terephthalate.

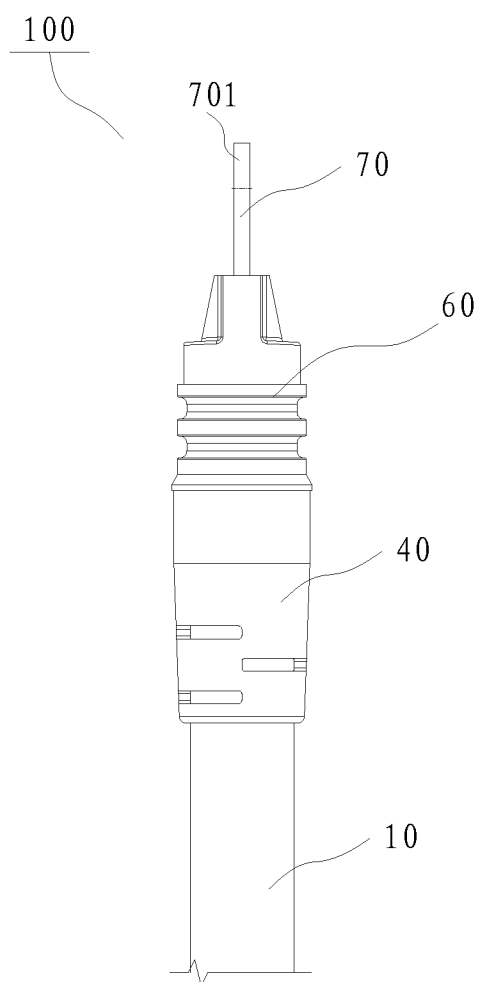


Fig. 1

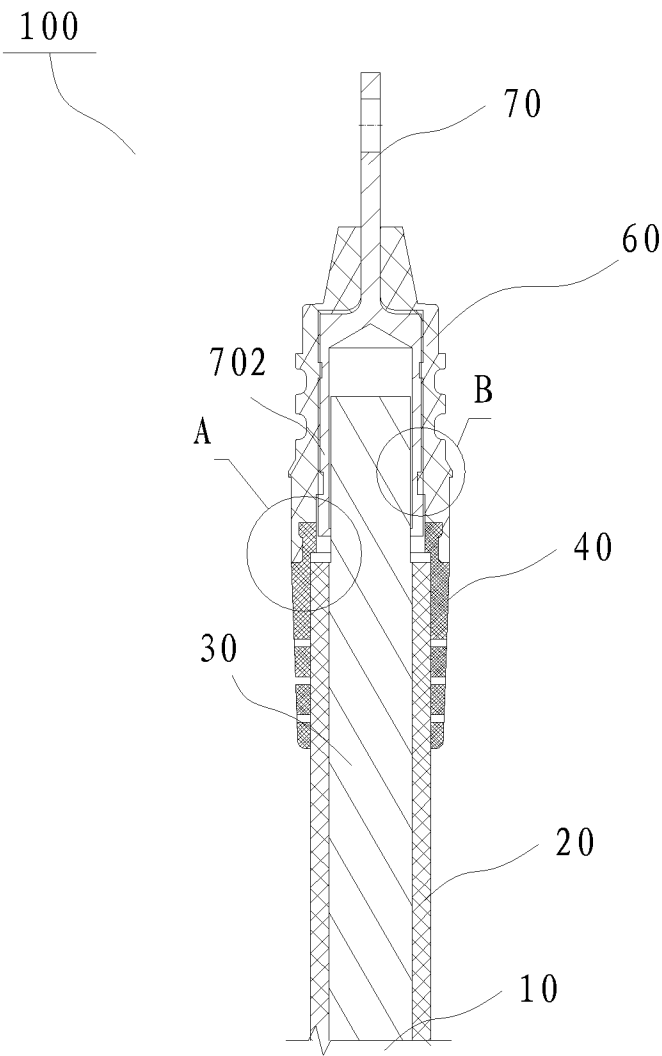


Fig. 2

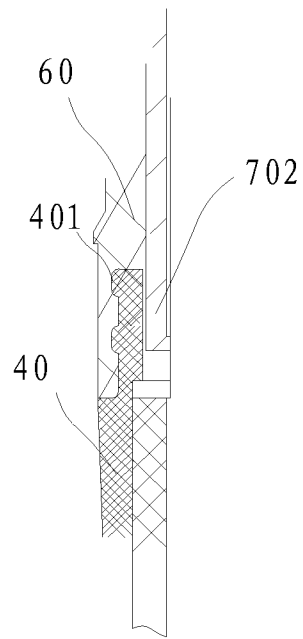


Fig. 3A

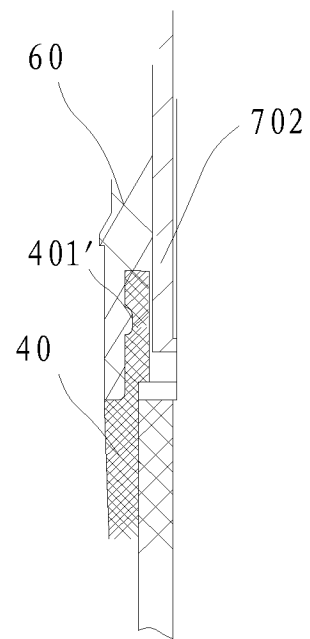


Fig. 3B

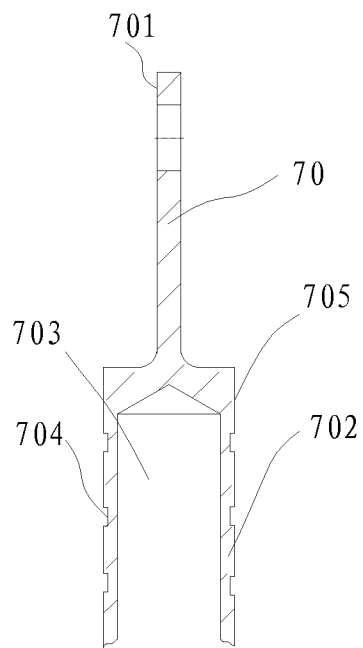


Fig. 4A

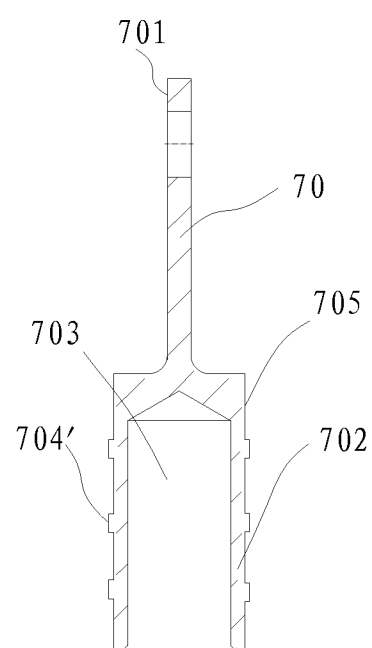


Fig. 4B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2010/072219

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H01R 4/-, 11/-, 13/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, CNPAT, CNKI: waterproof, terminal, cable, connector, insulation, concave, groove, protrusion

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 2634674 Y (XINGTIAN ELECTRIC CO LTD SHANGHAI) 18 Aug. 2004 (18.08.2004) page 5, the third paragraph from the bottom- page 7, the third paragraph in the description, figure 1	1-10
X	JP 2003-115353 A (YUKITA ELECTRIC WIRE CO LTD) 18 Apr. 2003 (18.04.2003) paragraphs 0020-0041, figure 1	1-10
A	CN 201087914 Y (GAN, Linan) 16 Jul. 2008 (16.07.2008) the whole document	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“A” document defining the general state of the art which is not considered to be of particular relevance	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
“E” earlier application or patent but published on or after the international filing date	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“L” document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family
“O” document referring to an oral disclosure, use, exhibition or other means	
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 16 Jul. 2010 (16.07.2010)	Date of mailing of the international search report 05 Aug. 2010 (05.08.2010)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer YU, Wenliang Telephone No. (86-10)62411758

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INTERNATIONAL SEARCH REPORT

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Continuation of: A. CLASSIFICATION OF SUBJECT MATTER

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