United States Patent

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[54] **MAGNETIC SAFE BREAK TERMINATOR ARC SUPPRESSOR**
6 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **339/111**
[51] **Int. Cl.** **H01r 13/52**
[50] **Field of Search** 339/12, 111

[56] **References Cited**

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ABSTRACT: An electrical connector including a plug having a member of arc-extinguishing material connected to an electrically conductive male element by a ferromagnetic stud and a receptacle having a sleeve of arc-extinguishing material connected to a hollow electrically conductive female element.

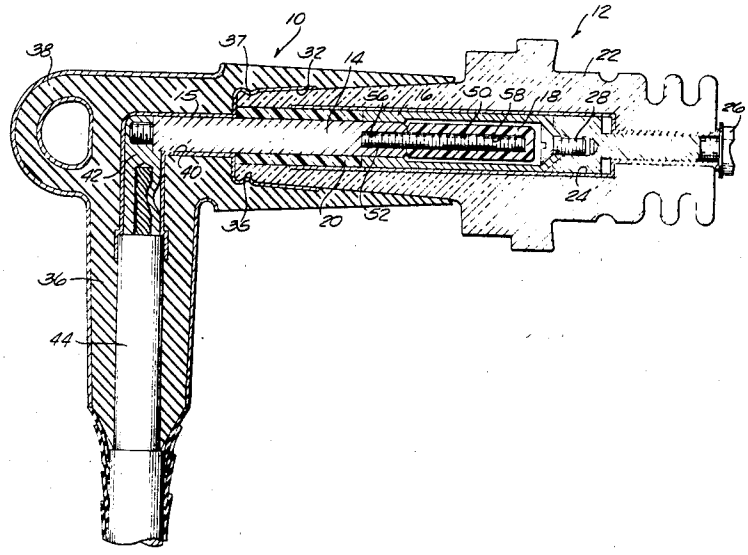


Fig. 1

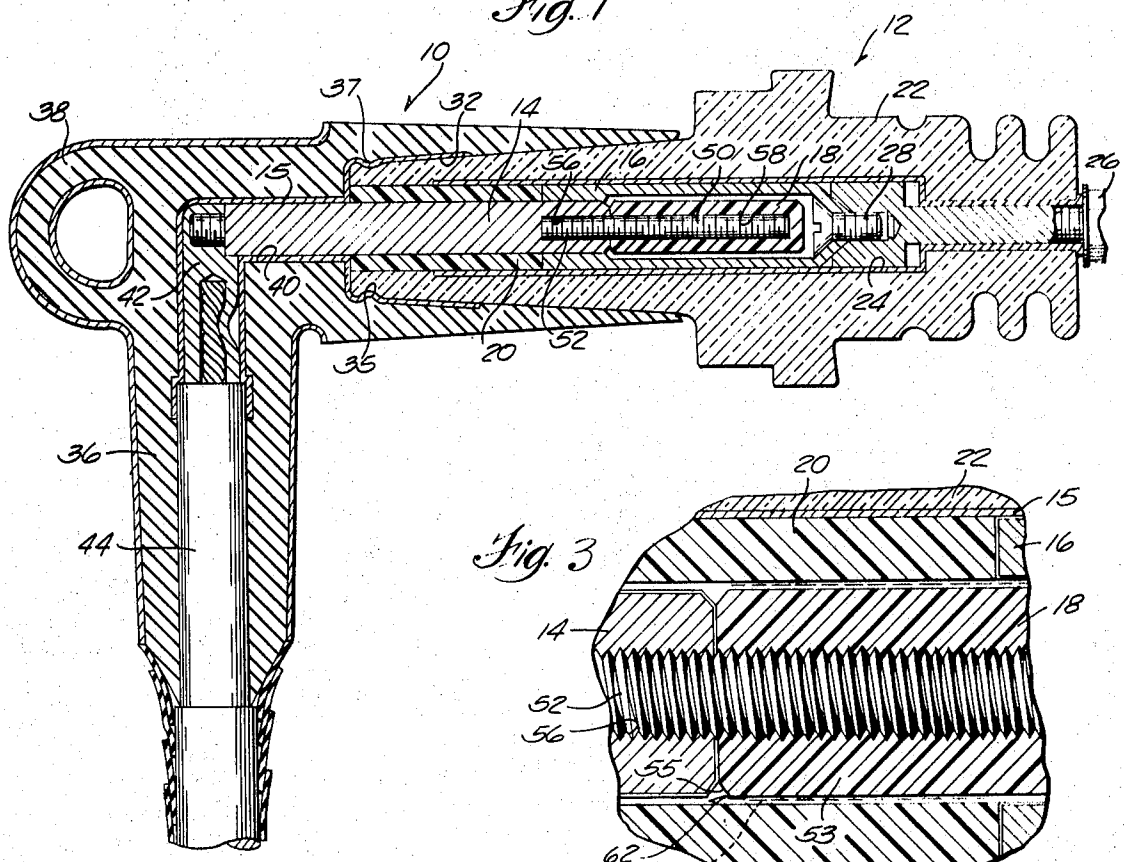


Fig. 3

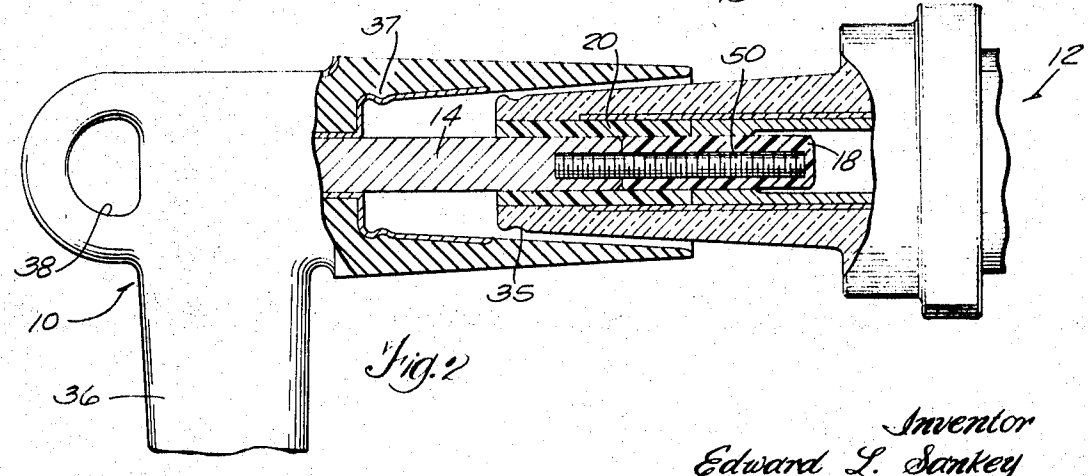


Fig. 2

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MAGNETIC SAFE BREAK TERMINATOR ARC SUPPRESSOR

BACKGROUND OF THE INVENTION

In electrical connectors of the type having a plug and receptacle as shown in copending application Ser. No. 748,142 , insulating members of arc-extinguishing material are positioned at the ends of the electrically conductive elements to interrupt the arc produced on disconnection of the plug from the receptacle. Repeated disconnection of the plug from the receptacle has resulted in a noticeable deterioration or erosion of the arc-extinguishing member in the plug at the juncture of the member with the electrically conductive element. Difficulty has also been encountered in connecting the arc-extinguishing member to the electrically conductive element in the plug.

SUMMARY OF THE INVENTION

The electrical connector plug of this invention is provided with an improved connection between the arc-extinguishing member and the electrically conductive element which increases the operating life of the arc-extinguishing member. This has been accomplished by using a magnetically permeable stud to connect the arc-extinguishing member to the electrically conductive male element. The stud is embedded within the arc-extinguishing member where it forms a magnetic core that directly exerts control on the arc formed on disconnection of the plug from the receptacle. Magnetic attraction of the arc to the core is believed to reduce damaging action of the arc on the extinguishing member and to facilitate arc extinction.

Other objects and advantages of the present invention will become apparent from the following detailed description when read in connection with the accompanying drawings in which:

FIG. 1 is a side view in section of the electrical connector with the plug mounted on the receptacle.

FIG. 2 is a side view in section of the electrical connector showing the plug partially withdrawn from the connector.

FIG. 3 is an exploded view of a portion of FIG. 2 showing the arc in the gap between the arc-extinguishing members.

DESCRIPTION OF THE INVENTION

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

Referring more particularly to the drawing, an electrical connector of the type contemplated herein includes a plug **10** telescopically received in a receptacle **12** each of which includes an electrically conductive element **14** and **16**, respectively. On withdrawal of the plug **10** from the receptacle **12** an arc drawn between the conductive elements **14** and **16** is interrupted by arc-extinguishing members **18** and **20** provided on the ends of the electrically conductive elements **14** and **16**, respectively.

More specifically, the receptacle **12** includes a bushing **22** formed either from an organic insulating material or an inorganic material, such as glass or porcelain. The electrically conductive element **16** is formed from a hollow tube and is housed within a central recess **24** provided in the bushing **22**. The element **16** is connected by means of a screw **28** to an electrical conductor **26** which is connected to a high voltage cable.

The arc-extinguishing member **20** is positioned in the end of the recess **24** in the bushing **22** at the end of the conductive element **16** and is made in the form of a sleeve. The arc-extinguishing members **18** and **20** are desirably formed from arc-extinguishing material such as Nylon, Delrin or any of the other known gas evolving arc-extinguishing materials.

The plug **10** includes an insulated hood **36** molded from any of the known insulating materials such as rubber and is generally provided with a hook eye **38** formed as an integral part of the hood **36**. The electrically conductive element **14** is housed within a recess **40** provided in the hood **36** and projects outwardly into a tapered recess **32**. The electrically conductive element **14** in recess **32** is connected to a terminal lug **42** crimped to the end of a high voltage cable **44**. The arc-extinguishing member **18** was formerly secured to the end of the electrically conductive element **14** by inserting a reduced diameter section of the member into an aperture at the end of the element **14**. The member **18** has an elongate shape for insertion into the sleevelike arc-extinguishing member **20** and the hollow electrically conductive element **16** in the receptacle **12**.

The plug **10** is connected to the receptacle **12** by telescoping the arc-extinguishing member **18** into the sleevelike member **20** and pushing the plug toward the receptacle until the electrical elements **14** and **16** are in mating engagement. The plug **10** will seat on the receptacle **12** with outer surface **30** of the receptacle in sealing engagement with the surface of recess **32**.

Snap release of the plug **10** from the receptacle **12** is provided by pulling on the elongated hook eye **38** to break the vacuum formed by the engagement of the surface of recess **32** with the surface **30** of the receptacle. The resistance to release of the plug **10** from the receptacle **12** may be increased by providing an annular groove **35** at the end of the receptacle and an annular ring **37** at the inner end of the recess **32**. The structure described above is substantially similar to the structure disclosed in copending application Ser. No. 748,142, however, an electrically conductive coating **15** is provided around the electrically conductive element in both the plug **10** and receptacle **12**.

The improvement relates to the means for influencing the path of the arc, as well as connecting the arc-extinguishing member **18** to the electrically conductive element **14**. This means includes a ferromagnetic stud or core **50** embedded in the arc-extinguishing member **18** and secured to the conductive element **14**. The stud **50** is formed from a ferrous material such as steel. In practice it may be provided with threads **52** and **54** at each end for anchorage. The threaded end **52** is screwed into a threaded aperture **56** at the end of the conductive element **14**. The arc extinguishing member **18** is provided with a threaded aperture **58** and is screwed onto the threaded end **54** of the stud. The stud **50** provided a magnetic flow path for the magnetic field which forms about the arc. The flux in that path tends to draw the arc toward the stud. Erosion of the end **53** of the member **18** at the junction **55** with the element **14** has been reduced markedly by using the ferromagnetic core.

Although the cause of the reduction in erosion of the member **18** has not been determined, it is believed to be due to the presence of a magnetically permeable material in the magnetic field of the arc current. Referring to FIGS. **2** and **3** the plug **10** is shown partially withdrawn from the receptacle **12** with the electrically conductive members **14** and **16** separated and an arc **60** is shown in the gap **62** between the arc-extinguishing members **18** and **20**. Normally, the arc is free to follow the ionized path of highest conductivity between the arc-extinguishing members **14** and **16** and tends to remain centrally disposed between the arc-extinguishing members **18** and **20**. However, the ferrous material in the stud or core **50** provides a magnetic flow path in close proximity to the magnetic field around the arc. The arc **60** will be pulled or drawn toward the core **50** due to the tendency of the magnetic field around the arc to seek the shortest magnetic flow path. This prevents the arc from moving freely in the gap and is believed to relieve the nonconductive sleeve of some heat and also possible helps in extinguishing the arc sooner. Although the ferromagnetic material has been disclosed in the form of a core or stud **50**, a ferromagnetic sleeve could also be mounted on the arc-extinguishing member **20**.

I claim:

1. A plug for connecting a high voltage cable to a receptacle having an arc extinguishing sleeve positioned at the entry end

of a hollow electrically conductive tubular member, said plug including

an electrically conductive element adapted to be inserted into the hollow tubular member,

an arc-extinguishing member secured to said element, and

a magnetically permeable core within said arc-extinguishing member for influencing the flow path of the arc drawn between the electrically conductive tubular member and said electrically conductive element on disconnection of said plug from the receptacle.

2. A plug according to claim 1 wherein said core comprises a ferromagnetic stud connecting said electrically conductive element to said arc extinguishing member.

3. An electrical connector for disconnecting high voltage conductors comprising

a receptacle having a first electrically conductive element having one end connected to a high voltage conductor and

a first member made of an arc-extinguishing material positioned at the other end of said first element,

a plug having a second electrically conductive element having one end connected to a high voltage conductor and a second member made of an arc-extinguishing material positioned at the other end of said second element, and

a magnetically permeable core embedded within said second member for influencing the flow path of the arc drawn between said first and second elements on disconnection of said plug from said receptacle.

4. An electrical connector according to claim 3 wherein

said core comprises a ferromagnetic stud.

5. An electrical connector for connecting high voltage conductors comprising

an electrically insulating plug having a tubular electrically conductive element connected to one of the high voltage conductors,

a ferromagnetic stud secured to the end of said element and forming an extension thereof and a member of arc-extinguishing material mounted on said stud,

an electrically insulating receptacle having a hollow electrically conductive element connected to another of the high voltage conductors and

a sleeve of arc-extinguishing material positioned at the entry to said hollow element to telescopically receive said tubular element and arc-extinguishing member on connection of said plug and receptacle.

6. The combination of a telescopically insulated cable connector having disconnectable male and female electrical contacts electrically connected to high voltage conductors,

the female contact having a first member of arc-extinguishing material positioned at the entry to said female contact,

the male contact having a second member of arc-extinguishing material affixed to the end of the male contact,

and a magnetically permeable element embedded in one of said first and second members to aid in extinguishing the arc drawn between said contacts on separation.

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