Nov. 10, 1970 E. F. JOHNSON ET AL 3,539,969

HIGH VOLTAGE CONNECTOR

Filed Feb. 20, 1968 2 Sheets-Sheet 1

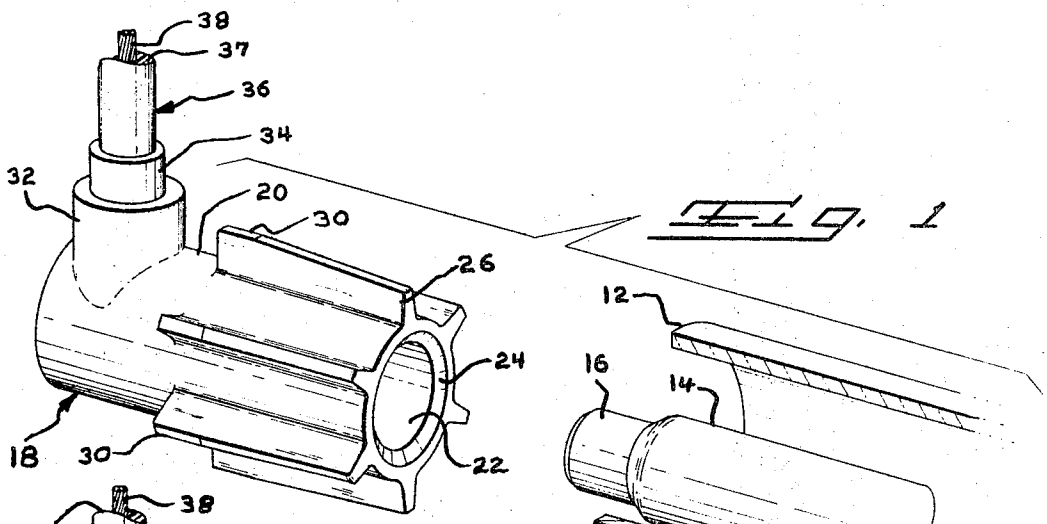


Fig. 1

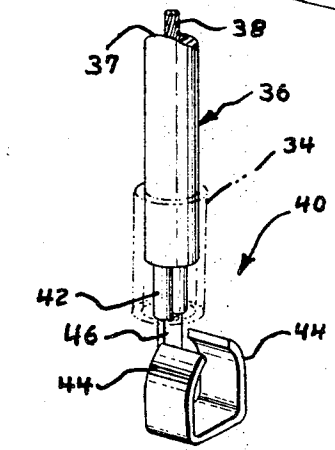


Fig. 2

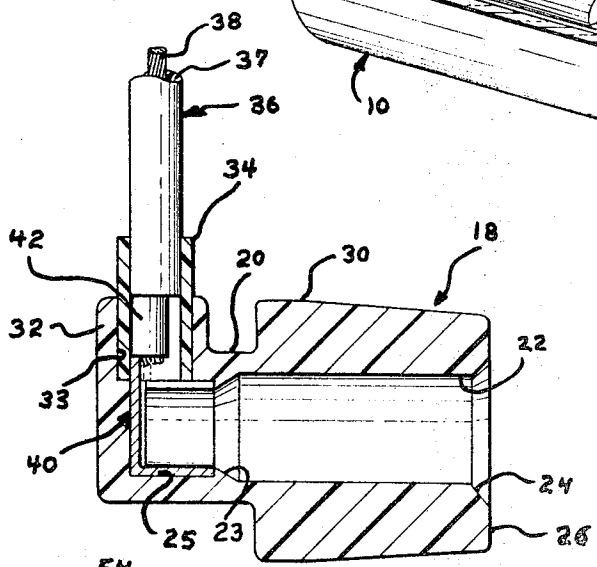


Fig. 3

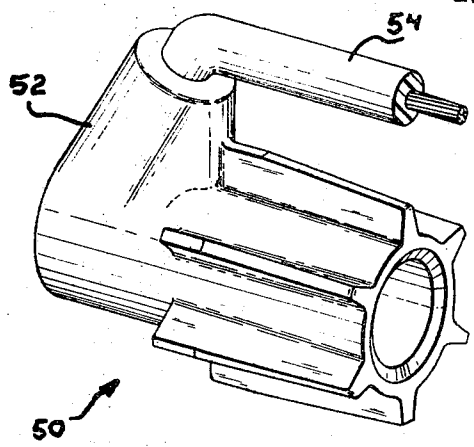


Fig. 4

INVENTOR
ERLON FITCH JOHNSON
JAY CALVIN GERBER
BY John A. Hopkins

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HIGH VOLTAGE CONNECTOR

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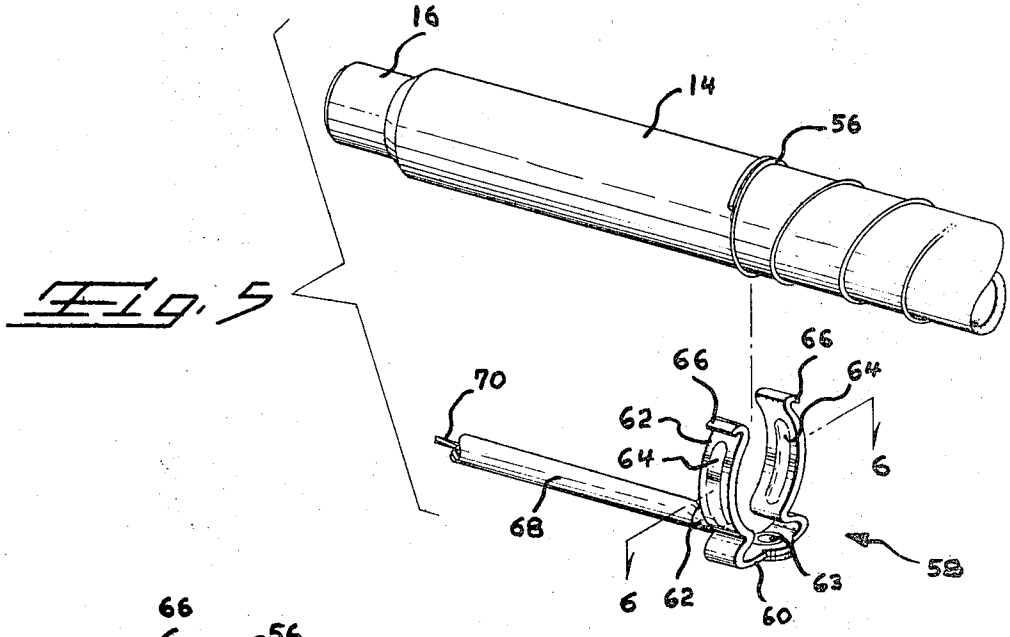


Fig. 5

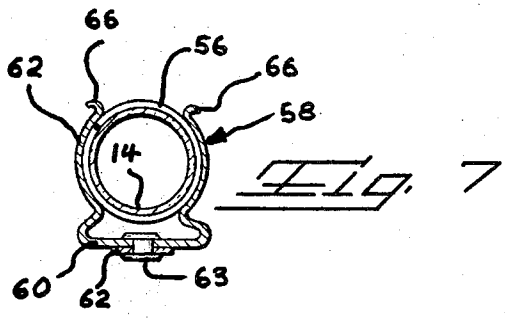


Fig. 7

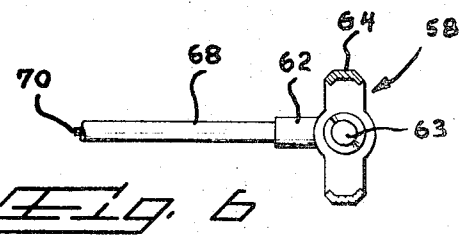


Fig. 6

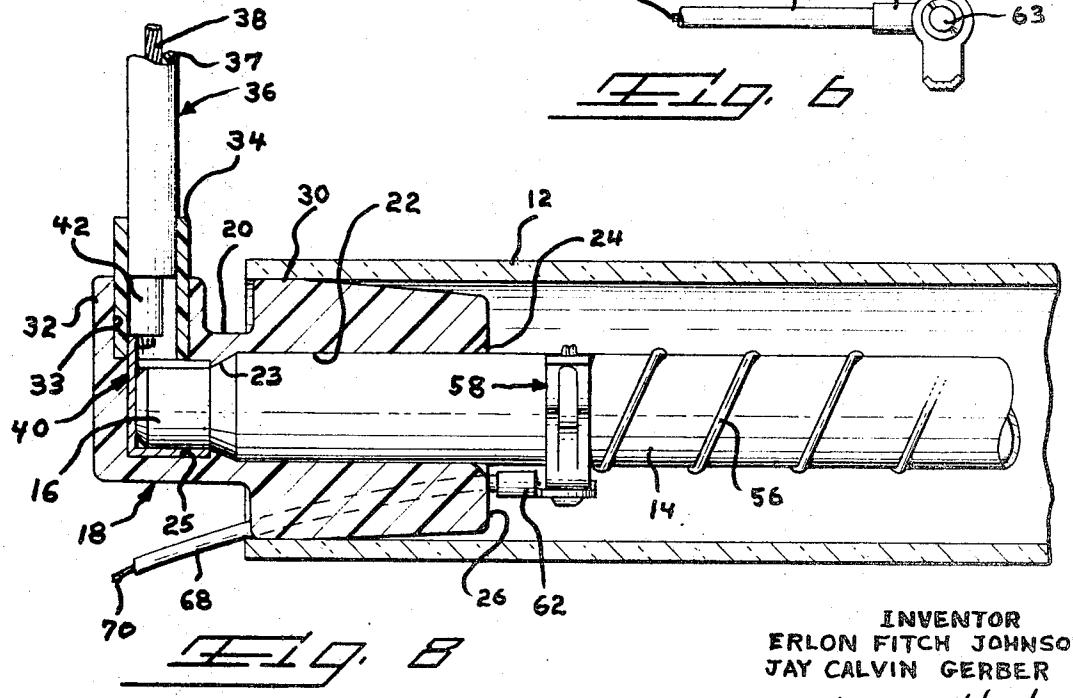


Fig. 8

INVENTOR
ERLON FITCH JOHNSON
JAY CALVIN GERBER

BY John C. Hopkins

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HIGH VOLTAGE CONNECTOR

Erlon Fitch Johnson and Jay Calvin Gerber, Elizabethtown, Pa., assignors to AMP Incorporated, Harrisburg, Pa.

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U.S. Cl. 339—52 11 Claims

ABSTRACT OF THE DISCLOSURE

A high voltage connector assembly is disclosed which includes a hollow mating portion adapted to support and terminate a fragile cylindrical member such as a xenon lamp. The connector mating portion includes a series of radially extending ribs tapered along the length thereof and spaced apart to provide lamp support and ventilation when connectors are plugged into each end of a protective tube. The connector mating portion and ribs are of a material sufficiently yieldable to facilitate plugging of the connector and lamp in position against accidental disfracturing such tube, but at the same time maintaining the connector into a thin walled glass protective tube without placement. A further connector is included which provides a connection to the starter winding of the xenon lamp spirally disposed therearound with the lead to such further connector extended through the space between the ribs of the mating portion. The foregoing connector structures provide support of xenon lamps and a termination of starter and supply high voltage leads therefor which can be easily and readily changed in the field.

BACKGROUND OF THE INVENTION

In the xerography art a source of rather intense white light is developed from a xenon lamp which is typically in the form of a relatively long and fragile glass cylinder having a metal band terminal at each end. Such lamps may be found in copying machines of the type manufactured by the Xerox Corporation. Xenon lamps have a life span related to usage and must be frequently replaced. Because xenon lamps operate at high voltage, generate considerable heat and are fragile, some difficulty has been experienced in providing lamp support and termination in a manner which facilitates field replacement. This problem is complicated by the fact that most lamps utilize what is known as a starter winding of rather stiff fine wire wound spirally about the outside of the lamp and along most of the lamp length. A typical lamp requires approximately four kv. for operation but requires approximately 10 kv. applied to the starter winding to initiate ionization. Lamp replacement requires that a connection be broken at each end of the lamp for both the main power supply and the starter supply. In most instances a transparent protective tube is made to surround the lamp along its length, further complicating replacement.

SUMMARY OF THE INVENTION

The present invention relates to a high voltage connector assembly capable of being plugged into a relatively fragile receptacle and capable of receiving a fragile body such as a xenon lamp and both terminating and supporting such body.

It is an object of the present invention to provide an easily replaceable high voltage connection of fragile devices. It is a further object to provide a connector assembly which terminates, supports and permits ventilation of fragile structures. It is yet another object to provide a termination of main voltage and starter voltage

terminals of a lamp structure disposed within a relatively fragile protective tube.

The foregoing objects are attained and the aforementioned problems are overcome by the invention through a high voltage connector body which has an interior circular bore adapted to receive and support a lamp structure having a terminal on the end which is received by a mating terminal in the connector body. The connector body includes on an exterior surface a series of thin tapered ribs extending axially along the body and outwardly in a radial sense to facilitate plugging the connector body into a fragile tube such as the protective envelope surrounding xenon lamps and the like. Spaces between the ribs on the connector body permit ventilation of the lamp within the protective tube. In one embodiment the spaces between the ribs facilitate a starter lead which is connected to a U-shaped terminal clipped on over a lamp starter wire. Connectors are used at each end of the protective tube to provide support and termination of both ends of a lamp.

While the disclosure herein presented is illustrated relative to mounting and terminating xenon tubes, it is to be understood that uses of the invention are contemplated for a variety of applications wherein connectors must be plugged into tubular receptacles to terminate and support at least one end of a fragile and heat generating element. The invention is visualized as solving the several problems of high voltage termination, support of fragile parts, connections facilitating ventilation or conviction and various applications exist wherein any one or several of these problems are present.

In the drawings:

FIG. 1 is a perspective view of a connector in accordance with the invention positioned relative to the end of a xenon lamp and a surrounding protective tube, the tube being partially sectioned to show the lamp.

FIG. 2 is a perspective view showing a high voltage lead connected to a terminal used with the connector shown in FIG. 1;

FIG. 3 is a longitudinal sectional view of the connector of FIG. 1;

FIG. 4 is a perspective view of an alternative version of the connector of the invention;

FIG. 5 is a perspective view showing the end of a xenon lamp and a portion of a starter wire disposed thereon with a starter connector in accordance with the invention shown prior to engagement with the lamp and starter wire;

FIG. 6 is a plan view of the connector shown in FIG. 5, as viewed from the section through lines **6—6** of FIG. 5;

FIG.7 is a cross-sectional view of the connector of FIG. 5 as mounted on the lamp and starter wire shown in FIG. 5; and

FIG. 8 is a longitudinal view in partial section showing the connectors of the invention in place and terminating and supporting one end of a xenon lamp within a protective tube.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 numeral **10** represents one end of a lamp assembly including an outer protective tube **12** surrounding a lamp **14** having at the end a terminal in the form of a metallic band **16**. The assembly **10** has a structure at the opposite end thereof which is substantially identical to that shown in FIG. 1. The tube **12** is typically of a transparent material such as glass. The lamp **14** typically includes a thin wall glass envelope approximately one-half inch in diameter, the tube **12** and the lamp both being approximately twelve inches in length.

In FIG. 1 numeral **18** represents a connector in accordance with the invention. The connector includes a body **20** of insulating and dielectric material, which in the illustrated embodiment is capable of withstanding heat generated by the xenon lamp. A number of hard rubbers such as Neoprene or hard silicone base material are available. As shown in FIG. 3, the body **20** includes a center bore **22** having an opening bevel **24** to facilitate insertion of the lamp **14** therewithin. As shown in FIG. 8, the bore **22** is of a diameter to receive and support lamp **14**. At the left end of the bore **22**, in the view shown in FIG. 3, the material of the body is necked down as at **23** to conform to the surface shape of **14**. Adjacent the necked down portion **23** of bore **22** is a recess or cavity **25** of a configuration to receive the end of a terminal positioned therewithin. Extending up from the left end of body **20** is a portion shown as **32** which includes an interior bore **33** leading to cavity **25**. Bore **33** is of a size to facilitate insertion of a sleeve **34** surrounding a lead **36** attached to a terminal **40**. The lead **36** includes an outer and relatively thick insulation sheath **37** surrounding a conductive core **38**. The sleeve **34** fills bore **33** to support the terminal, eliminate air and seal the lead and terminal within the connector body.

Terminal **40** includes a rear portion **42** adapted to be crimped or soldered to the core **38** of the lead. As shown in FIG. 2 the end of the terminal is comprised of a pair of upstanding arms **44** supported by a base portion to define spring contact elements which fit around the terminal sleeve **16** of lamp **14**. Base portion **44** is connected to portion **42** by a strip **46**. The terminal **40** is typically stamped of brass sheet material or the like.

Body **20** includes a series of ribs **26** extending axially along the forward portion of the body and radially outwardly thereof. Ribs **26** are tapered along most of the rib length and end in flats **30** which provide a supporting engagement between the connector **18** and the protective tube **12**. The ribs are of a width to permit compression without developing an undue force against the protective tube **12**. The taper assists in insertion and withdrawal of the connector body within tube **12**. The spacing between ribs is sufficient to permit convection transfer of heat generated by lamp **14** within tube **12**. FIG. 8 shows connector **18** in position supporting and terminating a lamp **14**. It is to be understood that with respect to the illustrative embodiment, an assembly like that shown in FIG. 8 would be provided at the opposite end of lamp **14** and tube **12**.

FIG. 4 shows an alternative connector embodiment which is essentially similar to the previously mentioned embodiment with changes made to permit a lead **54** to be brought out parallel to the length of the connector body. The connector shown as **50** includes a portion **52** angled back toward the front end of the connector with the lead **54** being carried out parallel to the length of the body. In the embodiments shown in FIGS. 1–3 and in FIG. 4, it is contemplated that the connector body would be made by molding with the terminal and lead then fitted into the body, or the terminal may be crimped on or soldered to the lead with the rear end of the body molded about such terminated lead.

Turning now to a further aspect of the invention, FIG. 5 shows a lamp **14** having a starter wire **56** disposed thereon. The wire **56** is typically of a hard fine conductive material spirally disposed along the length of the lamp. The ends of the wire are comprised of adjacent coils, as shown in FIG. 5, which must be terminated to a starter supply voltage. When a lamp **14** must be replaced it is necessary to disconnect the wire rewire the lamp, insert a fresh lamp within the wire and reconnect the wire to a starter supply lead.

The invention contemplates a starter connector shown as **58** in FIGS. 5, 6 and 7, which is comprised of a U-shaped metal contact spring **60** having arms **62** curved

in the general configuration of the lamp. The arms **62** have a boss **64** which facilitates disposition over the coils at the ends of wire **56**. The ends of the arms are curled outwardly as at **66** to permit the connector to be snapped on over wire **56** as mounted on lamp **14**. The forward portion of the connector is riveted as at **63** to a shank portion of **60** which is terminated as by crimping or soldering to the conductive core **70** of a starter voltage lead shown as **68**.

In use the wire **56** is placed over a lamp with connectors **58** snapped into position on each end of the wire on the lamp, one at a time by displacing the lamp from one end or the other within tube **12**. As this is done connectors **18** are applied to the ends of the lamp and worked into tube **12** to complete a termination of power and starter voltage leads to lamp **14** in the manner shown in FIG. 8.

What is claimed is:

1. A connector of a type plugged within a tubular receptacle comprised of a body having means at one end for receiving an electrical lead, a bore extending within said body and a terminal connected to said lead within said one end and positioned to receive and terminate a a device inserted within said body from the other end thereof, the said connector body having a series of ribs disposed on the periphery thereof and extending axially along and radially outward thereof, said ribs being relatively thin so as to provide a resilient but supporting engagement of said connector within a tubular receptacle.

2. The connector of claim **1** wherein the bore in the connector body is of a dimension to receive and support the device terminated by said connector.

3. The connector of claim **1** wherein the ribs are spaced apart to provide openings of appreciable area into said receptacle around the connector body.

4. The connector of claim **1** wherein said ribs include a taper extending axially along the length thereof to facilitate insertion and withdrawal of the connector body within a tubular receptacle.

5. The connector of claim **1** wherein said body includes a cylindrical portion and said ribs are disposed thereon, the said portion having a wall thickness to develop a supporting force holding the said device due to the engagement of said ribs with the receptacle.

6. In a connector for providing a high voltage termination of a lamp or like device including a connector body of insulating material having at one end a contact spring adapted to be terminated to a high voltage lead with the portions of the connector body substantially surrounding said contact spring and the end of said lead to minimize air pockets within said connector and reduce corona effects, the other end of said connector body including a bore adapted to receive and support the device terminated by the connector extended within the connector bore and means on the exterior of said other end of the connector body to provide a resilient mounting of the connector within a tubular receptacle, said means including paths extending from the outside of the tubular receptacle to the inside thereof for providing ventilation of interior of said receptacle.

7. The connector of claim **6** wherein said means providing ventilating paths is comprised of a series of channels defined by flexible ribs extending radially outward from said body.

8. In a connector assembly for providing starter and power connections to a lamp or like device of a type having an outer and protective tubular receptacle, a connector of insulating material carrying a terminal therein connected to a power supply lead, the connector including a forward portion having rib means extending axially along and radially outward from the periphery thereof to resiliently engage the receptacle and secure the connector thereto, said connector further including means in surface engagement with said lamp device for receiving and resiliently supporting the lamp device extended therewith-

in with the lamp terminal engaged by the connector terminal.

9. The connector assembly of claim **8** wherein the said receptacle is comprised of a relatively fragile material and said rib means is comprised of a series of ribs which are sufficiently flexible to permit said connector to be plugged into said receptacle without fracturing said receptacle or said lamp device, said ribs being positioned to form a series of ventilating channels extending from the outside of the tubular receptacle to the inside thereof for providing ventilation of the interior of said receptacle.

10. In a connector assembly for providing starter and power connections to a lamp or like device of a type having an outer and protective tubular receptacle, a connector of insulating material carrying a terminal therein connected to a power supply lead, the connector including a forward portion having means thereon to resiliently engage the receptacle and secure the connector thereto, said connector further including means for receiving and resiliently supporting the lamp device extended therewithin with the lamp terminal engaged by the connector terminal, a starter wire disposed along said lamp device, and a starter connector comprised of a clip like terminal capable of being snapped over said starter wire over said lamp device, said clip like terminal including a lead extending out through said means for supporting the connector within the receptacle.

11. Apparatus for supporting and terminating a component of a type having a terminal at each end which component is within a protective tubular receptacle including a pair of connectors each including a connector body and a terminal within said connector body terminated to an electrical lead, each connector body including at the forward portion a support structure to permit the connector to be resiliently engaged within an end of the receptacle and supported in position by said receptacle, each connector including means for receiving the end of the component with the terminal thereon in engagement with the terminal within the connector body and with the component supported free of engagement with the receptacle by the connectors disposed at each end of the receptacle, said apparatus further including a starter wire disposed on said component extending substantially along the length thereof, and said apparatus further includes a terminal clip for each connector terminated to a further electrical lead, each connector body including a channel to receive the further lead inserted therethrough to provide a connection of said clip to the starter wire.

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MARVIN A. CHAMPION, Primary Examiner

J. H. McGLYNN, Assistant Examiner

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