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(54) **ELECTRICAL WIRE STRAIN RELIEF DEVICE AND METHOD**

(57) An electrical connection and method to reduce strain on electrical wires can include a connector (12;112;212) configured to attach to an electrical source at a first end (18;118;218) and having a first pin (24;124;224) at a second end (22;122;222), a first electrical wire (14;114;214) connected to the first pin (24;124;224) and having an enlargement (26;126;226)

at a point along the first electrical wire (14;114;214) near the first pin (24;124;224), and a potting (16;116;216) bonded to the second end (22;122;222) of the connector (12;112;212) and surrounding the first pin (24;124;224), a portion of the first electrical wire (14;114;214), and the enlargement (26;126;226) along the first electrical wire (14;114;214).

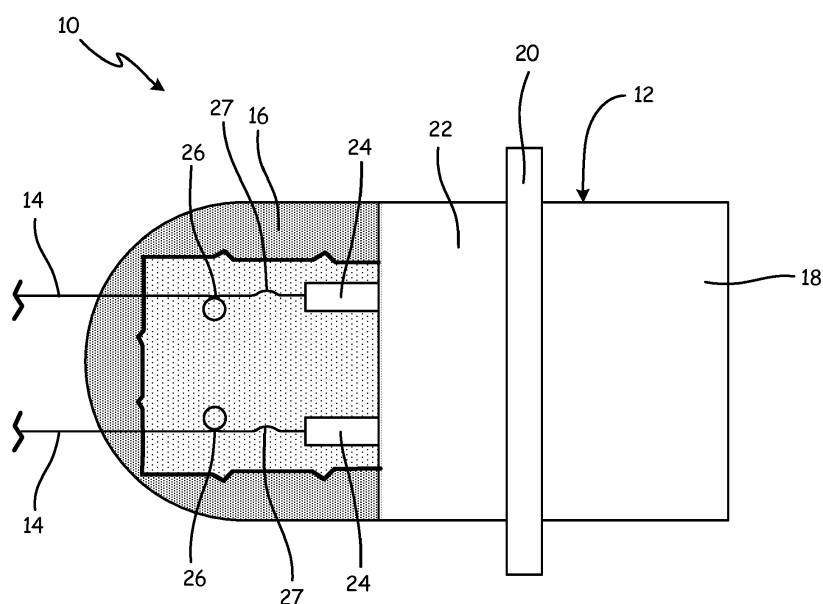


Fig. 1B

Description

BACKGROUND

[0001] The present invention relates to electrical devices and, in particular, to a strain relief device and method for preventing wires from separating from an electrical component.

[0002] In electrical devices, electrical wires are attached to an electrical source or another element and relay electricity between two components. If the electrical wires become detached from the electrical source or another element that is being supplied electricity, the electrical device will cease operation. Therefore, it is important to ensure the electrical wires do not become detached.

SUMMARY

[0003] An electrical connection to reduce strain on electrical wires can include a connector configured to attach to an electrical source at a first end and having a first pin at a second end, a first electrical wire connected to the first pin and having an enlargement at a point along the first electrical wire near the first pin, and a potting bonded to the second end of the connector and surrounding the first pin, a portion of the first electrical wire, and the enlargement along the first electrical wire.

[0004] A method of retaining an electrical wire can include connecting a first electrical wire to a connector, forming a first knot in the first electrical wire at a point near where the first electrical wire connects to the connector, providing slack in the first electrical wire between the first knot and a point where the first electrical wire connects to the connector, and introducing a potting adjacent to the connector such that the potting surrounds the first knot in the first electrical wire.

[0005] An apparatus configured to connect an electrical component to an electrical source, which the Applicant expressly reserves the right to claim independently, can include a connector configured to electrically connect to the electrical source, a first wire electrically connected to the connector and configured to electrically connect to the electrical component, a first enlargement on the first wire, and a potting adjacent to the connector and surrounding a portion of the first wire and the first enlargement on the first wire.

[0006] The present summary is provided only by way of example and not limitation. Other aspects of the present disclosure will be appreciated in view of the entirety of the present disclosure, including the entire text, claims, and accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1A is a perspective view of a strain relief device.

FIG. 1B is a cross-sectional view of the strain relief device of FIG. 1A taken along line A-A.

FIG. 1C is a cross-sectional view of the strain relief device of FIG. 1A adjacent to a component in an aircraft.

FIG. 2 is a cross-sectional view of another embodiment of a strain relief device.

FIG. 3 is a cross-sectional view of a third embodiment of a strain relief device.

[0008] While the above-identified figures set forth embodiments of the present disclosure, other embodiments are also contemplated, as noted in the discussion. In all cases, this disclosure presents the invention by way of representation and not limitation. It should be understood that numerous other modifications and embodiments can be devised by those skilled in the art, which fall within the scope and spirit of the principles of the invention. The figures may not be drawn to scale, and applications and embodiments of the present invention may include features and components not specifically shown in the drawings.

DETAILED DESCRIPTION

[0009] A strain relief device to retain electrical wires is disclosed herein that includes an enlargement, such as a knot, along the electrical wires to interact with a potting to prevent the electrical wires from becoming separated from an electrical component, such as a connector. The potting can be an adhesive, caulking, rubber, hot glue, thermoset plastic, epoxy, or another material that is secured to a structural element and surrounds the enlargement along the electrical wires to prevent the enlargement from being pulled away from and disconnected from the electrical source. Because the electrical wires are usually covered by a nonstick jacket, such as Teflon®, the potting can have difficulty bonding or otherwise being secured to the electrical wires to resist the electrical wires from being pulled through the potting to separate the electrical wires from the potting. Therefore, an enlargement is useful in providing an increased cross-section such that the electrical wires cannot be pulled out through an aperture or conduit in the potting formed by the electrical wires. With slack on the electrical wires between the enlargement and the connection of the electrical wires to a component (such as a connector), the electrical wires remain electrically connected to the component/connector, even if an opposite end of the electrical wires is pulled on or vibrated. As mentioned above, the enlargement can be a knot in the electrical wires, including a single knot, double knot, or an underwriter's knot or another knot that incorporates two or more electrical wires in a knot together. Additionally, the enlargement can be another configuration, such as an additional piece on the electrical wires, an increased thickness of the jacket covering the electrical wires, or braiding of the wires (either as a stand-alone feature, in combination with other knot

or knots, or with another configuration as seen in FIG. 2).

[0010] FIG. 1A is a perspective view of a strain relief device, FIG. 1B is a cross-sectional view of the strain relief device of FIG. 1A taken along line A-A, and FIG. 1C is a cross-sectional view of the strain relief device of FIG. 1A adjacent to a valve. Strain relief device 10 includes connector 12, electrical wires 14, and potting 16. Connector 12 includes mating side 18 (at a first end), flange 20, connection side 22 (at a second end), and pins 24 attached to or incorporated into connection side 22. Electrical wires 14 include enlargement 26 and slack 27 and may include a number of diodes near pins 24. Strain relief device 10 can be used in conjunction with valve 28 and solenoid 29, which are located along line 30.

[0011] Connector 12 is the main structural element of strain relief device 10 and transmits electricity from an electrical source or another component configured to carry electricity (not shown) to electrical wires 14. Connector 12 can transmit electricity either through internal components or by being constructed from a material that is an electrical conductor. Connector 12 can be constructed from a variety of materials; including metal (such as aluminum), plastic, or a composite material; and can be one continuous and monolithic piece or made from a number of pieces fastened together.

[0012] Mating side 18 (also referred to as the first end) of connector 12 connects to an electrical source or another component configured to carry electricity. While mating side 18 is shown to have a cylindrical shape, mating side 18 can have a variety of configurations, including a different shape and/or other electrical components (such as wires or pins) to attach to an electrical source.

[0013] Flange 20 of connector 12 extends outward from mating side 18 and connection side 22 to provide a surface for which connector 12 can be fastened to another body, such as valve 28. Flange 20 can be fastened to another body through the use of screws, rivets, adhesive, clamps, crimping, soldering, welding, brazing or another fastener. While flange 20 is shown to have a rectangular shape, flange 20 can have a variety of configurations, including a different shape, openings, and/or protrusions that allow flange 20 to be fastened to another body and remain structurally sufficient to support strain relief device 10.

[0014] Connection side 22 (also referred to as the second end) of connector 12 is electrically connected to electrical wires 14 and is adjacent to potting 16. Connection side 22 can be electrically connected to electrical wires 14 through pins 24, which can provide a connection point for electrical wires 14 to connect to connector 12. Pins 24 can be any other known mechanical means for making connections with metallic or other wires, including a soldered connection with a screw terminal. Connection side 22 and pins 24 can be one continuous and monolithic piece or can be fastened to one another through a number of fasteners, including screws, welding, soldering, or other means. Connection side 22 should be suited to bond or otherwise secure to potting 16, whether that

includes connection side 22 having a rough surface, being constructed from a material that bonds better to potting 16, and/or having another configuration. While connection side 22 is shown to have a cylindrical shape, connection side 22 can have a variety of configurations, including a different shape and/or other electrical components, to more easily connect to electrical wires 14, bond to potting 16, and interact with valve 28, solenoid 29, and/or another component.

[0015] Other embodiments of strain relief device 10 can have a different configuration of connector 12, including a configuration that does not include mating side 18, flange 20, and/or connection side 22.

[0016] Electrical wires 14 electrically connect connector 12 (and the electrical source) to an electrical component in need of electricity, such as valve 28 along line 30. Electrical wires 14 can be any wires that are able to transmit electricity between two electrical components. Electrical wires 14 well known in the art usually include a nonstick jacket, such as a Teflon® cover, to insulate electrical wires 14 from the surrounding environment to prevent shorts and protect the wires. Electrical wires 14 can have an element at each end that more easily allows electrical wires 14 to connect to pins 24 and to valve 28 (or another electrical component). Electrical wires 14 can be a variety of sizes/gauges. Additionally, one or multiple diodes or other elements can be present at a point along electrical wires 14. Electrical wires 14 can also be bundled together such that multiple electrical wires 14 are encased together within a casing, such as a tube, jacket, or another protective sheath.

[0017] Also at a point along electrical wires 14 is enlargement 26, which is an increase in the cross-sectional area of electrical wires 14 (each separate electrical wire 14 can have an individual enlargement 26; electrical wires 14 can be adjacent to one another such that electrical wires 14 share enlargement 26, such as in FIG. 2 where enlargement 126 is an underwriter's knot incorporating multiple wires; or electrical wires 14 can be encased within one common sheath having enlargement 26). Enlargement 26 can be located along electrical wires 14 at a point near pins 24 or can be at a distance away from pins 24, but enlargement 26 should be located along electrical wires 14 at a position where enlargement 26 is surrounded by potting 16 and where potting 16 can be secured to a structural component (either connector 12 or a structural body not shown in the figures). Enlargement 26 can be a knot in electrical wires 14 or can be another configuration, such as an additional piece on electrical wires 14 or an increased thickness of electrical wires 14 and/or the jacket covering electrical wires 14. If electrical wires 14 are bundled and encased together, enlargement 26 can be a knot in the entire bundle or another configuration. Additionally, enlargement 26 can be a braiding of electrical wires 14 with one another. Braiding electrical wires 14 may reduce the loss of strength of electrical wires 14 that may result from bending electrical wires 14 while also providing enlargement

26. Braiding could also be utilized with other configurations of enlargement 26, including other knots (such as with an underwriter's knot in FIG. 2 and/or a single knot in FIG. 3). It may be desirable to have enlargement 26 individually on each one of electrical wires 14 so that electrical wires 14 remain electrically isolated from one another. As mentioned above, enlargement 26 provides an increased cross-sectional area of electrical wires 14 so that electrical wires 14 cannot be pulled out through potting 16 so as to separate from connector 12. The larger the cross-section of enlargement 26, the more resistance strain relief device 10 will have to being pulled out through potting 16.

[0018] Potting 16 can be an adhesive, caulking, rubber, or another material that is bonded or otherwise secured to connection side 22 and surrounds enlargement 26, a portion of electrical wires 14, and pins 24. Potting 16 can be a fluid, such as room temperature vulcanization silicone, that is applied around enlargement 26 and electrical wires 14, bonds to connection side 22, and hardens while potting 16 dries. Potting 16 can also be a hardened material installed around enlargement 26 and electrical wires 14 and is fastened to connection side 22. While potting 16 is shown as being adjacent to connection side 22 and surrounding pins 24, potting 16 and enlargement 26 can be located at a position along electrical wires 14 where potting 16 is secured to another structural body (not shown) and surrounds enlargement 26. As mentioned above, potting 16 and the jacket/cover on electrical wires 14 can be materials that bond to one another, but are commonly materials that do not bond sufficiently to create a strong hold on one another. Therefore, enlargement 26 is needed to provide resistance against forces that may pull electrical wires away from pins 24 and connection side 22 to disconnect electrical wires 14 from pins 24. If materials are used for potting 16 and the jacket/cover that generally bond well, enlargement 26 can still be utilized to provide additional resistance and improved retention of electrical wires 14.

[0019] Strain relief device 10 can be utilized on any machine that has wires that electrically connect two components to one another, such as in FIG. 1C with valve 28 being electrically connected to an electrical source (not shown) and to solenoid 29 (with solenoid 29 able to accommodate an additional strain relief device 10). Valve 28 and solenoid 29 can control the flow of a fluid, such as anti-ice fluid, through line 30. Valve 28, solenoid 29, and line 30 can be located on an aircraft and thus strain relief device 10 may be subject to strain from experiencing vibration due to movement of the aircraft. Strain relief device 10 can also be utilized with solenoid 29 on a valve or another component in an aircraft or in other electro-mechanical or electronic devices, such as pressure sensors, torque motors, other motors, rotary variable transformers, linear transformers, switches, potentiometers, and other aerospace and non-aerospace applications, including in the automotive, industrial, electronic, and other industries.

[0020] As mentioned above, electrical wires 14 of strain relief device 10 can be subject to strain, which pulls and/or vibrates electrical wires 14. The strain can cause electrical wires 14 to become separated from pins 24. To prevent electrical wires 14 from becoming separated from pins 24, potting 16 surrounds a portion of electrical wires 14, pins 24, and enlargement 26. Potting 16 can bond to the outer surface of electrical wires 14 to provide some resistance to strain to prevent electrical wires 14 from becoming separated. To provide additional resistance, potting 16 surrounds enlargement 26 to prevent enlargement 26 from being pulled away from connection side 22 and pins 24. Slack 27 can be present in electrical wires 14 between pins 24 and enlargement 26 to ensure electrical wires 14 do not become separated from pins 24 if potting 16 is elastic and allows enlargement 26 to move a small distance.

[0021] FIG. 2 is a cross-sectional view of another embodiment of a strain relief device. Strain relief device 110 includes connector 112, electrical wires 114, and potting 116. Connector 112 includes mating side 118 (at a first end), flange 120, connection side 122 (at a second end), and pins 124 attached to or incorporated into connection side 122. Electrical wires 114 include enlargement 126 and slack 127 and may include a number of diodes near pins 124.

[0022] Strain relief device 110 of FIG. 2 is very similar to strain relief device 10 of FIGS. 1A, 1B, and 1C except that enlargement 126 of strain relief device 110 is an underwriter's knot, which is a common electrical knot known in the art to utilize at least two electrical wires 14. The use of an underwriter's knot for enlargement 126 may be desirable because an underwriter's knot provides a large enlargement 126, which may make it difficult for electrical wires 114 to be separated from potting 116 and pulled away from connection side 122 and pins 124. Other than the use of an underwriter's knot for enlargement 126, strain relief device 110, along with potting 116, of FIG. 2 functions similarly as strain relief device 10 of FIGS. 1A, 1B, and 1C.

[0023] FIG. 3 is a cross-sectional view of a third embodiment of a strain relief device. Strain relief device 210 includes connector 212, electrical wires 214, and potting 216. Connector 212 includes mating side 218 (at a first end), flange 220, connection side 222 (at a second end), and pins 224 attached to or incorporated into connection side 222. Electrical wires 214 include enlargement 226 and slack 227 and may include a number of diodes near pins 224.

[0024] Strain relief device 210 of FIG. 3 is very similar to strain relief device 10 of FIGS. 1A, 1B, and 1C and strain relief device 110 of FIG. 2 except that strain relief device 210 includes four pins 224 and four electrical wires 214 with four separate enlargements 226. Enlargements 226 are shown as individual single knots, but can each be separate double knots, a knot that incorporates some or all of electrical wires 214, one or multiple underwriter's knots, or another configuration, such as an additional

piece on electrical wires 214 or an increased thickness of electrical wires 214. While strain relief device 210 shows four electrical wires 214, the disclosed embodiments can be configured to accommodate any number of electrical wires connected to connector 212 in any type of pattern. Other than having four pins 224 and four electrical wires 214 with four enlargements 226, strain relief device 210, along with potting 216, of FIG. 3 functions similarly as the strain relief devices disclosed in other embodiments.

[0025] As mentioned above, the enlargements on the electrical wires in the disclosed embodiments provide additional strain relief (in addition to the strain relief provided by the bonding of the potting to the electrical wires) to prevent the electrical wires from separating from an attached electrical element, such as the pins on the connector.

Discussion of Possible Embodiments

[0026] The following are non-exclusive descriptions of possible embodiments of the present invention.

[0027] An electrical connection according to an exemplary embodiment of this disclosure, among other possible elements, can include a connector configured to attach to an electrical source at a first end and having a first pin at a second end, a first electrical wire connected to the first pin and having an enlargement at a point along the first electrical wire near the first pin, and a potting bonded to the second end of the connector and surrounding the first pin, a portion of the first electrical wire, and the enlargement along the first electrical wire.

[0028] The electrical connection of the preceding paragraph can optionally include, additionally and/or alternatively, any one or more of the following features, configurations, and/or additional components:

The enlargement is a knot in the first electrical wire.

[0029] The potting is a silicone material.

[0030] The first electrical wire includes slack between the enlargement and the first pin.

[0031] A second pin at the second end of the connector and a second electrical wire connected to the second pin and having an enlargement at a point along the second electrical wire near the second pin with the potting also surrounding the second pin, a portion of the second electrical wire, and the enlargement along the second electrical wire.

[0032] The enlargement of the first electrical wire and the enlargement of the second electrical wire are formed by an underwriter's knot.

[0033] The first electrical wire is connected at an end opposite first pin to a component on an aircraft.

[0034] A method of retaining an electrical wire according to an exemplary embodiment of this disclosure, among other possible steps, can include connecting a first electrical wire to a connector, forming a first knot in

the first electrical wire at a point near where the first electrical wire connects to the connector, providing slack in the first electrical wire between the first knot and a point where the first electrical wire connects to the connector, and introducing a potting adjacent to the connector such that the potting surrounds the first knot in the first electrical wire.

[0035] The method of retaining an electrical wire of the preceding paragraph can optionally include, additionally and/or alternatively, any one or more of the following features, configurations, steps, and/or additional components:

Connecting a second electrical wire to the connector, forming a second knot in the second electrical wire at a point near where the second electrical wire connects to the connector, and providing slack in the second electrical wire between the second knot and a point where the second electrical wire connects to the connector with the potting adjacent to the connector also surrounding the second knot in the second electrical wire.

[0036] Forming a first knot in the first electrical wire and forming a second knot in the second electrical wire includes forming an underwriter's knot.

[0037] Connecting an end of the first electrical wire to a component in an aircraft.

[0038] Preventing separation of the first electrical wire from the connector with the potting inhibiting the first knot in the first electrical wire from being pulled away from the connector.

[0039] The step of introducing a potting adjacent to the connector can further include molding a silicone material to surround the first knot in the first electrical wire.

[0040] An apparatus configured to connect an electrical component to an electrical source according to an exemplary embodiment of this disclosure, among other possible elements, can include a connector configured to electrically connect to the electrical source, a first wire electrically connected to the connector and configured to electrically connect to the electrical component, a first enlargement on the first wire, and a potting adjacent to the connector and surrounding a portion of the first wire and the first enlargement on the first wire.

[0041] The apparatus of the preceding paragraph can optionally include, additionally and/or alternatively, any one or more of the following features, configurations, and/or additional components:

The first enlargement on the first wire is a knot in the first wire.

[0042] The potting is a room temperature vulcanization silicone material.

[0043] The component is a solenoid in an aircraft.

[0044] The first wire includes slack between the first enlargement and a point where the first wire electrically

connects to the connector.

[0045] A second wire electrically connected to the connector and configured to electrically connect to the electrical component and a second enlargement on the second wire with the potting adjacent to the connector also surrounding a portion of the second wire and the second enlargement on the first wire.

[0046] The first enlargement on the first wire and the second enlargement on the second wire are formed by an underwriter's knot.

[0047] Any relative terms or terms of degree used herein, such as "substantially," "essentially," "generally," "approximately," and the like should be interpreted in accordance with and subject to any applicable definitions or limits expressly stated herein. In all instances, any relative terms or terms of degree used herein should be interpreted to broadly encompass any relevant disclosed embodiments as well as such ranges or variations as would be understood by a person of ordinary skill in the art in view of the entirety of the present disclosure, such as to encompass ordinary manufacturing tolerance variations; incidental alignment variations; alignment or shape variations induced by thermal, rotational, or vibrational operational conditions; and the like.

[0048] While the invention has been described with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiments disclosed, but that the invention will include all embodiments falling within the scope of the appended claims.

Claims

1. An electrical connection comprising:

a connector (12;112;212) configured to attach to an electrical source at a first end (18;118;218) and having a first pin (24;124;224) at a second end (22;122;222);
a first electrical wire (14;114;214) connected to the first pin (24;124;224) and having an enlargement (26;126;226) at a point along the first electrical wire (14;114;214) near the first pin (24;124;224); and
a potting (16;116;216) bonded to the second end (22;122;222) of the connector (12;112;212) and surrounding the first pin (24;124;224), a portion of the first electrical wire (14;114;214), and the enlargement (26;126;226) along the first electrical wire (14;114;214).

2. The electrical connection of claim 1, wherein the enlargement (26;126;226) is a knot in the first electrical wire (14;114;214).

3. The electrical connection of claim 1 or 2, wherein the potting (16;116;216) is a silicone material.

4. The electrical connection of claim 1, 2 or 3, wherein the first electrical wire (14;114;214) includes slack between the enlargement (26;126;226) and the first pin (24;124;224).

5. The electrical connection of any preceding claim, further comprising:

a second pin (24;124;224) at the second end (22;122;222) of the connector (12;112;212); and
a second electrical wire (14;114;214) connected to the second pin (24;124;224) and having an enlargement (26;126;226) at a point along the second electrical wire (14;114;214) near the second pin (24;124;224),
wherein the potting (16;116;216) also surrounds the second pin (24;124;224), a portion of the second electrical wire (14;114;214), and the enlargement (26;126;226) along the second electrical wire (14;114;214).

6. The electrical connection of claim 5, wherein the enlargement (26;126;226) of the first electrical wire (14;114;214) and the enlargement (26;126;226) of the second electrical wire (14;114;214) are formed by an underwriter's knot.

7. The electrical connection of any preceding claim, wherein the first electrical wire (14;114;214) is connected at an end opposite the first pin (24;124;224) to a component on an aircraft.

8. A method of retaining an electrical wire (14;114;214), the method comprising:

connecting a first electrical wire (14;114;214) to a connector (12;112;212);
forming a first knot (26;126;226) in the first electrical wire (14;114;214) at a point near where the first electrical wire (14;114;214) connects to the connector (12;112;212);
providing slack in the first electrical wire (14;114;214) between the first knot (26;126;226) and a point where the first electrical wire (14;114;214) connects to the connector (12;112;212); and
introducing a potting (16;116;216) adjacent to the connector (12;112;212) such that the potting (16;116;216) surrounds the first knot in the first electrical wire (14;114;214).

9. The method of claim 8, further comprising:

connecting a second electrical wire (14;114;214) to the connector (12;112;212);
 forming a second knot (26;126;226) in the second electrical wire (14;114;214) at a point near where the second electrical wire (14;114;214) connects to the connector (12; 112;212); and
 providing slack in the second electrical wire (14;114;214) between the second knot (26;126;226) and a point where the second electrical wire (14;114;214) connects to the connector (12;112;212),
 wherein the potting (16;116;216) adjacent to the connector (12;112;212) also surrounds the second knot (26;126;226) in the second electrical wire (14;114;214).

(12;112;212) and surrounding a portion of the first wire (14;114;214) and the first enlargement (26;126;226) on the first wire (14; 114;214).

10. The method of claim 9, wherein forming a first knot (26;126;226) in the first electrical wire (14;114;214) and forming a second knot (26;126;226) in the second electrical wire (14;114;214) includes forming an underwriter's knot.

11. The method of claim 8, 9 or 10, further comprising:

connecting an end of the first electrical wire (14;114;214) to a component in an aircraft.

12. The method of any of claims 8 to 11, further comprising:

preventing separation of the first electrical wire (14;114;214) from the connector (12;112;212) with the potting (16;116;216) inhibiting the first knot (26;126;226) in the first electrical wire (14;114;214) from being pulled away from the connector (12;112;212).

13. The method of any of claims 8 to 12, wherein the step of introducing a potting (16;116;216) adjacent to the connector (12;112;212) further comprises:

molding a silicone material to surround the first knot (26;126;226) in the first electrical wire (14;114;214).

14. An apparatus configured to connect an electrical component to an electrical source comprising:

a connector (12;112;212) configured to electrically connect to the electrical source;
 a first wire (14;114;214) electrically connected to the connector (12;112;212) and configured to electrically connect to the electrical component;
 a first enlargement (26;126;226) on the first wire (14;114;214); and
 a potting (16;116;216) adjacent to the connector

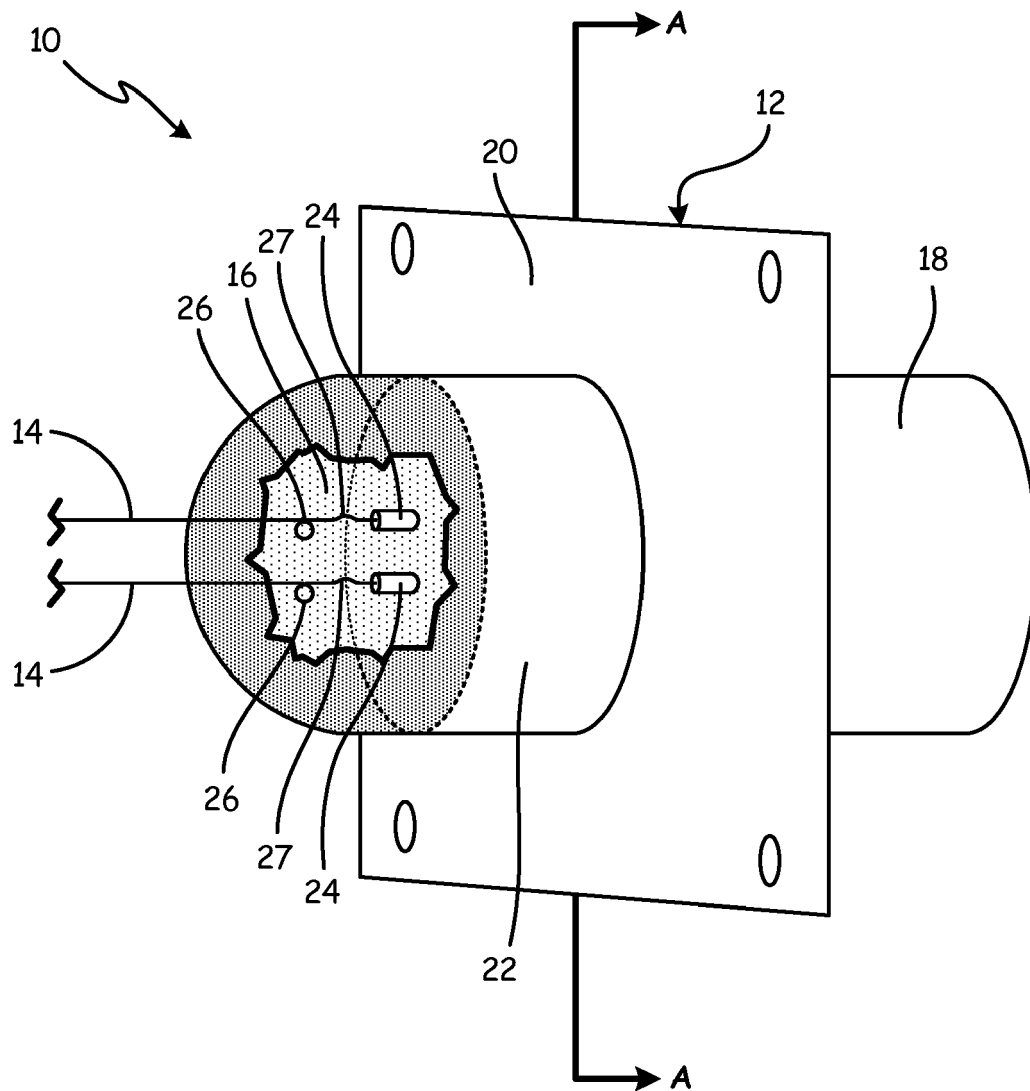


Fig. 1A

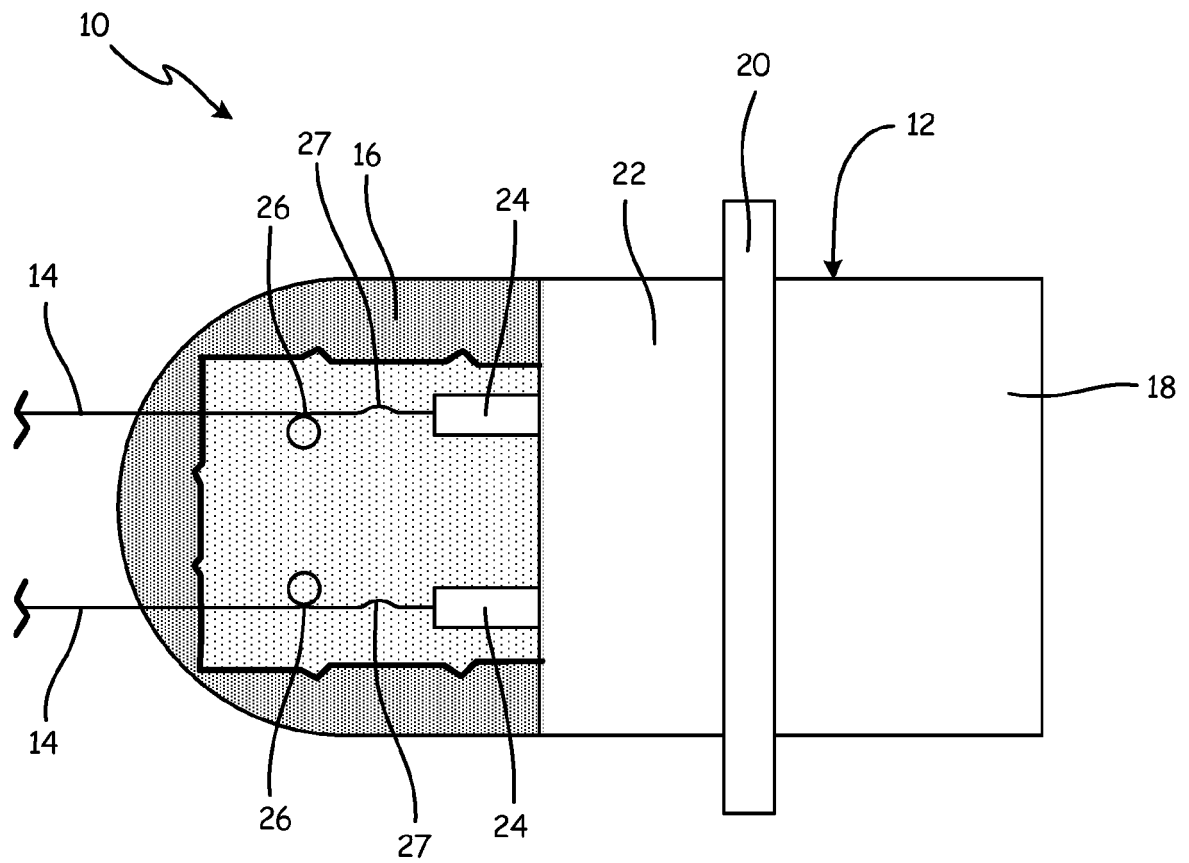


Fig. 1B

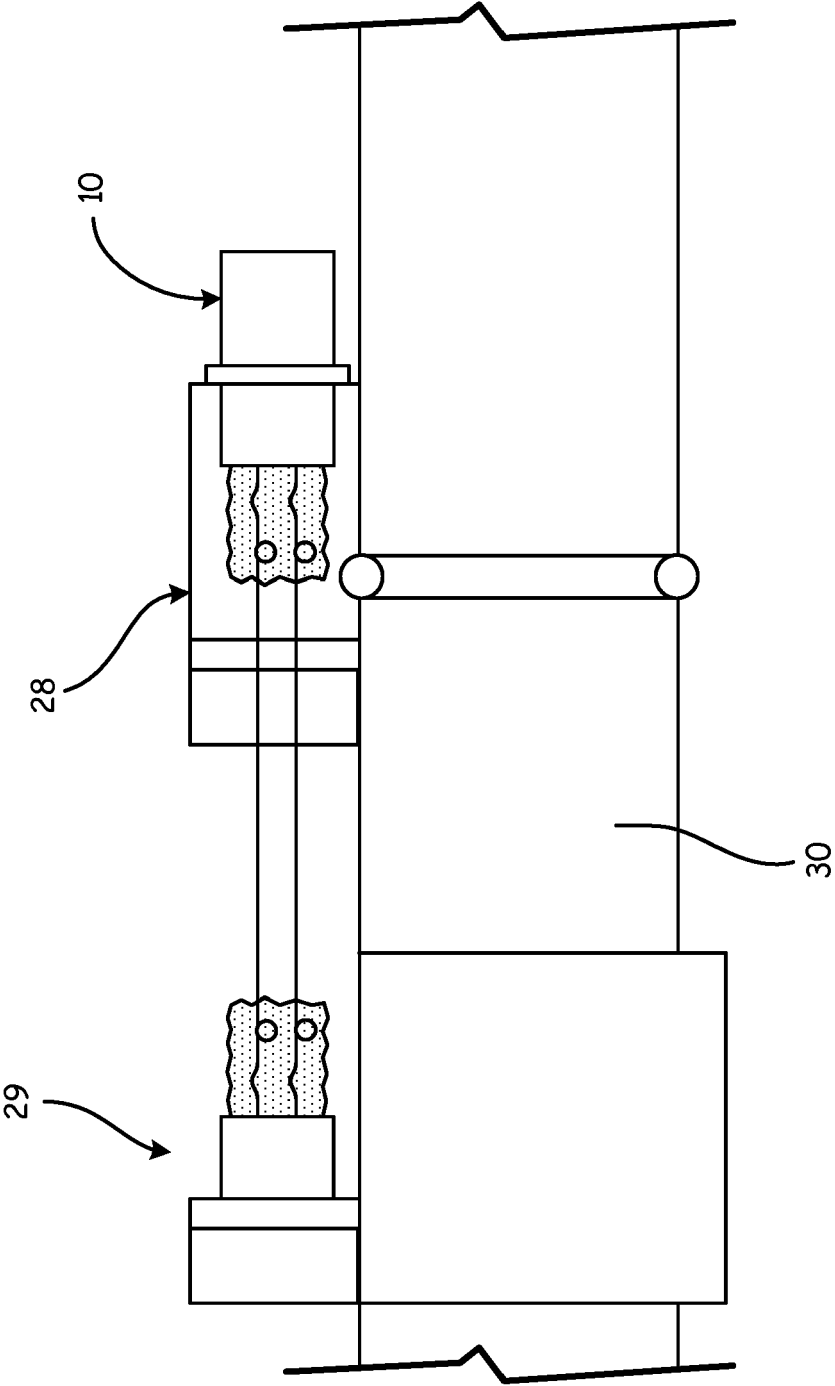


Fig. 1C

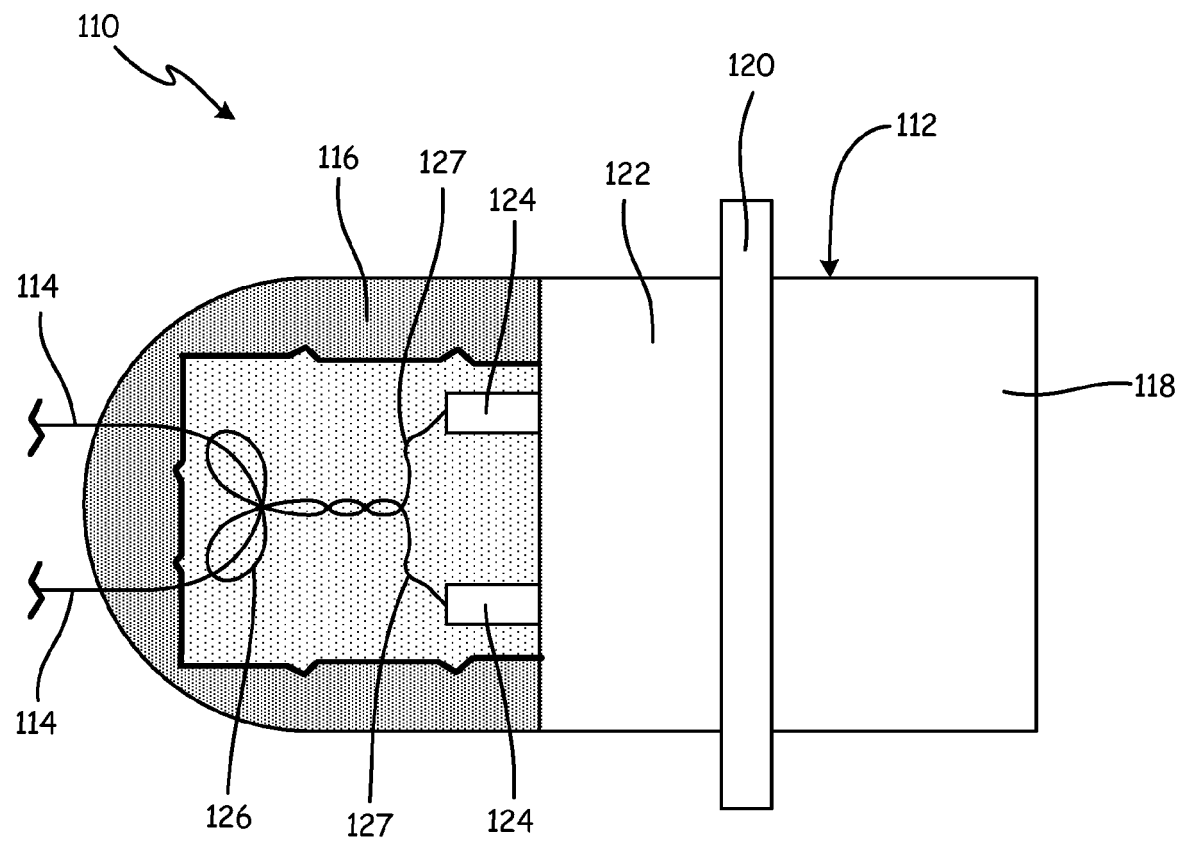


Fig. 2

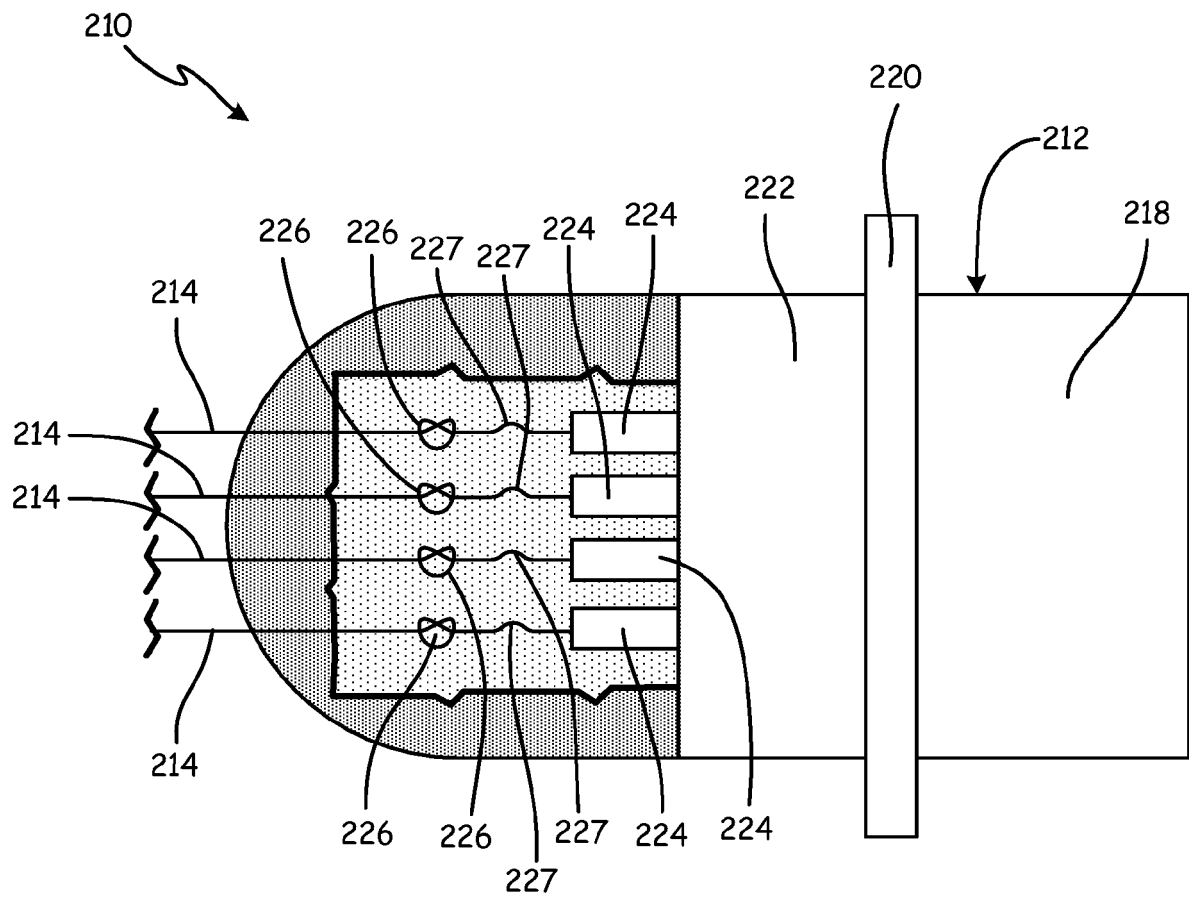


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 16 19 2027

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 20 395 B (RHEYDT KABELWERK AG) 5 December 1957 (1957-12-05) * the whole document * -----	1-14	INV. H01R13/58
			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 December 2016	Examiner Henrich, Jean-Pascal
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			

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 19 2027

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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21-12-2016

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	DE 1020395	B	05-12-1957	NONE
15	-----			
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82