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Food and beverage pipe bonding mechanical jumper kit

Abstract

A device includes a tensioning member including a head portion and a cylindrical portion. The head portion includes a first bore and a second bore in communication with the first bore. The cylindrical portion extends from the head portion towards a second end and includes one or more threads. A device may include a set screw member including threads formed along its length. The set screw member may couple to the first bore and retains an electrical conductor positioned in the second bore in connected engagement with the tensioning member. The tensioning member is configured to contact an elongate article to electrically connect the elongate article to the tensioning member and the electrical conductor. A device may also include a strap member. The strap member extends around the elongate article and the tensioning member applies a tension force between the strap member and the elongate article.

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Background/Summary

FIELD

(1) The present disclosure relates to the field of transfer systems for conveying dry materials. More particularly, for food and beverage pipe bonding mechanical jumper kits.

BACKGROUND

(2) In the food and beverage manufacturing process, pipes or conduits form part of the distribution system that is used to convey dry or liquid materials from a source to a destination. For sanitation purposes, these pipes are typically made of metal and may also be electrically conductive. Consequently, the friction caused by the material passing through the interior channel of the pipe can result in an electrical potential buildup at the pipe. Without proper electrical grounding protection, the electrical potential can discharge, thereby causing the material, such as flour, traveling through the metal pipe to ignite or combust. To prevent such occurrences, the elongate articles used in the food and beverage industry and other similar applications typically utilize grounding protection devices that are welded onto the metal pipe. Improved electrical grounding protection devices are desirable.

SUMMARY

(3) In some embodiments, a device includes a tensioning member including a first end, a second end, a head portion, and a cylindrical portion. The head portion includes a first bore and a second bore. The first bore is in communication with the second bore. The cylindrical portion extends from

the head portion towards the second end and includes one or more threads formed along a length of the cylindrical portion. The device includes a set screw member located in the first bore. The set screw member is configured to engage an electrical conductor located in the second bore to connect the tensioning member to the electrical conductor. The device includes a first nut located adjacent the second end of the tensioning member. The tensioning member extends through the first nut and the second end of the tensioning member is configured to contact a surface of an elongate article to electrically connect the elongate article to the tensioning member and the electrical conductor.

(4) In some embodiments, the device further includes a strap member including a first flange, a second flange, and a central elongate portion. The first flange and the second flange extend from opposing ends of the central elongate portion. The central elongate portion is configured to substantially extend around a circumference of an elongate article until the first flange is in contact with the second flange along adjacent sides.

(5) In some embodiments, a position of the tensioning member in the first nut is adjustable in a direction substantially perpendicular to a longitudinal axis of the elongate article to apply a tension force between the strap member and the elongate article.

(6) In some embodiments, the strap member further includes a first aperture at the first flange, and a second aperture at the second flange. The tensioning member extends through the first aperture and the second aperture to retain the strap member around the elongate article.

(7) In some embodiments, the strap member further includes a third aperture at the second flange adjacent the second aperture. The tensioning member is configured to extend through the first aperture and the third aperture to retain the strap member around the elongate article.

(8) In some embodiments, the first nut is configured to extend into the first aperture and connect to the first flange by binding to the strap member through mechanical deformation in response to a clamping force applied to the first nut.

(9) In some embodiments, the set screw member impinges on the electrical conductor to fixedly retain the electrical conductor in the second bore and to connect the tensioning member to the electrical conductor.

(10) In some embodiments, the first bore extends from the first end of the tensioning member towards the second end. The second bore extends through the head portion in a direction substantially perpendicular to the first bore.

(11) In some embodiments, the device further includes a second nut. The second nut is configured to thread onto the set screw member opposite the tensioning member and act upon the head portion of the tensioning member to retain a position of the set screw member in the first bore.

(12) In some embodiments, an apparatus includes a strap member including a first flange, a second flange, and a central elongate portion. The apparatus includes a tensioning member including a head portion at a first end, a first bore located in the head portion, a second bore located in the head portion in communication with the first bore, and a cylindrical portion at a second end. The second bore being in communication with the first bore. The apparatus includes a set screw member located in the first bore, a first nut, and a second nut. The tensioning member extends through the first nut and the second end of the tensioning member is configured to contact a surface of an elongate article to electrically connect the elongate article to the tensioning member, and a position of the tensioning member in the first nut is adjustable in a direction substantially perpendicular to a longitudinal axis of the elongate article to apply a tension force between the strap member and the elongate article.

(13) In some embodiments, the second bore extends through the head portion in a direction substantially perpendicular to the first bore, wherein the second bore is configured to receive an electrical conductor positioned in the second bore.

(14) In some embodiments, the set screw member extends from the first bore into the second bore and impinges on the electrical conductor to fixedly retain the electrical conductor in the second bore and connect the tensioning member to the electrical conductor. The tensioning member is

further configured to electrically connect the elongate article to the electrical conductor.
(15) In some embodiments, the strap member further includes a first aperture at the first flange and a second aperture at the second flange. The central elongate portion is configured to substantially extend around a circumference of the elongate article until the first flange is in contact with the second flange along adjacent sides. The tensioning member is configured to extend through the first aperture and the second aperture to retain the strap member around the elongate article.
(16) In some embodiments, the first nut is configured to extend into the first aperture and connect to the first flange by binding to the strap member through mechanical deformation in response to a clamping force applied to the first nut.
(17) In some embodiments, the strap member further includes a third aperture at the second flange adjacent the second aperture. The tensioning member is configured to extend through the first aperture and the third aperture.
(18) In some embodiments, the tensioning member is further configured to apply a tension force between the strap member and the elongate article.
(19) In some embodiments, a jack bolt includes a body having a first end and a second end, the body including a head portion located at the first end, the head portion including a first bore and a second bore. The second bore extends through the head portion in a direction substantially perpendicular to the first bore and the second bore is in communication with the first bore. The jack bolt includes a cylindrical portion located at the second end. The cylindrical portion extends from the head portion to the second end and includes threads formed on a length of the cylindrical portion.
(20) In some embodiments, the first bore extends from the first end towards the second end in the head portion. In some embodiments, the first bore includes threads formed on an inner surface of the first bore and the first bore is configured to receive a set screw member.
(21) In some embodiments, the second bore is configured to receive an electrical conductor positioned in the second bore. In some embodiments, the set screw member is configured to extend from the first bore into the second bore and impinge on the electrical conductor to fixedly retain the electrical conductor in the second bore and to connect the jack bolt to the electrical conductor.
(22) In some embodiments, the jack bolt includes electrically conductive metallic material. In some embodiments, the jack bolt includes dimensions capable of carrying at least 2,450 amps for a predetermined period of time.

Description

DRAWINGS
(1) Some embodiments of the disclosure are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the embodiments shown are by way of example and for purposes of illustrative discussion of embodiments of the disclosure. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the disclosure may be practiced.
(2) FIG. **1** depicts an example embodiment of a device, according to some embodiments.
(3) FIG. **2** depicts an exploded perspective view of the device, according to some embodiments.
(4) FIG. **3** depicts a perspective view of a tensioning member, according to some embodiments.
(5) FIG. **4** depicts a side view of the tensioning member, according to some embodiments.
(6) FIG. **5** depicts a top view of the tensioning member, according to some embodiments.
(7) FIG. **6** depicts a side sectional view of the device, according to some embodiments.
(8) FIG. **7** depicts a method of installing the device, according to some embodiments.
(9) FIG. **8** depicts a perspective view of the device, according to some embodiments.
DETAILED DESCRIPTION

(10) Among those benefits and improvements that have been disclosed, other objects and advantages of this disclosure will become apparent from the following description taken in conjunction with the accompanying figures. Detailed embodiments of the present disclosure are disclosed herein; however, it is to be understood that the disclosed embodiments are merely illustrative of the disclosure that may be embodied in various forms. In addition, each of the examples given regarding the various embodiments of the disclosure which are intended to be illustrative, and not restrictive.

(11) As material passes through the channel of an elongate article (e.g, metal pipe), the resulting friction may cause a buildup of an electrical discharge potential in the form of electric current at the elongate article. Without adequate grounding protection, the material passing through the elongate article can ignite or combust due to the discharge of the electrical potential, thereby potentially damaging equipment and/or causing injury to personnel. Conventional grounding methods include welding a stud onto an exterior surface of the elongate article and bolting a conductor (e.g., jumper, bonded jumper, etc.) onto the stud. However, this approach requires using specialized tools and equipment (e.g., welding tools) to weld the stud onto the pipe and also requires specialized permits to perform such work (e.g., hot work permits). As used herein, the term “pipe” refers to an elongated cylindrical conduit having one or more enclosed channels extending through the conduit and used for conveying material, such as a dry flowable material, from a source reservoir.

(12) The present disclosure includes various embodiments of a device, apparatus, system, or kit that includes one or more components adapted for mechanically and electrically connecting to an electrically conductive elongate article. The article is a metal pipe. In some embodiments, the article may include a conduit, channel, or other elongate electrically conductive article used to convey materials through the article. Additionally, the device connects the article to one or more grounded electrical conductors, thereby providing grounding protection to the article. The device is adapted to flexibly extend around the article such that the article extends through a central cylindrical opening formed by the device and the device securely attaches to the article by applying a tension force onto the article extending through the opening. The device is also adapted to be installed onto the elongate article using only hand tools. For example, with a hex wrench or other driver tool. Accordingly, the device may be easily installed onto the article to provide electrical grounding protection without requiring welding tools or requiring permits to install the device onto the article. It is to be understood by those of ordinary skill in the art that the article may include any of a plurality of diameters and profiles suitable for conveying dry materials through an interior channel of the elongate article. Accordingly, it is also to be understood by those of ordinary skill in the art that the device as described herein in not intended to be limiting any may include any of a plurality of dimensions suitable for being installed onto the article to provide electrical grounding capabilities to the article.

(13) In various embodiments, the device may be made substantially out of metallic materials suitable for providing grounding protection to the article by providing a discharge path for an electrical discharge potential that may build up at the article. In various embodiments, the device may be formed of metallic materials that are also corrosion resistant to prevent the buildup of rust on the device. For example, the device may be subject to a chemical washdown due to cleaning or sanitization procedures in the food manufacturing process where a chlorine bleach solution is applied to the device. In some embodiments, the device may be made of steel. In other embodiments, the device may be made of stainless steel. In some embodiments, the device may also include non-metallic materials. For instance, in some embodiments, the device may include a padding material installed between the article and the strap.

(14) FIG. **1** illustrates a perspective view of a device **100**, according to some embodiments. FIG. **2** illustrates an exploded perspective view of the device **100**, according to some embodiments. Unless specifically referenced, FIGS. **1** and **2** will be described collectively.

(15) The device **100** includes a strap member **102**. The strap member **102** is an elongate strap

having a first side **104** and a second side **106**. Additionally, the strap member **102** includes a first flange **108**, a second flange **110**, and a central portion **112** extending between, and connected to, each of the first flange **108** and the second flange **110**. Therefore, the first flange **108** and the second flange **110** extend from opposing longitudinal ends of the central portion **112**. In some embodiments, the central portion **112** may be an elongate strap portion that is integrally formed with the first flange **108** and the second flange. In other embodiments, the strap member **102** may be formed from one or more segments of strap that are joined together to form the strap member **102**. For example, the strap member **102** may include two or more segments that are welded together into an integrally formed strap, but it is to be understood by one of ordinary skill in the art that the segments may be joined together and connected by any of a plurality of other means suitable for forming the strap member **102**. In some embodiments, the strap member **102** may include a bend where the central portion borders the first flange **108** and the second flange **110**. In some embodiments, the first flange **108** may be referred to as a first portion. In some embodiments, the second flange **110** may be referred to as a second portion. In some embodiments, the central portion **112** may be referred to as a third portion.

(16) Referring to FIG. **2**, the strap member **102** includes a first aperture **114** and a second aperture **116** extending therethrough. In some embodiments, the first aperture **114** is located on the first flange **108** and the second aperture **116** is located on the second flange **110**. The strap member **102** is adapted to be installed onto the article by extending the central portion **112** around the article and the first flange **108** and the second flange **110** are drawn together from opposing sides of the article and positioned such that the first flange **108** and the second flange **110** are joined together and so that they contact along adjacent sides. In some embodiments, the strap member **102** is installed onto the article by aligning the first flange **108** and the second flange **110** where the first side **104** of the first flange **108** abuts the second side **106** of the second flange **110**. In various embodiments, the first flange **108** and the second flange **110** may be drawn together to enable a tensioning member **120** to extend through the first flange **108** and the second flange **110** to install the strap member **102** around the article. For example, the first flange **108** and the second flange **110** may be aligned such that the first aperture **114** and the second aperture **116** are in colinear alignment to enable the tensioning member **120** to be extended therethrough as shown in FIG. **1**. Accordingly, the flanges may be loosened or drawn together around the elongate article and receives the tensioning member **120**.

(17) In some embodiments, the strap member **102** may include a third aperture **118**. The third aperture **118** is located on the second flange **110** adjacent the second aperture **116**. Accordingly, in some embodiments, the first flange **108** and the second flange **110** may be aligned such that the first aperture **114** and the third aperture **118** are in colinear alignment to enable the tensioning member **120** to be extended therethrough.

(18) In some embodiments, the strap member **102** may be a flexible elongate strap. In some embodiments, the central portion **112** may be flexibly installed onto the article and where the first flange **108** and the second flange **110** are substantially rigid. In some embodiments, the strap member **102** may be substantially rigid but where the central portion **112** includes adequate flexibility to enable the central portion **112** to be manipulated onto the article while retaining its shape and being resistant to deformation. In various embodiments, the strap member **102** is made of metal. The metal may be stamped and formed into the configuration of the strap member **102** as shown in FIG. **1**, but it is to be understood by one of ordinary skill in the art that the embodiments shown in the figures are non-limiting examples and the strap member **102** may include other shapes, dimensions, and features in accordance with this disclosure. For example, a length and width of the strap member **102** may vary based on the dimensions of the article. In other embodiments, the dimensions of the strap member **102** may also be based on the other components of the device **100**, such as the size and dimensions of the tensioning member **120**. In other embodiments, the length of the central portion may vary. In some embodiments, the strap member

102 may include a certain length and the strap member **102** may be adapted to be installed onto a plurality of articles having various sizes or diameters.

(19) The device **100** includes a tensioning member **120**. The tensioning member **120** is defined by a body having a first end **122** and a second end **124**. Referring to FIG. **2**, the tensioning member **120** includes a head portion **136** and a cylindrical portion **138**. The head portion **136** is located at the first end **122**. The cylindrical portion **138** extends from the head portion **136** towards the second end **124**. In some embodiments, the head portion **136** and the cylindrical portion **138** may be integrally formed to form the body of the tensioning member **120**.

(20) The cylindrical portion **138** includes one or more threads formed on the length of the cylindrical portion **138** between the first end **122** and the second end **124**. In some embodiments, a portion of the length of the cylindrical portion **138** may include the one or more threads. For example, in some embodiments, the cylindrical portion **138** may include a shank adjacent the head portion **136** and the first end **122**, the shank being substantially smooth and not including the one or more threads formed thereon. In some embodiments, the second end **124** of the tensioning member **120** may include a tapered end. In some embodiments, the second end **124** of the tensioning member **120** may be substantially flat. In other embodiments, the second end **124** may be convex (e.g., rounded). In some embodiments, the tensioning member **120** may include a shank adjacent the first end **122**, the shank being substantially smooth and not including the one or more threads.

(21) The device **100** includes a set screw member **126**. The set screw member **126** is defined by a body having a cylindrical shape and includes one or more threads formed on an outer longitudinal surface of the set screw member **126**. The one or more threads extend circumferentially along the length of the set screw member **126**. Additionally, the one or more threads of the set screw member **126** correspond to the threads of the bore **140**.

(22) The set screw member **126** is adapted to be installed into the tensioning member **120** and impinge upon an electrical conductor that is also inserted into the tensioning member **120** to electrically and mechanically connect the electrical conductor to the tensioning member **120** and the device to provide grounding capabilities to the elongate article. Accordingly, the set screw member **126** is threaded into the head portion **136** (FIG. **3**) and impinges upon an electrical conductor also inserted into the head portion **136** (FIG. **3**) to impinge on the electrical conductor to electrically and mechanically connect the electrical conductor to the tensioning member **120** as will be further described herein.

(23) The device **100** includes a first nut **128**. The first nut **128** is defined by a body and includes a bore **130** extending therethrough. The bore **130** includes one or more threads formed on an inner surface of the bore **130**. Additionally, the one or more threads of the bore **130** correspond to the one or more threads on the tensioning member **120** as will be further described herein. Accordingly, the tensioning member **120** is adapted to extend through the strap member **102** and also extends through the first nut **128**. In some embodiments, the bore **130** may be referred to as a third bore.

(24) In some embodiments, the first nut **128** may be fixedly attached to the strap member **102**. In some embodiments, the first nut **128** may be attached to the strap member **102** at the first flange **108**. Accordingly, the first nut **128** may be positioned so that a portion of the first nut **128** extends through the first aperture **114**. Specifically, an end of the first nut **128** that is adapted to receive the tensioning member **120** is inserted into the first aperture **114**. In this regard, the first nut **128** is positioned such that the body of the first nut **128** is adjacent the second side **106** of the strap member **102** and a portion of the first nut **128** extends through the strap member **102** from the second side **106** and towards the first side **104**. Furthermore, a clamping force may then be applied to the first nut **128** to attach the first nut **128** to the strap member **102** at the first aperture **114**. The clamping force mechanically deforms the first nut **128** in the first aperture **114**, thereby mechanically binding the first nut **128** to the strap member **102** through mechanical deformation, thereby restricting movement of the first nut **128** relative to the strap member **102** in an axial and radial direction. In some embodiments, the first nut **128** may be attached to the strap member **102**

by a user. In some embodiments, the clamping force may be applied via a clamping tool. In some embodiments, the clamping tool may be a hand clamping tool.
(25) In some embodiments, the first nut **128** may be a lock nut. In some embodiments, the first nut **128** may be a press-fit nut. In other embodiments, the first nut **128** may be a rivet nut. However, it is to be understood that the first nut **128** may be any of a plurality of nuts capable of attaching to the strap member **102** by mechanically binding to the strap member **102** in response to a clamping force.
(26) The device **100** includes a second nut **132**. The second nut **132** includes a bore **134** that extends into the second nut **132**. The bore **134** extends through a portion of the second nut **132**. In some embodiments, the bore **134** extends through the second nut **132** from one side of the second nut **132** and out through to the opposite side. In some embodiments, the bore **134** includes one or more threads formed on the inner surface of the bore **134**. Additionally, the one or more threads of the bore **134** correspond to the threads on the set screw member **126**. In some embodiments, the bore **134** may be referred to as a fourth bore.
(27) The second nut **132** is adapted to be installed onto the set screw member **126** by engaging the one or more threads of the set screw member **126**. Accordingly, as shown in FIG. **3**, the second nut **132** is installed onto the set screw member **126** at an end opposite the tensioning member **120** when the set screw member **126** is installed onto the tensioning member **120**. Additionally, the second nut **132** can be threaded onto the exposed portion of the set screw member **126** that extends from the first end **122** of the tensioning member **120** until the second nut **132** engages the first end **122** of the tensioning member **120**. The second nut **132** acting on the tensioning member **120** covers the exposed portion of the set screw member **126** that extends from the tensioning member **120**. Additionally, tightening the second nut **132** to enable the second nut **132** to act on the tensioning member **120** also retains the position of the set screw member **126** relative to the tensioning member thereby restricting the movement of the set screw member **126** in the bore **140** (FIG. **4**).
(28) Referring to FIG. **1**, the second nut **132** is a cap nut. In some embodiments, the second nut **132** may be an acorn cap nut. In other embodiments, the second nut **132** may be a lock nut. The second nut **132** includes a unique circumferential profile to facilitate threading the second nut **132** onto the set screw member **126**. In some embodiments, the profile can correspond to a hand tool, such as a wrench, for driving the second nut **132** onto the threads of the set screw member **126**. In some embodiments, the second nut **132** may include a hexagonal profile.
(29) FIG. **3** shows a perspective view of the tensioning member **120** from FIG. **1**, according to some embodiments. FIG. **4** shows a side view of the tensioning member **120**, according to some embodiments. FIG. **5** shows a top view of the tensioning member **120**, according to some embodiments. Unless specifically referenced, FIGS. **3-5** will be described collectively.
(30) Referring to FIG. **3**, the tensioning member **120** includes the head portion **136** and the cylindrical portion **138**. The head portion **136** includes a bore **140** and a bore **142**. The bore **140** extends from the first end **122** of the tensioning member **120** and towards the cylindrical portion **138** in a first direction. The bore **140** also includes one or more threads formed on an inner surface. The bore **142** extends through the head portion **136** in a second direction. In some embodiments, the bore **140** may be substantially perpendicular to the bore **142**. Therefore, in some embodiments, the first direction may also substantially perpendicular to the second direction. In some embodiments, the bore **142** may include a substantially smooth inner surface. Referring to FIG. **4**, the bore **140** extends partway through the head portion **136**. Additionally, the bore **140** extends from the first end **122** and to the bore **142** to place the bore **140** in communication with the bore **142**.
(31) The cylindrical portion **138** includes a cylindrical shape and extends from the head portion **136** towards the second end **124**. The cylindrical portion **138** includes one or more threads formed on an outer longitudinal surface of the cylindrical portion **138**. The one or more threads extend circumferentially along the length of the cylindrical portion **138**. In some embodiments, a portion

of the cylindrical portion **138** may include the one or more threads. For example, a segment of the cylindrical portion **138** adjacent the second end **124** may not include threads. In another example, the segment of the cylindrical portion **138** that is adapted to extend from the first nut **128** may not include threads.

(32) The tensioning member **120** provides a conductive discharge path for electrical current between the article and the grounded electrical conductor. Accordingly, the tensioning member **120** (e.g., jack bolt) is capable of carrying at least 2,450 amps. In some embodiments, the device **100** may be capable of conducting at least 2,450 amps of current. In some embodiments, the device **100** may be capable of conducting more than 2,450 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,400 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,300 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,200 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,000 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,500 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,600 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,700 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,800 amps of current. In some embodiments, the device **100** may be capable of conducting at least 2,900 amps of current. In some embodiments, the device **100** may be capable of conducting at least 3,000 amps of current.

(33) The device **100** is capable of carrying the specified electrical current for a period of time and being resistant to cracking, breaking, or melting when subjected to the specified current for the specified period of time. In some embodiments, the period of time may be a predetermined period of time. In other embodiments, the period of time may be a specified period of time. In some embodiments, the device **100** may also be capable of maintaining the elongate article in connection to the grounded conductor after carrying the specified current for the specified period of time.

(34) FIG. **6** is a sectional side view of the device **100**, according to some embodiments.

(35) The tensioning member **120** is adapted to receive the set screw member **126** at the bore **140**. The set screw member **126** engages the tensioning member **120** by threading into the bore **140** and extending into the channel of bore **142**. Bore **142** is also adapted to receive an electrical conductor in bore **142**. In some embodiments, the electrical conductor can be inserted into bore **142** such that the electrical conductor extends past the opening to bore **140** in bore **142**. Accordingly, in some embodiments, the set screw member **126** may be threaded into the bore **140** to drive the set screw member **126** into the bore **142** and to enable the set screw member **126** to impinge on the electrical conductor positioned in bore **142**. Accordingly, the set screw member **126** electrically and mechanically connects the tensioning member **120** to the electrical conductor as a result of the set screw member **126** being threaded into the head portion **136** at the bore **140** and impinging on the electrical conductor located in the bore **142**. Additionally, in some embodiments, when the tensioning member **120** is positioned such that the second end **124** of the tensioning member **120** contacts a surface of the electrically conductive elongate article, the elongate article may also be electrically connected to the grounded electrical conductor through the tensioning member **120**.

(36) In some embodiments, the electrical conductor may further include an electrical connector installed onto the conductor, and the connecter may be inserted into the second bore. Furthermore, the set screw member **126** may be threaded into the bore **140** and impinge on the electrical connector inserted into the bore **142** to electrically and mechanically connect the conductor to the tensioning member **120** and the article.

(37) The set screw member **126** includes a socket **150** located at an end of the set screw member **126** adapted to receive the second nut **132**. The socket **150** includes a unique profile adapted to receive a driver bit to drive the set screw member **126** into the tensioning member **120**. More particularly, to drive the set screw member **126** into the bore **140**. In some embodiments, the socket **150** may include a hexagonal shape adapted to receive a hexagonally shaped tool (e.g., allen key)

to drive the set screw member **126**. In other embodiments, the socket **150** may include any of a plurality of other profiles capable of receiving a tool bit capable of driving the set screw member **126** in and out of the tensioning member **120**.

(38) As shown in FIG. **6**, the bore **130** may include a first segment **146** having a first diameter and a second segment **148** having a second diameter, the first diameter being wider than the second diameter. Additionally, in some embodiments, the second segment **148** may include the one or more threads formed on the inner surface of the second section. In some embodiments, the first nut **128** may include one or more threads formed on the inner surface of the bore **130** that corresponds to the one or more threads of the tensioning member **120**. In some embodiments, the bore **130** of the first nut **128** may include a consistent diameter as the bore **130** extends through the first nut **128**.

(39) The tensioning member **120** extends through the first nut **128** by engaging the threads of the first nut **128**. Additionally, the position of the tensioning member **120** relative to the first nut **128** may be adjustable in the direction a by rotating the tensioning member **120** clockwise or counterclockwise relative to the first nut **128**. Therefore, by adjusting the position of the tensioning member **120**, the tensioning member **120** can extend from the first nut **128** to contact the elongate article and to apply the tension force between the strap member **102** and the elongate article. In some embodiments, the bore of the first nut **128** may be referred to as a third bore.

(40) The tensioning member **120** is adapted to extend through the first aperture **114** and the second aperture **116** of the strap member **102** and through a first nut **128**. Accordingly, the threads of the cylindrical portion **138** engage the threads at the bore **130** of the first nut **128** to enable the tensioning member **120** to extend through the first nut **128**. Additionally, the head portion **136** acts upon the first flange **108** and the second flange **110** as the tensioning member **120** is threaded through the first nut **128** so that a compressive force is applied between the head portion **136** and the first nut **128** to retain a position of the strap member **102** between the tensioning member **120** and the first nut **128**. The tensioning member **120** is also adapted to extend through the first nut **128** to contact a metal surface of the article to place the article in connection with a conductor connected to the tensioning member **120**. Accordingly, the tensioning member **120** is also adapted to electrically connect the article to the electrical conductor to provide a discharge path for electrical current from the article to the grounded electrical conductor through the tensioning member **120**.

(41) The position of the tensioning member **120** relative to the first nut **128** may be adjustable in the direction a substantially perpendicular to a central longitudinal axis of the article. Additionally, the position of the tensioning member **120** relative to the first nut **128** and the article may be adjusted in the direction a by rotating the tensioning member **120** in the clockwise or counterclockwise direction in the threads of the first nut **128**. The position of the tensioning member **120** relative to the first nut **128** may be adjusted to enable the tensioning member **120** to adjustably extend towards the article until the second end **124** of the tensioning member **120** contacts a surface of the article. Additionally, the position of the tensioning member **120** in the direction a may also be adjusted to apply a tension force onto the article and the strap member **102**. Applying the tension force on the strap member **102** and the article extending therethrough facilitates connected engagement between the tensioning member **120** and the surface of the article and also facilitates retention of the device on the article.

(42) In various embodiments, the position of the device **100** relative to the central longitudinal axis of the article may be retained by the tensioning applied by the tensioning member **120** onto the article and the strap member **102**, where movement of the device **100** is thereby restricted along the longitudinal axis of the article. In various embodiments, the tensioning member **120** may be referred to as a screw, bolt, coupler, jack bolt, or other like members.

(43) FIG. **7** shows a method **200** of installing the device **100** of FIG. **1**, according to some embodiments. At **210**, the method **200** includes installing a strap member **102** onto an elongate

article. In some embodiments, the article is an electrically conductive article, such as a elongate article. In some embodiments, the strap member **102** is installed around a circumference of the article where a first flange **108** is positioned to slidably contact a second flange **110** along adjacent sides. The first flange **108** and the second flange **110** of the strap member **102** is extended around the outer circumference of the article (e.g., metal pipe) until the first flange **108** meets the second flange **110** from opposing sides of the article.

(44) In some embodiments, installing the strap member **102** to be positioned around a circumference of the article includes manipulating the central portion **112** around the article and drawing the first flange **108** and the second flange **110** together from opposing sides of the article. Additionally, in some embodiments, the first flange **108** and the second flange **110** are drawn together so that a first side **104** of the first flange **108** slidably contacts a second side **106** of the second flange **110**, the first flange **108** and the second flange **110** being positioned so that the first aperture **114** and the second aperture **116** are in colinear alignment. Additionally, aligning the first flange **108** and the second flange **110** to enable the first aperture **114** to be in colinear alignment with the second aperture **116** to enable the tensioning member **120** to be inserted through the first aperture **114** and the second aperture **116**.

(45) In some embodiments, positioning the strap member **102** around the article includes drawing the first flange **108** and the second flange **110** together so the first flange **108** slidably contacts the second flange **110** and the first aperture **114** is in colinear alignment with the third aperture **118** to enable tensioning member **120** to be inserted through the first aperture **114** and the second aperture **116** of the strap member **102**. In some embodiments, positioning the strap member **102** further includes positioning a first flange **108** relative to a second flange **110** so the first side **104** of the first flange **108** abuts the second side **106** of the second flange **110** around the elongate article.

(46) At **220**, the method **200** includes positioning a tensioning member **120** to extend through the first flange **108** and the second flange **110**. In some embodiments, positioning the tensioning member **120** further includes extending the tensioning member **120** through the first nut **128**. In some embodiments, positioning the tensioning member **120** through the first nut **128** further includes threadingly engaging the threads of the bore **130** of the first nut **128** and adjusting the position of the tensioning member **120** relative to the first nut **128** to enable the second end of the tensioning member **120** to extend from the first nut **128**.

(47) In some embodiments, the method **200** further includes attaching the first nut **128** to the strap member **102**. In some embodiments, attaching the first nut **128** to the strap member **102** includes inserting the first nut **128** through the first aperture **114** to enable a portion of the first nut **128** to extend through the strap member **102** from the second side **106** towards the first side **104**. In some embodiments, the method **200** includes applying a clamping force to the first nut **128** to attach the first nut **128** to the strap member **102**. In some embodiments, attaching the first nut **128** to the strap member **102** by applying a clamping force onto the first nut **128** mechanically deforms the first nut **128** around a profile of the strap member **102** and the first aperture **114**. In some embodiments, the first nut **128** is attached to the strap member **102** in the first aperture **114** using a clamping tool. In some embodiments, the clamping tool may be a hand tool.

(48) At **230**, the method **200** includes installing a set screw member **126** into the tensioning member **120**. The set screw member **126** includes one or more threads formed on the outer longitudinal surface. Additionally, the tensioning member **120** includes a head portion **136**. The head portion **136** includes a bore **140** and a bore **142**. The bore **140** includes one or more threads formed on the inner surface of the bore **140** that correspond to the threads on the set screw member **126**. Accordingly, in some embodiments, installing the set screw member **126** into the tensioning member **120** includes the threads of the set screw member **126** threadingly engaging the threads of the bore **140** and driving the set screw member **126** into the tensioning member **120**. Furthermore, a position of the set screw member **126** relative to the tensioning member **120** may be adjustable to enable the set screw member **126** to extend into the bore **142** and impinge on an electrical

conductor positioned in the bore **142**. In some embodiments, impinging on the electrical conductor mechanically and electrically connects the tensioning member **120** to the electrical conductor.
(49) At **240**, the method **200** includes installing the tensioning member **120** into a first nut **128** to extend through the first nut **128**. In some embodiments, the tensioning member **120** includes one or more threads formed on an outer surface of the tensioning member **120**. In some embodiments, the tensioning member **120** includes a cylindrical portion that includes the one or more threads. Additionally, the first nut **128** includes a bore **130** that includes one or more threads formed on the inner surface that corresponds to the threads on the tensioning member **120**. Accordingly, installing the tensioning member **120** into the first nut **128** includes the threads of the tensioning member **120** threadingly engaging the threads of the bore **130** to enable the tensioning member **120** to extend through the first nut **128** and towards the article extending through the strap member **102**. Additionally, the position of the tensioning member **120** relative to the first nut **128** may be adjustable relative to the first nut **128** in a direction a to enable the tensioning member **120** to contact a surface of the article and to enable the tensioning member **120** to apply a tension force between the strap member **102** and the article. In some embodiments, adjusting the position of the tensioning member **120** relative to the first nut **128** includes rotating the tensioning member **120** in the clockwise and counterclockwise direction to move the tensioning member **120** in the direction a substantially perpendicular to a longitudinal axis of the article.
(50) At **250**, the method **200** includes threading a second nut **132** onto the set screw member **126** until the second nut **132** acts on the tensioning member **120** to retain a position of the set screw member **126**. The second nut **132** retains a position of the set screw member **126** relative to the tensioning member **120**. In some embodiments, threading the second nut **132** onto the set screw member **126** includes rotating the second nut **132** in the clockwise and counterclockwise direction to adjust the position of the second nut **132** relative to the tensioning member **120**. In some embodiments, threading the second nut **132** to act on the tensioning member **120** applies a compressive force between the tensioning member **120** and the second nut **132** and retains a position of the set screw member **126** relative to the tensioning member **120**. Accordingly, the set screw member **126** may be threaded into the bore **140** and impinge upon the electrical conductor that extends through the bore **142** and the second nut **132** may facilitate retaining a position of the set screw member **126** in the tensioning member **120**.
(51) In some embodiments, the method **200** further includes installing a first nut **128** into a first aperture **114** at the first flange **108**. In some embodiments, installing the first nut **128** further includes positioning the first nut **128** to extend through the first aperture **114** from the first side **104** of the strap member **102** towards the second side **106**. In some embodiments, the method **200** further includes applying a clamping force onto the first nut **128** to mechanically bind the first nut **128** to the strap member **102** in the first aperture **114**.
(52) In some embodiments, positioning the tensioning member **120** through the first flange **108** and the second flange **110** of the strap member **102** further includes positioning the tensioning member **120** to extend through the first aperture **114** on the first flange **108** and the second aperture **116** on the second flange **110**. In other embodiments, positioning the tensioning member **120** through the first flange **108** and the second flange **110** of the strap member **102** further includes positioning the tensioning member **120** to extend through the first aperture **114** on the first flange **108** and the third aperture **118** on the second flange **110**.
(53) In some embodiments, the method may include installing a connector **152** onto the set screw member **126** between the tensioning member **120** and the second nut **132**. The connector **152** may include an aperture that extends therethrough and the connector **152** may be positioned so the set screw member **126** extends through the connector **152** and connected to the tensioning member **120** in response to the second nut **132** acting on the connector **152** and the tensioning member **120** when tightened onto the set screw member **126**.
(54) FIG. **8** shows a perspective view of the device **100** of FIG. **1**, according to some embodiments.

The device **100** is connected to the connector **152**. The connector **152** is installed onto the tensioning member **120** between the first nut **128** and the second nut **132** and also connected to an electrical conductor **144** to provide a discharge path for the electrical potential built up in the elongate article. In the embodiment shown in FIG. **6**, the device **100** is electrically connected with device **100**″ through the electrical conductor **144**. In some embodiments, the device **100** and/or the device **100**″ may be electrically connected with the ground. In other embodiments, the device **100** may also be in electrical connection with one or more of the device **100** in series using one or more of the electrical conductor **144** and in electrical connection with the ground.

(55) In some embodiments, the device **100** may be in electrical connection with any of a plurality of electrical conductors suitable for conducting a specific amount of electrical current to the ground. For example, the electrical conductor may be a bonded electrical jumper capable of carrying at least 2,450 amps of current.

(56) In some embodiments, the device **100** may be installed onto a section of elongate article. In some embodiments, the elongate article may be made of one or more sections of elongate article and each section may include the device **100** installed onto the elongate article. In some embodiments, a section of elongate article may include one or more of the device **100** installed thereon. For example, a particular section may include a first device and a second device installed at opposite ends of the elongate article section.

(57) In some embodiments, the device **100** may include one or more of the connector **152** coupled to the tensioning member **120**. In some embodiments, the device **100** may include a first connector and a second connector installed onto the tensioning member **120**. For example, the elongate article can include a first device, a second device, and a third device installed onto the elongate article in series and where the third device is also electrically connected to the ground. It is to be understood by one of ordinary skill in the art that the elongate article may include one or more segments and may include one or more of the device **100** installed thereon. Furthermore, it is to be understood by one of ordinary skill in the art that the device **100** may include one or more of the connector **152** installed thereon to enable the device **100** to be connected to another one of the device **100** in series and/or the ground to provide a discharge path for electrical current to the elongate article or to enable the device **100** to act as a relay in electrically connecting another device **100** to the ground in accordance with the present disclosure.

(58) All prior patents and publications referenced herein are incorporated by reference in their entireties.

(59) Throughout the specification and claims, the following terms take the meanings explicitly associated herein, unless the context clearly dictates otherwise. The phrases “in one embodiment,” “in an embodiment,” and “in some embodiments” as used herein do not necessarily refer to the same embodiment(s), though it may. Furthermore, the phrases “in another embodiment” and “in some other embodiments” as used herein do not necessarily refer to a different embodiment, although it may. All embodiments of the disclosure are intended to be combinable without departing from the scope or spirit of the disclosure.

(60) As used herein, the term “based on” is not exclusive and allows for being based on additional factors not described, unless the context clearly dictates otherwise. In addition, throughout the specification, the meaning of “a,” “an,” and “the” include plural references. The meaning of “in” includes “in” and “on.”

(61) As used herein, the term “between” does not necessarily require being disposed directly next to other elements. Generally, this term means a configuration where something is sandwiched by two or more other things. At the same time, the term “between” can describe something that is directly next to two opposing things. Accordingly, in any one or more of the embodiments disclosed herein, a particular structural component being disposed between two other structural elements can be: disposed directly between both of the two other structural elements such that the particular structural component is in direct contact with both of the two other structural elements;

disposed directly next to only one of the two other structural elements such that the particular structural component is in direct contact with only one of the two other structural elements; disposed indirectly next to only one of the two other structural elements such that the particular structural component is not in direct contact with only one of the two other structural elements, and there is another element which juxtaposes the particular structural component and the one of the two other structural elements; disposed indirectly between both of the two other structural elements such that the particular structural component is not in direct contact with both of the two other structural elements, and other features can be disposed therebetween; or any combination(s) thereof.

(62) As used herein “embedded” means that a first material is distributed throughout a second material.

ASPECTS

(63) Various Aspects are described below. It is to be understood that any one or more of the features recited in the following Aspect(s) can be combined with any one or more other Aspect(s). Aspect 1. A device comprising: a tensioning member comprising: a first end, a second end, a head portion comprising: a first bore, a second bore, wherein the first bore is in communication with the second bore, and a cylindrical portion, wherein the cylindrical portion extends from the head portion towards the second end and includes one or more threads formed along a length of the cylindrical portion; a set screw member located in the first bore, wherein the set screw member is configured to engage an electrical conductor located in the second bore to connect the tensioning member to the electrical conductor; and a first nut located adjacent the second end of the tensioning member; wherein the tensioning member extends through the first nut and the second end of the tensioning member is configured to contact a surface of an elongate article to electrically connect the elongate article to the tensioning member and the electrical conductor. Aspect 2. The device according to aspect 1, further comprising: a strap member comprising: a first flange, a second flange, a central elongate portion, and wherein the first flange and the second flange extend from opposing ends of the central elongate portion, wherein the central elongate portion is configured to substantially extend around a circumference of an elongate article until the first flange is in contact with the second flange along adjacent sides. Aspect 3. The device according to aspect 2, wherein a position of the tensioning member in the first nut is adjustable in a direction substantially perpendicular to a longitudinal axis of the elongate article to apply a tension force between the strap member and the elongate article. Aspect 4. The device according to aspects 2 or 3, wherein the strap member further includes: a first aperture at the first flange, and a second aperture at the second flange, wherein the tensioning member extends through the first aperture and the second aperture to retain the strap member around the elongate article. Aspect 5. The device according to aspects 2, 3, or 4, wherein the strap member further includes: a third aperture at the second flange adjacent the second aperture, wherein the tensioning member is configured to extend through the first aperture and the third aperture to retain the strap member around the elongate article. Aspect 6. The device according to aspects 2, 3, 4, or 5, wherein the first nut is configured to extend into the first aperture and connect to the first flange by binding to the strap member through mechanical deformation in response to a clamping force applied to the first nut. Aspect 7. The device according to any of the preceding aspects, wherein the set screw member impinges on the electrical conductor to fixedly retain the electrical conductor in the second bore and to connect the tensioning member to the electrical conductor. Aspect 8. The device according to any of the preceding aspects, wherein the first bore extends from the first end of the tensioning member towards the second end; wherein the second bore extends through the head portion in a direction substantially perpendicular to the first bore. Aspect 9. The device according to any of the preceding aspects, further comprising: a second nut, wherein the second nut is configured to thread onto the set screw member opposite the tensioning member and act upon the head portion of the tensioning member to retain a position of the set screw member in the first bore. Aspect 10. An apparatus comprising: a strap member

comprising: a first flange, a second flange, and a central elongate portion; a tensioning member comprising: a head portion at a first end, a first bore located in the head portion, a second bore located in the head portion in communication with the first bore, wherein the second bore being in communication with the first bore, and a cylindrical portion at a second end; a set screw member located in the first bore; a first nut; and a second nut; wherein the tensioning member extends through the first nut and the second end of the tensioning member is configured to contact a surface of an elongate article to electrically connect the elongate article to the tensioning member, and a position of the tensioning member in the first nut is adjustable in a direction substantially perpendicular to a longitudinal axis of the elongate article to apply a tension force between the strap member and the elongate article. Aspect 11. The apparatus according to aspect 10, wherein the second bore extends through the head portion in a direction substantially perpendicular to the first bore, wherein the second bore is configured to receive an electrical conductor positioned in the second bore. Aspect 12. The apparatus according to aspect 10 or 11, wherein the set screw member extends from the first bore into the second bore and impinges on the electrical conductor to fixedly retain the electrical conductor in the second bore and connect the tensioning member to the electrical conductor; wherein the tensioning member is further configured to electrically connect the elongate article to the electrical conductor. Aspect 13. The apparatus according to aspects 10, 11, or 12, wherein the strap member further comprises: a first aperture at the first flange, a second aperture at the second flange, and wherein the central elongate portion is configured to substantially extend around a circumference of the elongate article until the first flange is in contact with the second flange along adjacent sides, wherein the tensioning member is configured to extend through the first aperture and the second aperture to retain the strap member around the elongate article. Aspect 14. The apparatus according to aspect 13, wherein the first nut is configured to extend into the first aperture and connect to the first flange by binding to the strap member through mechanical deformation in response to a clamping force applied to the first nut. Aspect 15. The apparatus according to aspects 13 or 14, wherein the strap member further includes: a third aperture at the second flange adjacent the second aperture, wherein the tensioning member is configured to extend through the first aperture and the third aperture. Aspect 16. The apparatus according to aspects 10, 11, 12, 13, 14, or 15, wherein the tensioning member is further configured to apply a tension force between the strap member and the elongate article. Aspect 17. A jack bolt comprising: a body having a first end and a second end, the body comprising: a head portion located at the first end, the head portion comprising: a first bore, a second bore, wherein the second bore extends through the head portion in a direction substantially perpendicular to the first bore and the second bore is in communication with the first bore, and a cylindrical portion located at the second end, wherein the cylindrical portion extends from the head portion to the second end and includes threads formed on a length of the cylindrical portion. Aspect 18. The jack bolt according to aspect 17, wherein the first bore extends from the first end towards the second end in the head portion, wherein the first bore includes threads formed on an inner surface of the first bore and the first bore is configured to receive a set screw member. Aspect 19. The jack bolt according to aspects 17 or 18, wherein the second bore is configured to receive an electrical conductor positioned in the second bore; wherein the set screw member is configured to extend from the first bore into the second bore and impinge on the electrical conductor to fixedly retain the electrical conductor in the second bore and to connect the jack bolt to the electrical conductor. Aspect 20. The jack bolt according to aspects 17, 18, or 19, wherein the jack bolt comprises electrically conductive metallic material; wherein the jack bolt comprises dimensions capable of carrying at least 2,450 amps for a predetermined period of time.

(64) It is to be understood that changes may be made in detail, especially in matters of the construction materials employed and the shape, size, and arrangement of parts without departing from the scope of the present disclosure. This Specification and the embodiments described are examples, with the true scope and spirit of the disclosure being indicated by the claims that follow.

Claims

1. A device comprising: a tensioning member comprising: a first end, a second end, a head portion comprising: a first bore, a second bore, wherein the first bore is in communication with the second bore, and a cylindrical portion, wherein the cylindrical portion extends from the head portion towards the second end and includes one or more threads formed along a length of the cylindrical portion; a set screw member located in the first bore, wherein the set screw member is configured to engage an electrical conductor located in the second bore to connect the tensioning member to the electrical conductor; and a first nut located adjacent the second end of the tensioning member; wherein the tensioning member extends through the first nut and the second end of the tensioning member is configured to contact a surface of an elongate article to electrically connect the elongate article to the tensioning member and the electrical conductor.
2. The device according to claim 1, further comprising: a strap member comprising: a first flange, a second flange, a central elongate portion, and wherein the first flange and the second flange extend from opposing ends of the central elongate portion, wherein the central elongate portion is configured to substantially extend around a circumference of an elongate article until the first flange is in contact with the second flange along adjacent sides.
3. The device according to claim 2, wherein a position of the tensioning member in the first nut is adjustable in a direction substantially perpendicular to a longitudinal axis of the elongate article to apply a tension force between the strap member and the elongate article.
4. The device according to claim 2, wherein the strap member further includes: a first aperture at the first flange, and a second aperture at the second flange, wherein the tensioning member extends through the first aperture and the second aperture to retain the strap member around the elongate article.
5. The device according to claim 4, wherein the strap member further includes: a third aperture at the second flange adjacent the second aperture, wherein the tensioning member is configured to extend through the first aperture and the third aperture to retain the strap member around the elongate article.
6. The device according to claim 4, wherein the first nut is configured to extend into the first aperture and connect to the first flange by binding to the strap member through mechanical deformation in response to a clamping force applied to the first nut.
7. The device according to claim 1, wherein the set screw member impinges on the electrical conductor to fixedly retain the electrical conductor in the second bore and to connect the tensioning member to the electrical conductor.
8. The device according to claim 1, wherein the first bore extends from the first end of the tensioning member towards the second end; wherein the second bore extends through the head portion in a direction substantially perpendicular to the first bore.
9. The device according to claim 1, further comprising: a second nut, wherein the second nut is configured to thread onto the set screw member opposite the tensioning member and act upon the head portion of the tensioning member to retain a position of the set screw member in the first bore.
10. An apparatus comprising: a strap member comprising: a first flange, a second flange, and a central elongate portion; a tensioning member comprising: a head portion at a first end, a first bore located in the head portion, a second bore located in the head portion in communication with the first bore, wherein the second bore being in communication with the first bore, and a cylindrical portion at a second end; a set screw member located in the first bore; a first nut; and a second nut; wherein the tensioning member extends through the first nut and the second end of the tensioning member is configured to contact a surface of an elongate article to electrically connect the elongate article to the tensioning member, and a position of the tensioning member in the first nut is adjustable in a direction substantially perpendicular to a longitudinal axis of the elongate article to

apply a tension force between the strap member and the elongate article.
11. The apparatus according to claim 10, wherein the second bore extends through the head portion in a direction substantially perpendicular to the first bore, wherein the second bore is configured to receive an electrical conductor positioned in the second bore.
12. The apparatus according to claim 11, wherein the set screw member extends from the first bore into the second bore and impinges on the electrical conductor to fixedly retain the electrical conductor in the second bore and connect the tensioning member to the electrical conductor; wherein the tensioning member is further configured to electrically connect the elongate article to the electrical conductor.
13. The apparatus according to claim 10, wherein the strap member further comprises: a first aperture at the first flange, a second aperture at the second flange, and wherein the central elongate portion is configured to substantially extend around a circumference of the elongate article until the first flange is in contact with the second flange along adjacent sides, wherein the tensioning member is configured to extend through the first aperture and the second aperture to retain the strap member around the elongate article.
14. The apparatus according to claim 13, wherein the first nut is configured to extend into the first aperture and connect to the first flange by binding to the strap member through mechanical deformation in response to a clamping force applied to the first nut.
15. The apparatus according to claim 13, wherein the strap member further includes: a third aperture at the second flange adjacent the second aperture, wherein the tensioning member is configured to extend through the first aperture and the third aperture.
16. The apparatus according to claim 10, wherein the tensioning member is further configured to apply a tension force between the strap member and the elongate article.
17. A jack bolt comprising: a body having a first end and a second end, the body comprising: a head portion located at the first end, the head portion comprising: a first bore, a second bore, wherein the second bore extends through the head portion in a direction substantially perpendicular to the first bore and the second bore is in communication with the first bore, and a cylindrical portion located at the second end, wherein the cylindrical portion extends from the head portion to the second end and includes threads formed on a length of the cylindrical portion.
18. The jack bolt according to claim 17, wherein the first bore extends from the first end towards the second end in the head portion, wherein the first bore includes threads formed on an inner surface of the first bore and the first bore is configured to receive a set screw member.
19. The jack bolt according to claim 18, wherein the second bore is configured to receive an electrical conductor positioned in the second bore; wherein the set screw member is configured to extend from the first bore into the second bore and impinge on the electrical conductor to fixedly retain the electrical conductor in the second bore and to connect the jack bolt to the electrical conductor.
20. The jack bolt according to claim 19, wherein the jack bolt comprises electrically conductive metallic material; wherein the jack bolt comprises dimensions capable of carrying at least 2,450 amps for a predetermined period of time.