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(71) Applicant: **AUSTRALASIAN STEEL PRODUCTS PTY LTD** [AU/AU]; 11-19 Whitehall Street, Footscray, Victoria 3011 (AU).

(72) Inventors: **MORRISON, Leigh, Wayne**; 354 Albert Road, South Melbourne, Victoria 3205 (AU). **CHRISTENSEN, Paul, Charles**; 22 Railway Crescent, Williamstown, Victoria 3016 (AU). **LAI, Kon**; 69 Meadowbank Drive, North Sunshine, Victoria 3020 (AU).

(74) Agent: **PHILLIPS ORMONDE FITZPATRICK**; Level 21, 22 & 23, 367 Collins Street, Melbourne, Victoria 3000 (AU).

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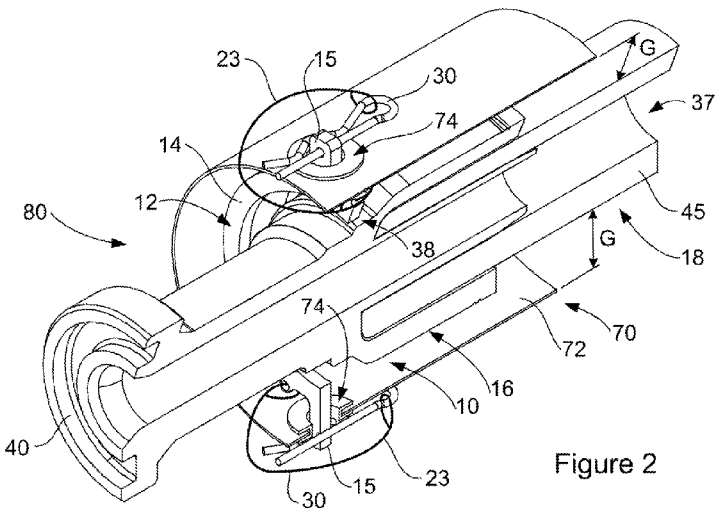


Figure 2

(57) Abstract: An anchoring arrangement (10, 110, 210, 310, 310A) for a protective sleeve (72) which includes at least one fastening formation (74) and locates, in use, over a conduit assembly (40). The anchoring arrangement (10, 110, 210, 310, 310A) includes at least one anchor (12, 112, 212, 312) which includes a mounting element (14, 114, 214, 314) that, in use, locates on and substantially annularly extends around a portion of the conduit assembly (40). Each anchor (12, 112, 212, 312) also includes at least one fastening element (15, 115, 215, 315) which extends from the mounting element (14, 114, 214, 314) and is configured, in use, to be cooperatively secured to or with at least one fastening formation (74) of a co-located protective sleeve (72).

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ANCHORING ARRANGEMENT FOR A PROTECTIVE SLEEVE

CROSS-REFERENCE

[0001] The present application claims priority from Australian provisional patent application No. 2013901915 filed on 29 May 2013, the disclosure of which should be understood to be incorporated into this specification.

TECHNICAL FIELD

[0002] The present invention relates generally to an anchoring arrangement for a protective sleeve for a conduit such as, but not limited to, a hose or pipe. More particularly, the invention relates to an anchoring arrangement for a protective sleeve which can be mounted to and around a large variety of conduit and conduit connector configurations.

BACKGROUND TO THE INVENTION

[0003] The following discussion of the background of the invention is intended to facilitate an understanding of the invention. However, it should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was published, known or part of the common general knowledge as at the priority date of the application.

[0004] The integrity of conduits and conduit assemblies that convey hydraulic or pneumatic fluids in such systems is critical. Failed conduits can cause serious damage to surrounding machinery, as well as cause injury to personnel, particularly in high pressure applications. Conduits can fail at a point which is at or proximate to a conduit coupling (or anchor) causing the free end of the conduit to whip about violently. Furthermore, conduits which fail at any point along their length may splash, spray or mist fluid (and material entrained therein) onto surrounding machinery, components or personnel.

[0005] In order to reduce injury and danger, relevant conduits can include a reinforced or strengthened outer layer integrated or combined with the conduit. Alternatively, the relevant conduits could be enclosed with a protective sleeve or sheath designed to form a protective barrier between people or machinery and the ruptured conduit and fluid (or other working mediums) erupting therefrom.

[0006] Examples of such protective sleeves are provided in International Patent Publication WO2006/002459. This patent publication describes a hydraulic or pneumatic hose assembly which has a protective sleeve mounted over the hose assembly. The protective sleeve comprises a seamless woven fabric sleeve which is fitted loosely about the hose with a gap between the cover and the hose. The protective sleeve is anchored at both ends to act as a whip check to contain whipping of the hose should the hose assembly fail and to act as a fluid suppression device.

[0007] In a first embodiment of WO2006/002459, the protective sleeve is crimped to the hose couplings by a metal crimping sleeve or ferrule. Sealing the ends of the protective sleeve with a crimping sleeve or ferrule can create a fluid seal between the coupling, hose and protective seal. In the event of hose failure, fluid can be retained within the protective sleeve, causing pressure to build up in that sleeve. Significant pressure build up can lead to ballooning of the protective sleeve and in some cases failure, which again can cause injury to proximate persons and damage to surrounding machinery.

[0008] In a second embodiment of WO2006/002459, the protective sleeve includes two spaced apart eyelets in each distal end of the sleeve through which the ends of anchoring staples can be received. The anchoring staples are received in a staple groove formed in a section of a staple coupling attached to the hose. The staple provides a gap through which fluid can escape in the event of hose failure. However, whilst this arrangement provides suitable anchoring for

staple couplings, no suitable anchoring arrangement is described for use with other types of hose couplings.

[0009] It would therefore be desirable to provide an improved and/or alternate anchoring arrangement for a protective sleeve located around a conduit, such as a hose or pipe.

SUMMARY OF THE INVENTION

[0010] A first aspect of the present invention provides an anchoring arrangement for a protective sleeve. The protective sleeve includes at least one fastening formation and locates, in use, over a conduit assembly. The anchoring arrangement includes at least one anchor which includes a mounting element that, in use, locates on and substantially annularly extends around a portion of the conduit assembly. Each anchor also includes at least one fastening element which extends from the mounting element and is configured, in use, to be cooperatively secured with at least one fastening formation of a co-located protective sleeve.

[0011] The present invention provides an anchoring arrangement including one or more anchors that mounts around a portion of a conduit assembly. This anchoring arrangement is advantageously configured to have a wide usage on a large variety of conduit assemblies and more preferably be received and mount substantially annually around a large variety of conduit connection assemblies. To this end, each anchor includes a fastening element, preferably a projection, configured to be cooperatively secured with or to a fastening formation of a co-located protective sleeve to mount that protective sleeve on and about the conduit assembly.

[0012] The fastening formation can comprise any suitable element with which the fastening element can cooperate to secure or otherwise mount the protective sleeve onto the mounting element. In some embodiment, the

fastening formation can comprise at least one of hook, opening, aperture, loop, chain, clip, clamp, peg cord or the like. In some embodiments, the fastening formation comprises a combination of two or more of the aforementioned fastening formations. The fastening formation is therefore configured to attach to or otherwise be secured with that configuration of fastening formation. For example, where the fastening formation comprises a loop, the fastening element would preferably be configured to hook, clip, tied or be otherwise secured in that loop. In a preferred embodiment, the fastening formation comprises a fastening aperture, and the at least one fastening element extends from the mounting element and is configured to be received, in use, in at least one fastening aperture of a co-located protective sleeve. In this respect, the fastening element is cooperatively received in the fastening aperture to secure the protective sleeve to the mounting element.

[0013] The anchoring assembly may include any number of anchors for anchoring the protective sleeve relative to a length of conduit in a conduit assembly. The one or more anchors may be provided in any suitable arrangement which may advantageously minimise or prevent a conduit from whipping if fluid or other working medium erupts through a rupture point/zone or damaged area of a conduit which is covered by the protective sleeve according to the invention. Furthermore, the one or more anchors can be arranged relative to the conduit to assist the protective sleeve function to at least partially capture any fluid or other working medium which erupts through a rupture point/zone of the conduit and is directed or dispelled towards one or more ends of the protective sleeve.

[0014] The mounting element of each anchor of the anchoring assembly is designed to substantially annually extend around a portion of the conduit assembly. The mounting element therefore preferably includes an opening through which a portion of the conduit assembly is received. The opening can be of any suitable shape, such as round, oval, polygonal such as square,

rectangular, triangular, pentagonal, hexagonal, octagonal or any other regular polygon. In preferred embodiments, the opening has a cooperative configuration to the portion of the conduit assembly, preferably conduit connection assembly, it is designed to receive and be seated about. Preferably, the opening comprises a round or circular opening.

[0015] The mounting element similarly can have any suitable shape and/or configuration. In some embodiments, the mounting element comprises a polygonal body shape, such as square, triangular or the like. However, in preferred embodiments, the mounting element comprises an annulus, preferably a ring or hoop.

[0016] In some embodiments, the mounting element may include a split or break which enables the shape of mounting element to be bent, deformed or otherwise manipulated to be mounted or seated on and around a selected portion of the conduit assembly. For example, in one embodiment, the mounting element comprises a split ring.

[0017] In some embodiments, the mounting element is formed from at least two releasably securable parts. The releasably securable parts are preferably movable between an open position enabling the mounting element to be located on a portion of the conduit assembly, and a closed position, in which the mounting element can be fastened to substantially annularly extend around the selected portion of the conduit assembly. The releasably securable sections may comprise at least a first section and a second section.

[0018] In some embodiments, the mounting element can include a pivot or hinge portion which enables the first section to be moved, preferably pivoted, relative to the second section of the mounting element. The first and second sections are also preferably releasably fastened together at the ends (distal ends) of those sections which are moved apart about the hinge or pivot. Those distal ends may include a cooperating fastening or securing means such as (but not

limited to) a clasp, clip, pin, lock, tie, latch, hook or the like. In some embodiments, the mounting element has a clam configuration.

[0019] In yet other embodiments, the mounting element may be formed and constructed from at least two separate component elements which can be fastened or secured together to construct the mounting element. In such embodiments, the first section and second section can be connectable around a selected portion of the conduit assembly from an open position where the first section and second section are spaced apart and a closed position in which the first section and second section are fastened together to substantially annularly extend around the selected portion of the conduit assembly. Again, the component elements may be secured together using any suitable cooperating fastening or securing means such as (but not limited to) a clasp, clip, pin, lock, tie, latch, hook or the like.

[0020] The mounting element preferably has a substantially smaller thickness compared to width. The thickness of the mounting element is preferably between 1 and 15 mm, and more preferably between 2 and 10 mm.

[0021] The fastening element of each anchor is used to releasably secure the protective sleeve to the anchoring assembly of the present invention. For this function, the fastening body preferably comprises a body, more preferably a projection, such as a tab, rod, spring, sling, wing, hook, bolt, screw, wire, pin, foot or arm, which extends outwardly, preferably radially outwardly, from the mounting element. This body is received within one of the fastening formations of the protective sleeve, thereby interconnecting the protective sleeve with the anchoring assembly. In order to provide a secure connection, the fastening element is preferably configured to, in use, extend through at least one fastening formation of a co-located protective sleeve to mount the protective sleeve over the conduit assembly.

[0022] Each anchor can include any number of fastening elements extending from the mounting element. Some embodiments include a single fastening element. However, it is preferred that the anchoring assembly includes at least two fastening elements. Each fastening element is preferably spaced apart, more preferably annually space apart, around the mounting element. In order to provide secure attachment around the entire perimeter of the protective sleeve, it is preferable that each fastening element (and cooperative fastening formation of the co-located protective sleeve) is evenly spaced apart around the mounting element.

[0023] A securement arrangement can be provided for releasably securing the protective sleeve to the anchoring arrangement. The securement arrangement preferably comprises at least one securing element which cooperates with a distal end of the fastening element to retain a portion of the protective sleeve about the fastening element. In preferred forms, the securing element or elements capture a portion of protective sleeve proximate the fastening formation about the fastening element between the securing element and the mounting element.

[0024] In some embodiments, the securing element comprises a fastener which is releasably secured to or about the distal end of the fastening element. The securement arrangement can further include a tether between the securing element and at least one portion of the anchoring arrangement. The tether can comprise any flexible element which can interconnect the securing element and the anchoring arrangement. For example, in some embodiments, the tether comprises a cord or cable secured between the fastening body and a portion of the mounting element. In some embodiments, the mounting element includes a tether connection formation, for example a lug, flange, projection, aperture or combination thereof, onto which the tether can be connected.

[0025] Whilst a large variety of configurations are possible, exemplary embodiments of the securement arrangement can comprise at least one of the following:

at least one formation located in the fastening element and a cooperative fastening body, preferably a rod, pin, peg or clip; or

at least one fastener, preferably a nut, clasp or clip, releasably securable to a cooperative fastening feature, preferably a thread, recess or groove, on the fastening element.

[0026] In one embodiment, the securement arrangement comprises a formation located in the fastening element which is configured to receive a cooperative cotter pin which is, in use, fastened within the formation once the fastening element is received in, and extends through the cooperative fastening formation of the protective sleeve.

[0027] In other exemplary embodiments, the securement arrangement comprises a securing body mounted to the fastening element, and movable between a receiving position in which the fastening body enables securement of the fastening element to or with the fastening formation of the protective sleeve, and a locking position, in which the fastening body prevents removal of the protective sleeve. In these embodiments, the securing body preferably comprises an elongate body, preferably a rod, clip or pin, pivotably mounted to or in the fastening element. Where the fastening formation comprises a fastening aperture, the receiving position comprises a position in which the fastening body is received through the fastening aperture of the protective sleeve.

[0028] A securement arrangement may not necessarily be required to secure a portion of protective sleeve around a fastening element. In some embodiments, at least one of the fastening elements comprises a hook or other projection, such as rod, tab or arm, which extends radially outward of the mounting element, and is axially angled, bent or curved away from an orthogonal

radial axis of the mounting element. Here, a portion of protective sleeve is retained around a fastening element by and in the angle, bend or curve of that fastening element.

[0029] It should be appreciated that in some embodiments of the securement arrangement the mounting element may also include one or more additional lugs, arms, projection or other such attachment points or formations for the attachment of additional restraints, connectors or the like.

[0030] A second aspect of the present invention provides a protective sleeve assembly comprising a protective sleeve sized to fit over the at least one conduit with a gap between the cover and the conduit, the protective sleeve including at least one fastening formation. The assembly also includes an anchoring arrangement according to the first aspect of the present invention. In use, at least one fastening element of an anchor of the anchoring arrangement is cooperatively secured with at least one of the fastening formations of the protective sleeve to mount the protective sleeve over a conduit.

[0031] Again, the fastening element of each anchor of the anchoring assembly is preferably configured, in use, to extend through at least one fastening formation of a co-located protective sleeve to mount the protective sleeve over the conduit assembly. The formations of the protective sleeve preferably comprise eyelets through which the fastening element is received and extends. The eyelets can include a strengthening element, such as a disc or plate.

[0032] The protective sleeve can be constructed from any suitable material. One example of a suitable sleeve is described in the Applicant's earlier international patent publication WO2010/003174 which comprises a multilayer construction of a woven outer layer and an inner elastomeric layer. The protective sleeve may be formed of a closed-weave material, and may be, for example, made of textiles material. The protective sleeve may, for example, be

made of multi-filament nylon. However, it should be appreciated that any suitable construction can be used with the present invention.

[0033] The protective sleeve may have any one or more attributes of particular benefit in certain applications. These attributes include:

- withstanding high burst pressure, in excess of about 300 bar or more;
- a high abrasive resistance;
- rated to withstand high temperatures and/or is at least partially flame-resistant;
- an electrical conductivity which is substantially static-free.

Static-free electrical conductivity is particularly advantageous for applications where anti-static componentry is mandatory for safety reasons, such as underground and/or in coal mining.

[0034] The protective sleeve is particularly suitable for application into environments using high pressure lines, steam lines, fuel lines where splashing, misting and/or eruption of oil or fuel vapour may lead to an explosion or fire.

[0035] A third aspect of the present invention provides a conduit assembly including at least one conduit, at least one conduit connection assembly mounted on at least one end of the conduit. The assembly also includes an anchoring arrangement according to the first aspect of the present invention. The anchoring arrangement is mounted about or to the conduit connection assembly. A protective sleeve is also provided sized to fit over the at least one conduit with a gap between the cover and the conduit. The protective sleeve includes at least one fastening formation. At least one fastening element of an anchor of the anchoring arrangement is cooperatively secured with at least one of the fastening formations of the protective sleeve to mount the protective sleeve over the conduit.

[0036] It is to be appreciated that the term "conduit" used herein can include any practical rigid walled pipe, flexible walled hose or other fluid carrying arrangement. In preferred embodiments, the conduit comprises a hose or pipe.

[0037] The present invention is particularly applicable for use with high pressure conduits, such as high pressure flexible hoses, used in an environment using high pressure hydraulic applications. However, it is to be appreciated that the invention is not limited to that application, and could instead be used in other safety applications such as within a domestic environment, for applications using substantially rigid conduits such as pipes or rigid lines, or in low pressure applications where lower pressure fluids or other working mediums are being conveyed through flexible pipes or hoses. The present invention may also be used in applications where the lower pressure working medium is a dangerous substance upon contact, such as steam or super-heated steam.

[0038] Again, the fastening element of each anchor of the anchoring assembly is preferably configured, in use, to extend through at least one fastening formation of a co-located protective sleeve to mount the protective sleeve over the conduit assembly.

[0039] The anchors of the anchoring assembly can be located at any suitable position on the conduit assembly. However, in order to substantially enclose the conduit, it is preferred for one or more of the anchors of the anchor assembly to be arranged towards at least one, preferably each end of the protective sleeve. At least one anchor is mounted around a conduit connection assembly, and more preferably around at least a portion of at least one of the male connector or female connector of the conduit connection assembly. Preferably, at least one anchor is mounted around a conduit connection assembly connected to an end of the conduit. In some embodiments, the conduit assembly includes:

at least two conduit connection assemblies, each conduit connection assembly being mounted on opposite ends of the conduit; and

at least two anchors, each anchor being located around a conduit connection assembly, the protective sleeve being mounted to the conduit assembly on and by the anchors of the anchor assembly.

[0040] In some embodiments, the protective sleeve includes further anchoring points along its length at one or more points remote from its ends. These one or more anchors may anchor the protective sleeve to one or more external fixing points. Furthermore, the conduit assembly as described above can further include one or more anchors which can be arranged in any suitable anchor arrangement as determined by a person skilled in the art. For example, the one or more anchors can be arranged towards at least one of the end of the protective sleeve. Alternatively, or additionally, the one or more anchors may anchor the protective sleeve to an external fixing point. The protective sleeve can further, or alternatively, include one or more anchoring points, to which the one or more anchors can be anchored.

[0041] The anchoring assembly is preferably sized to space apart the inner surface of the protective sleeve from the outer surface of the conduit assembly. In this respect, each anchor functions as a spacer between the protective sleeve and conduit assembly. This provides a gap through which fluid can flow and escape from the sleeve in the event of conduit failure.

[0042] The protective sleeve is also preferably sized such to provide a gap between the protective sleeve and the conduit. The width of the gap can be advantageously arranged such that if fluid erupts through a rupture point in the conduit, the protective sleeve can dissipate the energy of the erupted fluid, and any reinforcing material contained within the conduit, such as metal wires etc, which may become exposed at the rupture point can be contained within the gap

and not damage or rupture the protective sleeve. Preferably, the gap is arranged as an annular gap.

[0043] The protective sleeve is generally configured to have an inner diameter that is larger than an outer diameter of the conduit of the assembly. In one embodiment, the inner diameter of the protective sleeve is about 20% or more larger than the outer diameter of the conduit of the assembly, and more preferably between about 20% to about 60% larger than the outer diameter of the conduit of the assembly. However it will depend on the specific use for which the protective sleeve is applied. Some uses may require a greater or lesser diameter. For example, flexible hoses which are bent or do not remain static during use may require a relatively larger diameter sleeve to accommodate any bending and/or movement of the hose therein.

[0044] The protective sleeve preferably has a sleeve length which is between about 5% to about 15% longer than the length of conduit of the assembly, and more preferably the protective sleeve length is 5 to 15%, preferably no more than 10%, more preferably about 8% longer than the length of conduit. However, the preferred length of the protective sleeve will depend on whether/how the protective sleeve is anchored, and the particular arrangement of the conduit within the conduit assembly. Generally, the greater the coverage provided by the protective sleeve located about the length of conduit, the greater the protection which can be provided along the length of conduit. Furthermore, when the protective sleeve locates about a substantial proportion of, or a substantially similar length to, the length of conduit, any fluid which erupts from a rupture point/zone in the conduit can be dispelled away from the rupture point/zone and towards the ends of the protective sleeve, which can minimise the chance of damage to nearby equipment or components, or any injury caused by fluid injection to personnel or otherwise.

[0045] In a preferred embodiment, the conduit of the conduit assembly is arranged as a high pressure hose which is rated to any practical working pressure. In a particularly preferred embodiment, the conduit assembly according to the invention can include a conduit or hose being rated to a working pressure of about 300 bar or more.

BRIEF DESCRIPTION OF THE DRAWINGS

[0046] The present invention will now be described with reference to the figures of the accompanying drawings, which illustrate example embodiments of the present invention, wherein:

[0047] Figure 1 is a perspective view of an anchor of an anchoring assembly according to a first embodiment of the present invention.

[0048] Figure 2 is a perspective view of the anchoring assembly illustrated in Figure 1 mounted around a conduit assembly.

[0049] Figure 3 is a perspective view of an anchor of an anchoring assembly according to a second embodiment of the present invention.

[0050] Figure 4 is a perspective view of an anchor of an anchoring assembly according to a third embodiment of the present invention.

[0051] Figure 5 is a perspective view of an anchor of an anchoring assembly according to a fourth embodiment of the present invention, in a closed configuration.

[0052] Figure 6 is a perspective view of the anchor of Figure 5 in an open configuration.

[0053] Figure 7 is a perspective view of another anchor of an anchoring assembly according to a fourth embodiment of the present invention, in an open configuration.

[0054] Figure 8 is a perspective view of the anchor of Figure 7 in a closed configuration with attached restraints.

[0055] Figure 9 is a perspective view of the anchor of Figure 7 when cooperatively secured around a female coupling.

[0056] Figure 10 is a perspective view of the anchor of Figure 7 when cooperatively secured onto a protective sleeve.

DETAILED DESCRIPTION

[0057] The present invention provides an anchoring arrangement for a protective sleeve, a protective sleeve assembly incorporating an anchoring arrangement, and a conduit assembly which includes a protective sleeve assembly. A first embodiment of the anchoring arrangement 10, protective sleeve assembly 70 and conduit assembly 40 according to the present invention is illustrated in Figures 1 and 2. Further embodiments of the anchoring arrangement 110, 210, 310, 310A are illustrated in Figures 3 to 10. It should be appreciated that these anchoring arrangements can be used in a similar configuration as is illustrated and will be described in relation to the protective sleeve assembly 70 and conduit assembly 40 shown in Figure 2.

[0058] Referring firstly to Figures 1 and 2, there is shown an anchoring arrangement 10, protective sleeve assembly 70 and conduit assembly 40 according to a first embodiment of the present invention.

[0059] The illustrated anchoring arrangement 10 comprises one or more anchors 12 shown in Figure 1. Each anchor 12 comprises a mounting ring 14 and two radially extending fastening arms 15, which extend radially outwardly from laterally opposite sides of the mounting ring 14. The mounting ring 14 includes a circular mounting opening 16 through which, in use, receives and annularly extends around a cooperatively shaped portion of a conduit connection

assembly 18, as shown in Figure 2. The anchoring arrangement 10 also includes two tether mounting lugs 20 each of which include a mounting aperture 21 which are configured to receive and secure one end of a tether cable 23, again as shown in Figure 2.

[0060] The illustrated fastening arms 15 of the anchor 12 are used to releasably secure a protective sleeve 72 to the anchoring assembly 10. Each fastening arm 15 extends radially outwardly the mounting ring 14 and as shown in Figure 2, is received and extends through a cooperative fastening aperture 74 of the protective sleeve 72, thereby interconnecting the protective sleeve with the anchoring assembly. The distal end 26 of each fastening arm 15 includes a securement aperture 28. Each securement aperture 28 is designed to receive a securement pin 30 once the fastening arm 15 extends through a cooperative fastening aperture 74. In the illustrated embodiment, the securement pin 30 comprises a cotter pin. The placement of the securement pin 30 in the securement aperture 28 captures a portion of protective sleeve 72 proximate the fastening aperture 74 about the fastening arm 15 between the securement pin 30 and the mounting ring 14.

[0061] Whilst a securement pin 30 is illustrated in Figures 1 and 2 for cooperation with the securement aperture 28, it should be appreciated that it is possible to use other cooperative fastening bodies, such as (but not limited to) rods, pins, pegs, hooks or clips.

[0062] This securement arrangement used in each anchor 12, 112, 212, 312 can take various forms. Three alternate embodiments are shown in Figures 3 ,4, 5 and 6.

[0063] Figure 3 shows a second embodiment of an anchoring arrangement 110 according to the present invention. The anchoring arrangement 110 includes at least one anchor 112 shown in Figure 3. Each anchor 112 comprises a mounting ring 114 and two radially extending fastening

arms 115, which extend radially outwardly from laterally opposite sides of the mounting ring 114. Similar to the first embodiment, the mounting ring 114 includes a circular mounting opening 116 through which, in use, receives and annularly extends around a cooperative portion of a conduit connection assembly, similar to the conduit connection assembly 18 shown in Figure 2. Unlike the first embodiment, each fastening arm 115 comprises a threaded spigot having a circular cross-section enabling each fastening arm 115 to receive a wing nut 130. Each wing nut 130 is secured onto each fastening arm 115 once the fastening arm 115 extends through a cooperative fastening aperture 74 of the protective sleeve 72 (shown in Figure 2, therefore capturing a portion of protective sleeve 72 proximate the fastening aperture 74 about the fastening arm 115 between the wing nut 130 and the mounting ring 114.

[0064] It should be appreciated that any other suitable type of fastener such as a nut, screw or bolt (with the fastening arm 115 being internally threaded) etc could also be used in this arrangement without departing from the spirit and scope of the present invention. Furthermore, other embodiments may include a clasp or clip, releasably securable to or within a cooperative fastening feature, such as a recess, detent, cavity or groove, on or in the fastening arm 215.

[0065] Figure 4 shows a third embodiment of an anchoring arrangement 210 according to the present invention. The anchoring arrangement 210 includes one or more anchors 212 shown in Figure 4. Each anchor 212 comprises a mounting ring 214 and two radially extending fastening arms 215, which extend radially outwardly from laterally opposite sides of the mounting ring 214. Similar to the first and second embodiment, the mounting ring 214 includes a circular mounting opening 216 through which, in use, receives and annularly extends around a cooperative portion of a conduit connection assembly, similar to the conduit connection assembly 18 shown in Figure 2. Unlike the first or second embodiment, each fastening arm 215 includes two spaced apart sub-arms 215A between and on to which a locking rod 230 is pivotably mounted. Each locking rod 230 is movable between a receiving position in which the

locking rod 230 is longitudinally aligned with the sub-arms 215A, and a locking position, in which the locking rod 230 is pivoted to a position forming an angle between the longitudinal length of the locking rod 230 and the sub-arms 215A. In the receiving position, the locking rod 230 can be received through the fastening aperture 74 of a protective sleeve 72 (Figure 2). In the locking position, the locking rod 230 prevents removal of the protective sleeve 72 once the fastening arm 215 extends through a cooperative fastening aperture 74 of the protective sleeve 72 (shown in Figure 2). This is achieved by capturing a portion of protective sleeve 72 proximate the fastening aperture 74 about the fastening arm 215 between the locking flap 230 and the mounting ring 214.

[0066] Whilst not illustrated, it should be appreciated that in other embodiments one or more of the fastening arms 15 may extends radially outward of the mounting element, and be axially angled, bent or curved away from an orthogonal radial axis of the mounting ring 14, for example a hook or other angled rod or tab (not illustrated). Here, a portion of protective sleeve 72 can be retained around such a fastening arm 15 by and in the angle, bend or curve of that fastening arm 15.

[0067] In another embodiments, an anchoring arrangement (not illustrated) according to the present invention can be provided having a similar configuration as the above described third embodiment with each fastening arms including a torsion spring which extends radially outward of the mounting element. Each fastening arm extends substantially 90 deg. from the mounting ring. This embodiment of the anchor is used and functions to anchor a protective sleeve 72 over a conduit in a similar manner as described above.

[0068] Whilst the illustrated mounting rings 14, 114, 214 are shown as a solid body, it should be understood that in other embodiments the mounting ring 14, 114, 214 may include a split, for example a split ring, which enables the shape of mounting ring 14, 114, 214 to be bent, deformed or otherwise

manipulated to be mounted or seated on and around a selected portion of the conduit assembly 80.

[0069] Figures 5 and 6 illustrate a fourth embodiment of an anchoring arrangement 310 according to the present invention in which the anchor 312 includes a mounting ring 314 which is formed from two interengageable half rings 314A and 314B. The closed configuration (Figure 5) has a similar configuration as the anchor 10 illustrated in Figure 1. In this respect, the mounting ring 314 includes two radially extending fastening arms 315, which extend radially outwardly from laterally opposite sides of the mounting ring 314. The mounting ring 314 includes a circular mounting opening 316 through which, in use, receives and annularly extends around a cooperatively shaped portion of a conduit connection assembly 18, as shown in Figure 2. The distal end 326 of each fastening arm 315 includes a securement aperture 328 designed to receive a securement pin (not illustrated, but similar to pin 30 in Figure 1 or other described alternatives) once the fastening arm 315 extends through a cooperative fastening aperture 74 of a protective sleeve 72 (as shown in Figure 2). However, in this embodiment, each fastening arm 315 is formed from two overlapping arms 315A and 315B which respectively form part of one half ring 314A or 314B.

[0070] In some embodiments, a first set of overlapping fastening arms 315 (the pivot fastening arms 333) are proximate a pivot pin 335 (inserted in pivot aperture 329) about which the half rings 314A and 314B can move between an closed position (shown in Figure 5) and an open position (shown in Figure 6). A second set of overlapping fastening arms 315 (the locking fastening arms 333A) are proximate a locking aperture 339, though which a fastener, such as a bolt 337 and nut 338 (as illustrated) or other form of fastener, for example clip, pin, rod, tie, rivet or the like, can be inserted to lock the locking fastening arms 333A together when the anchor 312 is in the closed position. In the open position, the locking fastening arms 333A can be moved apart to increase the size of the

opening 316, and/or allow an object, such as a pipe, tube or other conduit and/or conduit connectors to be inserted through the gap G between the locking fastening arms 333A. The mounting ring 314 can therefore be fitted around a pipe, other conduit or conduit connectors. Again, this embodiment of the anchor 312 is used and functions in a similar manner as described above in relation to the first embodiment of the anchor 12.

[0071] In some embodiments, in the open position, each half rings 314A and 314B are separated with locking fastening arms 333 and 333A spaced apart to allow an object, such as a pipe, tube or other conduit and/or conduit connectors to be inserted between the half rings 314A and 314B. The half rings 314A and 314B can then be fitted around a pipe, other conduit or conduit connectors. Again, this embodiment of the anchor 312 is used and functions in a similar manner as described above in relation to the first embodiment of the anchor 12. The closed position is reached when the respective fastening arms 333 and 333A are moved to overlap. The respective fastening arms 333 and 333A can then be held together using a fastener such as a bolt 337 and nut 338 (as illustrated) or other form of fastener, for example clip, pin, rod, tie, rivet, screw or the like, which can be inserted to lock the locking fastening arms 333 and 333A together. In some embodiments, the fastener comprises a rivet which is inserted to lock the locking fastening arms 333 and 333A in the closed position around a portion of a pipe, conduit or conduit connector.

[0072] As shown in Figures 7 to 10, this fourth embodiment of anchor 312 (or any of the other embodiments of anchors 12, 112, 212) may also include additional tether lugs or attachment points 350 on the mounting ring 314 for the attachment of a securement pin, in this case comprising securement clip 357. As shown in these Figures, attachment points 350 are provided on each half ring 314A and 314B for attachment of securement assembly 354 comprising attachment ring 355, tether (flexible cord) 356 and a securement clip 357. As shown in Figure 10, the securement clip 357 is secured in each respective

securement aperture 328 of each fastening arm 315 once the fastening arm 315 extends through a cooperative fastening aperture 74 of a protective sleeve 72 to secure the respective fastening arms 315 therein

[0073] In another embodiment (not illustrated), the mounting ring 14 may be formed and constructed from at least two separate component elements (not illustrated) which can be fastened or secured together to construct the mounting ring 14. The component elements may comprise halves or segments of the mounting ring 14 and connected/ interconnected parts. Again, the component elements of the mounting ring 14 may be secured together using any suitable cooperating fastening or securing means such as (but not limited to) a clasp, clip, pin, lock, tie, latch or the like.

[0074] The mounting ring 14, 114, 214, 314 of each anchor 12, 112, 212, 312 has a substantially smaller thickness T compared to width W. The thickness T of the mounting ring 14, 114, 214, 314 is preferably between 1 and 15 mm, and more preferably between 2 and 10 mm.

[0075] The anchors 12, 112, 212, 312 can be made from any suitable material. In preferred embodiments the anchors 12, 112, 212, 312 are generally made from a steel such as carbon steel, spring steel or stainless steel. However, it should be appreciated that the anchors can be made from other materials, such as reinforced plastics or composites.

[0076] In use, each of the illustrated anchoring arrangement 10, 110, 210, 310, 310A are mounted around a conduit assembly 80. As illustrated by example in Figure 2 for the first embodiment of the anchoring arrangement 10, the anchor 12 can be mounted on a selected annular seat 38 of a male connector/coupling 40 of a conduit connector assembly 18. The male connector 40 is connected at the other end to a hose 45, in this case a high pressure hose. It should be appreciated that whilst only one end of the conduit assembly 80 is

illustrated, the assembly 80 would include a pair of connectors 40 (only one of which is illustrated), one at each end of the hose 45 having a similar configuration. The connectors 40 could adopt any suitable form and need not be of the type illustrated.

[0077] The conduit assembly 80 may be used as a hydraulic or pneumatic line, and may contain or transfer a fluid or other working medium, for example oil or air, so as to provide a control or power action. It may also be used as a transport line to supply material, for example the fluid or working medium itself or material entrained therein, and for example may be used as pump lines.

[0078] Due to the high pressures that are generally involved, significant safety concerns may arise if the hose 45 in the conduit assembly 80 fails. For example, fluid ejected from a burst or damaged hose may splash, spray or mist nearby machinery components or personnel, which may cause a significant fire hazard, or may even be injected into a person under high pressures, causing serious injury or even death. Also, the forces involved in the failure may cause a failure in the assembly at a point at or near a hose anchor or coupling, such that one end of the hose becomes free to whip about violently, causing harm and damage should the free end of the hose strike nearby machinery or personnel.

[0079] A protective sleeve 72 is provided around the hose 45 designed to mitigate against fluid ejection problems in a damaged or burst hose and to eliminate or at least more effectively restrain any whipping movement occurring in a failed hose assembly. The protective sleeve 72 can be constructed from any suitable material. An example of one suitable protective sleeve 72 is described in the Applicant's earlier international patent publication WO2010/003174 which comprises a multilayer construction of a woven outer layer and an inner elastomeric layer. The protective sleeve 72 may be formed of a closed-weave material, and may be for example made of textiles material. It may for example be made of multi-filament nylon. This can provide a strong protective sleeve 72

that is able to resist whipping and fluid forces, and that can also prevent fluid from escaping through its surface. However, it should be appreciated that any suitable construction can be used with the present invention.

[0080] Whilst not shown in the embodiment in Figure 2, it should be appreciated that the protective sleeve includes two anchors 12, located at the ends of the protective sleeve 72 to anchor the protective sleeve 72 relative to the hose 45. It will be appreciated, however, that a single anchor 12 could be used which is arranged towards at least one of the end of the protective sleeve 72, or that other anchor arrangements could alternatively, or additionally, be used depending on the requirements of the conduit assembly 80.

[0081] Advantageously, the one or more anchors 14 can be arranged such that the protective sleeve 72 can at least partially capture any fluid or other working medium which erupts through a rupture point/zone of the hose 45. Furthermore, the one or more anchors 14 can be arranged in any suitable arrangement which may advantageously minimise or prevent a hose or other form of conduit from whipping if fluid or other working medium erupts through a rupture point/zone of a hose or other form of conduit which is covered by the protective sleeve 72 according to the invention.

[0082] As shown in Figure 2, the mounting ring 14 of each anchor 12 is seated around the male connector 40 at the designed annular seat 38. Each fastening arm 15 passes through a pair of opposed fastening apertures 74. Each fastening aperture 74 is reinforced with an eyelet 75 comprising a metal element which is folded back on itself to provide a double thickness. Each fastening arm 15 extends through a cooperative fastening aperture 74 of the protective sleeve 72. The placement of the securement pin 30 in the securement aperture 28 captures a portion of protective sleeve 72 proximate the fastening aperture 74 about the fastening arm 15 between the securement pin 30 and the mounting ring 14. Each securement pin 30 is connected to the anchor 12 by a tether cable

23 which is fastened at one end to the securement pin and the other end through one of the mounting lugs 20 (via a mounting aperture 21) of the anchor 12.

[0083] In one embodiment (not shown), the one or more anchors 12 can be positioned to anchor the protective sleeve 72 to an external fixing point (not shown), or to one or more of the conduit connectors 40 of the conduit assembly 80.

[0084] Another embodiment of the anchoring assembly 310A is illustrated in Figures 9 and 10, using anchor 312A shown and as described above in relation to Figures 7 and 8. This anchor 312A comprises two half rings 314A and 314B which can be separated to fit around a pipe, other conduit or conduit connectors. In the illustrated embodiment, the two half rings 314A and 314B are fitted around a female connector 40A of a conduit connector assembly between a connection sleeve 43 and nut 41. The anchor 312A is trapped in that location. In use, a protective sleeve 72 is placed over the anchor 312, and each fastening arm 315 is received through a cooperative fastening aperture 74. A securement clip 357 is attached to attachment points 350 of each half ring 314A and 314B using flexible cord. As best shown in Figure 10, each securement clip 357 is received and extends through the securement aperture 328 of each fastening arm 315 once the fastening arm 315 extends through a cooperative fastening aperture 74 of a protective sleeve 72 to secure the respective fastening arms 315 therein.

[0085] The anchoring assembly 10, 110, 210, 310, 310A of the present invention is preferably sized to space apart the inner surface of the protective sleeve 72 from the outer surface of the conduit assembly 80. In this respect, each anchor 12, 112, 212, 312 functions as a spacer between the protective sleeve 72 and conduit assembly 80. This provides a gap G through which fluid can flow and escape from the protective sleeve 72 in the event of conduit 45 failure.

[0086] The protective sleeve 72 and anchors 12, 112, 212, 312 are sized and configured to provide a gap G (i.e. a loose fit) between the protective sleeve 72 and the hose 45. The width of the gap G can be advantageously arranged such that if fluid erupts through a rupture point in the hose 45, the protective sleeve 72 can dissipate the energy of the erupted fluid, and any fluid which ejects from the hose 45 can be dispelled through the gap G and towards or out of the ends of the protective sleeve 72. Furthermore, any reinforcing material contained within the hose 45, such as metal wires etc, which may become exposed at the rupture point can be contained within the gap G and not damage or rupture the protective sleeve 72. Advantageously, the gap G can be arranged as an annular gap.

[0087] The protective sleeve 72 is a loose fit over the hose 45, and is sized so that there is a gap G between the hose 45 and the protective sleeve 72. The protective sleeve 72 may for example, in a relaxed state, have an inner diameter that is greater than the outer diameter of the hose 45 by about 25% or more, for example between about 25% to about 50%, with 50% being particularly advantageous. The protective sleeve 72 may be sized so that it can extend over the conduit connection assembly 18, so that it can be placed over the conduit assembly 80 after the hose 45 and conduit connection assembly 18 are connected together.

[0088] While the embodiments shown in the Figures are not shown to scale, in a relaxed state the protective sleeve 72 is preferably sized to have an inner diameter that is in excess of about 20% larger than an outer diameter of the hose 45 of the conduit assembly 80. In a particularly preferred embodiment, the inner diameter of the protective sleeve 72 is between about 20% to about 60% larger than the outer diameter of the hose 45 of the conduit assembly 80. Generally, the larger the hose diameter, the larger the ratio of the protective sleeve 72 inner diameter to the protective sleeve 72 outer diameter that is required. However, a protective sleeve 72 with a larger relative outer diameter

than the hose outer diameter may be used for applications where the hose (or other form of conduit) is flexible or subject to bending.

[0089] In one embodiment (not shown) the protective sleeve 72 length can be arranged to extend over, or past, one or both of conduit connectors 40 which are located at or near to the ends of the protective sleeve 72. This can provide the advantage in a situation where a hose conduit assembly 80 fails at or near a coupling 40, and the additional length of the protective sleeve 72 extending over, or past, the hose couplings 16 can allow the protective sleeve to move, flex or deform in response to the pressure applied to the protective sleeve 72 by the ejected fluid or working medium during the failure, whilst still providing at least partial protection in the area of the conduit connector 40.

[0090] Preferably, the protective sleeve 72 has a sleeve length which is between about 5% to about 20% longer than the length of hose 45, and more preferably the length of the protective sleeve 72 is about 10% longer than the length of hose 45 of the conduit assembly 80.

[0091] Generally speaking, the greater the coverage provided by the protective sleeve 72 located about the length of hose 45, the greater the protection that can be provided along the length of hose 45. Furthermore, when the protective sleeve 72 locates about a substantial proportion of, or a substantially similar length to, the length of hose 45, any fluid which erupts from a rupture point/zone in the hose 45 can be dispelled further away from the rupture point/zone of the hose 45 towards the ends of the protective sleeve 72. This can minimise the spraying, misting or ejection of fluid or other working medium onto nearby machinery or components, and can also reduce the chance of injury to personnel caused by fluid injection or spraying.

[0092] The protective sleeve 72 provides a dual role should the conduit assembly 80 fail. Thus, it suppresses or retarding the ejection of pressurised

fluid from the hose 45 into the surroundings, and also restrains the movement of the hose 45, so that whipping of the hose 45 is limited or eliminated.

[0093] For example, should the hose 45 separate from one of the conduit connection assembly 18, the fluid ejected from the hose end will remain in the protective sleeve 72 and be channelled along its length. Even if fluid did burst through the protective sleeve 72, it would have expended a good deal of its energy, and so would be able to cause less harm.

[0094] Further, the hose 45 is constrained to whip within the protective sleeve 72, and the protective sleeve 72 is able to give and to absorb a lot of the energy of the hose 45, whilst itself being restrained to move only within a limited area. Even with burst- through of fluid, the hose protective sleeve 72 will generally be able to keep sufficient integrity along its length to anchor the hose assembly against violent movements.

[0095] The loose fitting and sizing of the protective sleeve 72 has been found to be advantageous in that the force of the ejected fluid can significantly drop between its ejection through the hose 45 and its hitting of the protective sleeve 72, thereby reducing the possibility of the protective sleeve 72 being penetrated.

[0096] It also has the advantage that it allows the fluid that hits the protective sleeve 72 to be redirected along the gap G along the length of the hose 45, and this can help to dampen the whipping action of the hose 45 through a redirection of the fluid forces longitudinally along the length of the protective sleeve 72.

[0097] A further point is that the hose 45 often includes wire-reinforcement or the like, and when the hose 45 bursts, these reinforcement materials may be dislodged or expelled in a violent manner. The protective sleeve assembly 70 of the present invention has the advantage that it can reduce the possibility of these reinforcements piercing the protective sleeve 72 if dislodged or expelled.

[0098] The protective sleeve 72 should be of a suitable strength such that it can withstand the forces associated with a failure of the associated hose 45, which will generally be explosive and comprise a sudden release of stored energy over a relatively short period.

[0099] The strength required will generally depend on the pressures involved, the hose 45 and the like. As one example, for a hose of Vz diameter operating at 350 bar, an appropriate protective sleeving may have a tensile strength of around 400 Kg force or more per layer (two layers/sleeves may therefore have a 800 Kg force tensile strength).

[00100] The protective sleeve 72 may be made to be flame-resistant and anti-static. It may for example be made of materials to which conductive dyes or paints have been applied, and/or may include a weave of conductive material, for example steel wire, therein. It may for example have a resistance of less than 1 MΩ/m, and/or may conform to other suitable standards, for example Australian standard AS2660.

[00101] Those skilled in the art will appreciate that the invention described herein is susceptible to variations, modifications and/or additions other than those specifically described. It is understood that the invention includes all such variations, modifications and/or additions which fall within the spirit and scope of the present invention.

[00102] Furthermore, it is understood that the features of the disclosed embodiments may be combined in a number of different ways to create other embodiments which can provide effective burst suppression and/or whipping conduit restraint.

[00103] The description of drawings provided above refers primarily to an anchoring arrangement for a protective sleeve configured to locate about a hose.

However, the drawings are intended to be for illustrative purposes only, and it is therefore to be appreciated that the invention is intended for the more general application to a conduit (or conduits) such as, but not limited to, a hose or a pipe. The invention may be used in applications with any practical working pressure as suitable for the particular application required.

[00104] Where the terms "comprise", "comprises", "comprised" or "comprising" are used in this specification (including the claims) they are to be interpreted as specifying the presence of the stated features, integers, steps or components, but not precluding the presence of one or more other feature, integer, step, component or group thereof.

CLAIMS:

1. An anchoring arrangement for a protective sleeve, the protective sleeve including at least one fastening formation and locates, in use, over a conduit assembly, the anchoring arrangement including at least one anchor comprising:

a mounting element which, in use, locates on and substantially annularly extends around a portion of the conduit assembly; and

at least one fastening element which extends from the mounting element and is configured , in use, to be cooperatively secured with at least one fastening formation of a co-located protective sleeve.

2. An anchoring arrangement according to claim 1, wherein the fastening formation comprises a fastening aperture, and the at least one fastening element is configured to be received, in use, in at least one fastening aperture of a co-located protective sleeve.

3. An anchoring arrangement according to claim 1 or 2, wherein the mounting element includes an opening through which a portion of the conduit assembly is received.

4. An anchoring arrangement according to any preceding claim, wherein the mounting element comprises an annulus, preferably a ring or hoop.

5. An anchoring arrangement according to any preceding claim, wherein the mounting element is configured, in use, to be received around a conduit connection assembly of the conduit assembly.

6. An anchoring arrangement according to any preceding claim, wherein the mounting element is formed from at least two releasably securable sections.

7. An anchoring arrangement according to claim 6, wherein the releasably securable sections comprise at least a first section and a second section and the

mounting element includes a pivot portion which enables the first section to be moved relative to the second section of the mounting element.

8. An anchoring arrangement according to claim 6 or 7, wherein the first section and the second section are releasably fastened together at the ends of those sections which are moved apart about the hinge or pivot.

9. An anchoring arrangement according to any preceding claim, wherein the at least one fastening element is configured to, in use, extend through the at least one fastening formation of the co-located protective sleeve.

10. An anchoring arrangement according to any preceding claim, wherein the fastening element comprises a projection which extends substantially radially outwardly from the mounting element.

11. An anchoring arrangement according to any preceding claim, wherein the fastening element comprises at least one of a tab, rod, spring, sling, wing, hook or arm.

12. An anchoring arrangement according to any preceding claim, further including at least two fastening elements.

13. An anchoring arrangement according to any preceding claim, wherein each fastening element is spaced apart, preferably annually around the mounting element.

14. An anchoring arrangement according to claim 13, wherein each fastening element is evenly spaced apart around the mounting element.

15. An anchoring arrangement according to any preceding claim, further including a securement arrangement for releasably securing the protective sleeve to the anchoring arrangement, the securement arrangement comprising at

least one securing element which cooperates with a distal end of the fastening element to retain a portion of the protective sleeve about the fastening element.

16. An anchoring arrangement according to claim 15, wherein at least one securing element captures a portion of protective sleeve proximate the fastening formation about the fastening element between the securing element and the mounting element.

17. An anchoring arrangement according to claim 15 or 16, wherein the at least one securing element comprises a fastener which is releasably secured to or about the distal end of the fastening element.

18. An anchoring arrangement according to claim 15, 16 or 17, further including a tether between the securing element and at least one portion of the anchoring arrangement.

19. An anchoring arrangement according to claim 18, wherein the tether comprises a flexible element, preferably a cord or cable secured between the fastening body and a portion of the mounting element.

20. An anchoring arrangement according to any one of claims 15 to 19, wherein the securement arrangement comprises at least one of:

at least one formation located in the fastening element and a cooperative fastening body, preferably a rod, pin, peg or clip; or

at least one fastener, preferably a nut, clasp or clip, releasably securable to a cooperative fastening feature, preferably a thread, recess or groove, on the fastening element.

21. An anchoring arrangement according to any one of claims 15 to 19, wherein the securement arrangement comprises a securing body mounted to the fastening element, and movable between a receiving position in which the fastening body enables securement of the fastening element to or with the

fastening formation of the protective sleeve, and a locking position, in which the fastening body prevents removal of the protective sleeve.

22. An anchoring arrangement according to claim 21, wherein the securing body comprises an elongate body, preferably a rod or pin, pivotably mounted to or in the fastening element.

23. An anchoring arrangement according to any preceding claim, wherein at least one of the fastening element comprises a tab or arm which extends radially outward of the mounting element, and is axially angled, bent or curved away from an orthogonal radial axis of the mounting element.

24. A protective sleeve assembly comprising:

a protective sleeve sized to fit over the at least one conduit with a gap between the cover and the conduit, the protective sleeve including at least one fastening formation; and

an anchoring arrangement according to any one of the preceding claims;

wherein, in use, at least one fastening element of an anchor of the anchoring arrangement is cooperatively secured with at least one of the fastening formations of the protective sleeve to mount the protective sleeve over a conduit.

25. A conduit assembly including:

at least one conduit;

at least one conduit connection assembly mounted on at least one end of the conduit;

an anchoring arrangement according to any one claims 1 to 23, the anchoring arrangement being mounted about or to the conduit connection assembly; and

a protective sleeve sized to fit over the at least one conduit with a gap between the cover and the conduit, the protective sleeve including at least one fastening formation, at least one fastening element of an anchor of the anchoring arrangement being cooperatively secured with at least one of the fastening

formations of the protective sleeve to mount the protective sleeve over the conduit.

26. A conduit assembly according to claim 25, wherein at least one anchor of the anchor assembly is arranged towards at least one of the ends of the protective sleeve.

27. A conduit assembly according to claim 25 or 26, wherein

at least two conduit connection assemblies, each conduit connection assembly being mounted on opposite ends of the conduit; and

at least two anchors, each anchor being located around a conduit connection assembly, the protective sleeve being mounted to the conduit assembly on and by the anchors of the anchor assembly.

28. A conduit assembly according to any one of claims 25 to 27, wherein the anchoring assembly is sized to space apart the inner surface of the protective sleeve from the outer surface of the conduit assembly.

29. A conduit assembly according to any one of claims 25 to 28, wherein the protective sleeve and is sized to have an inner diameter that is about 25% or more larger than the outer diameter of the conduit of the conduit assembly.

30. A conduit assembly according to any one of claims 25 to 29, wherein the protective sleeve is sized to have an inner diameter that is between about 25% and about 50% larger than the outer diameter of the conduit of the conduit assembly.

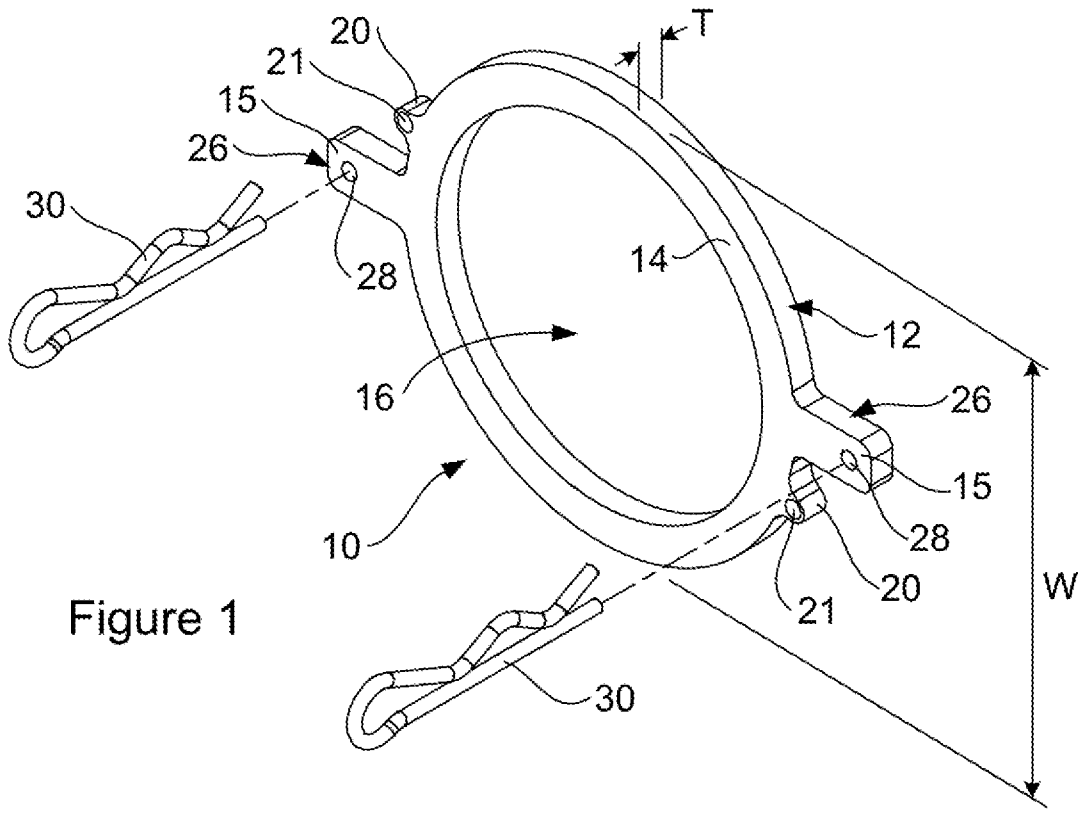


Figure 1

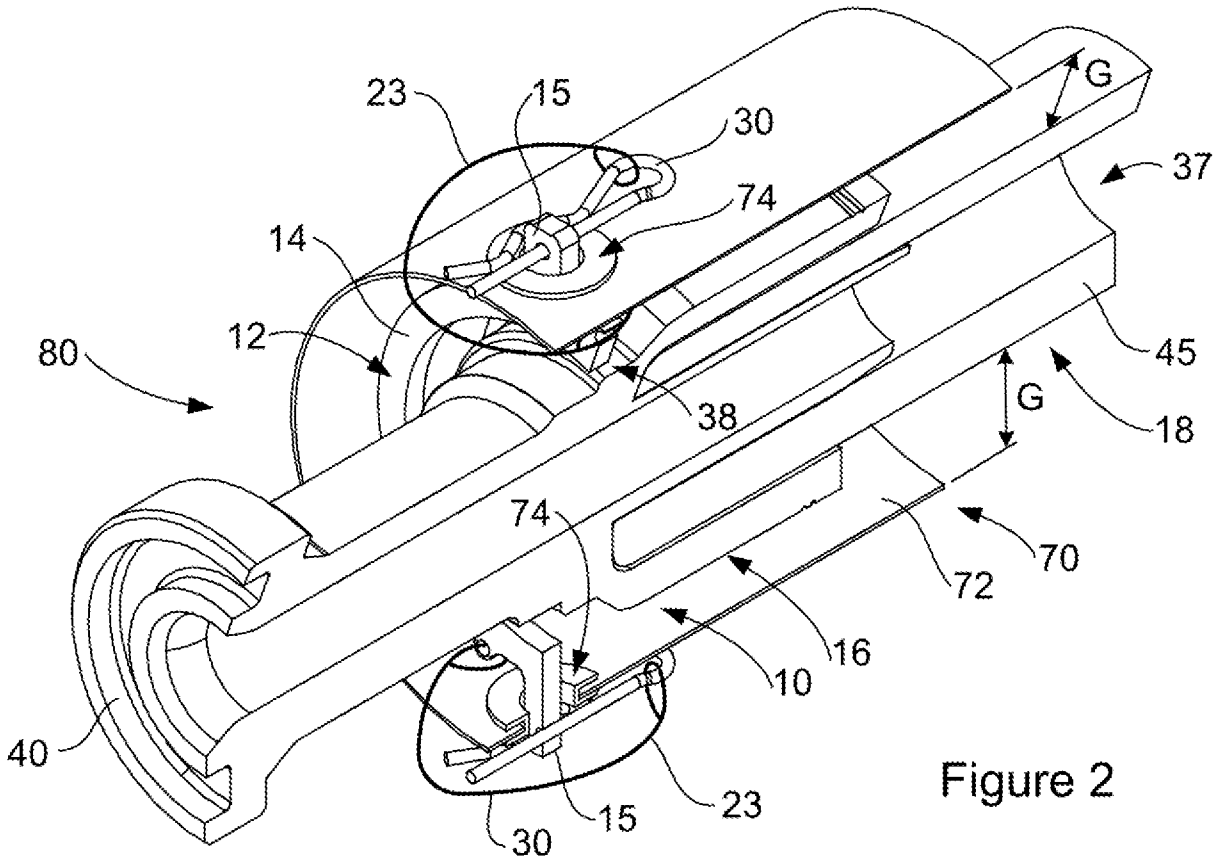


Figure 2

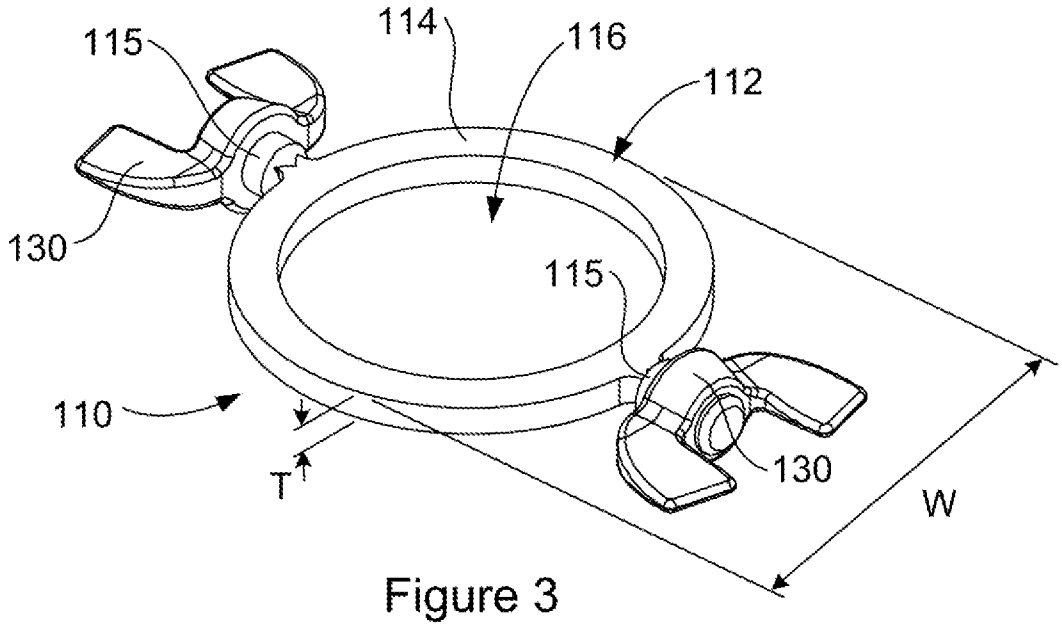


Figure 3

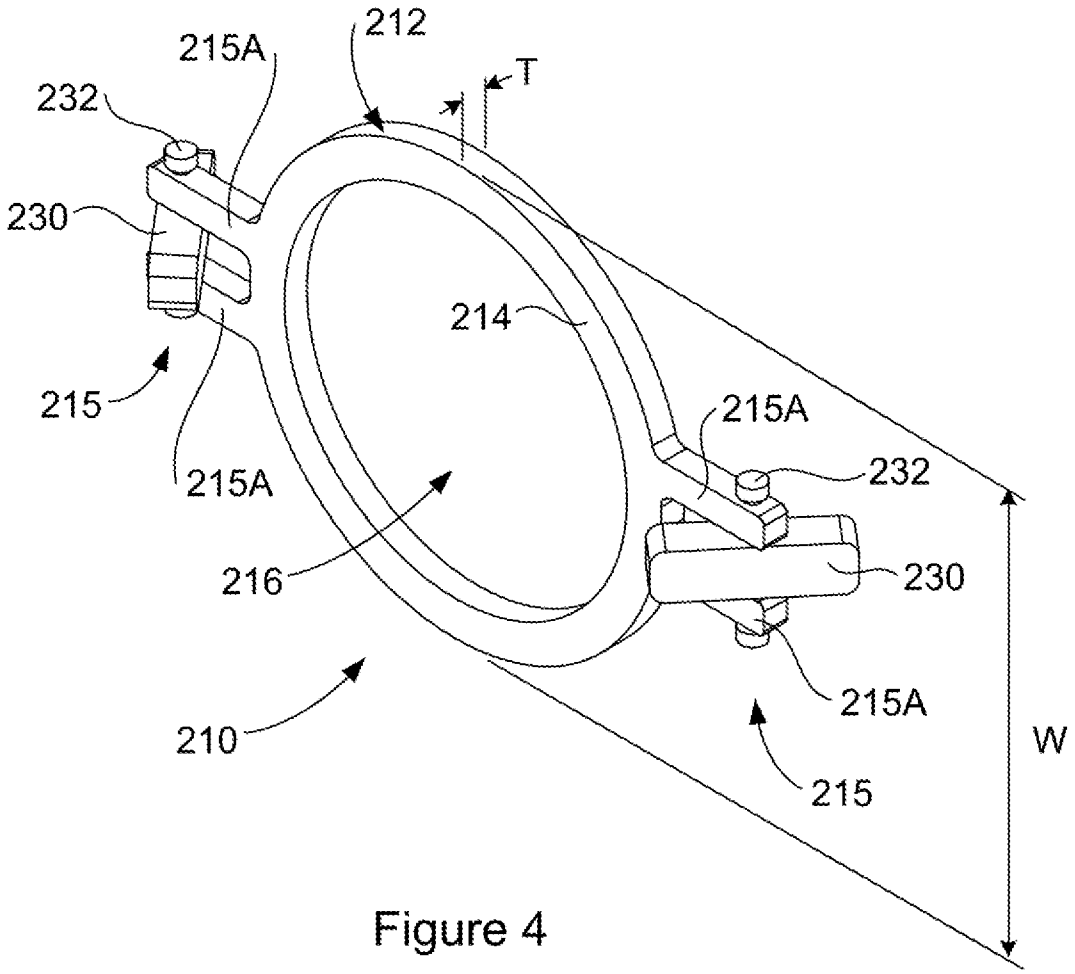


Figure 4

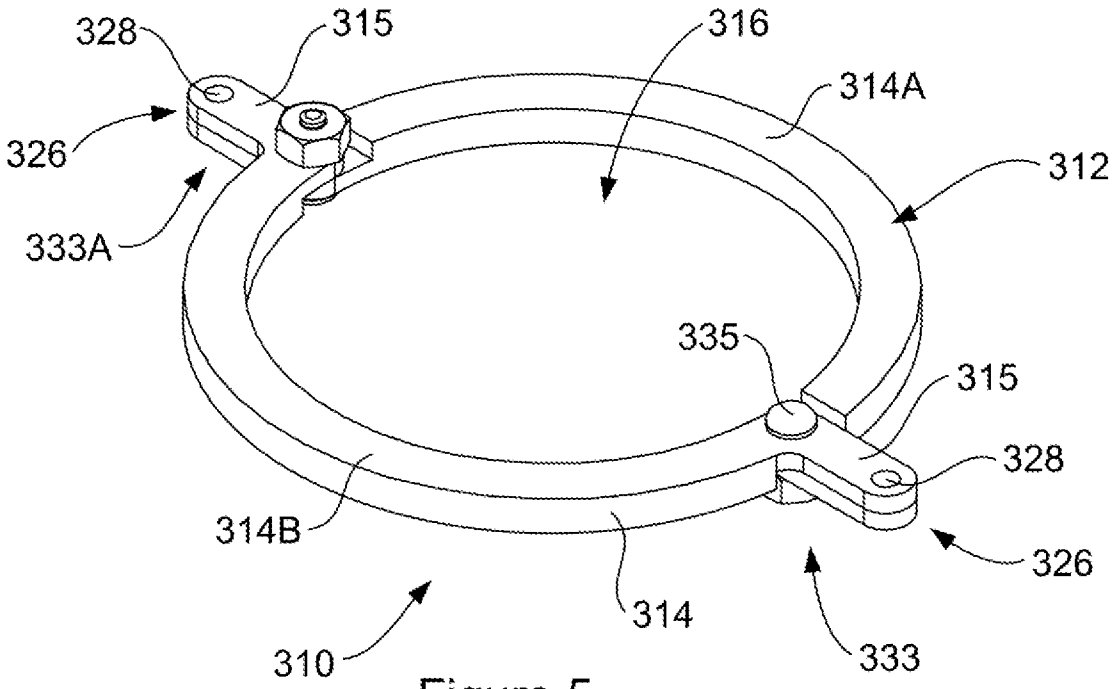


Figure 5

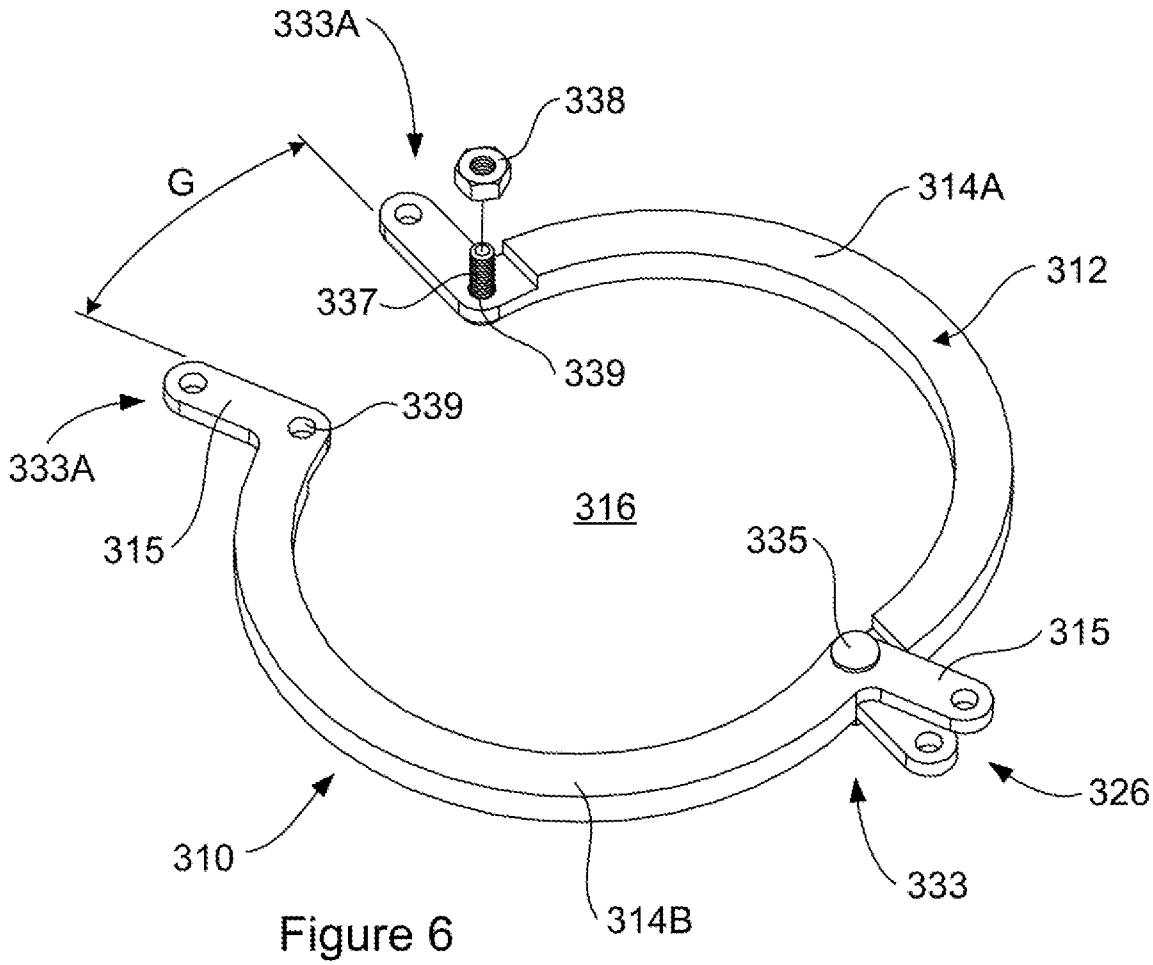


Figure 6

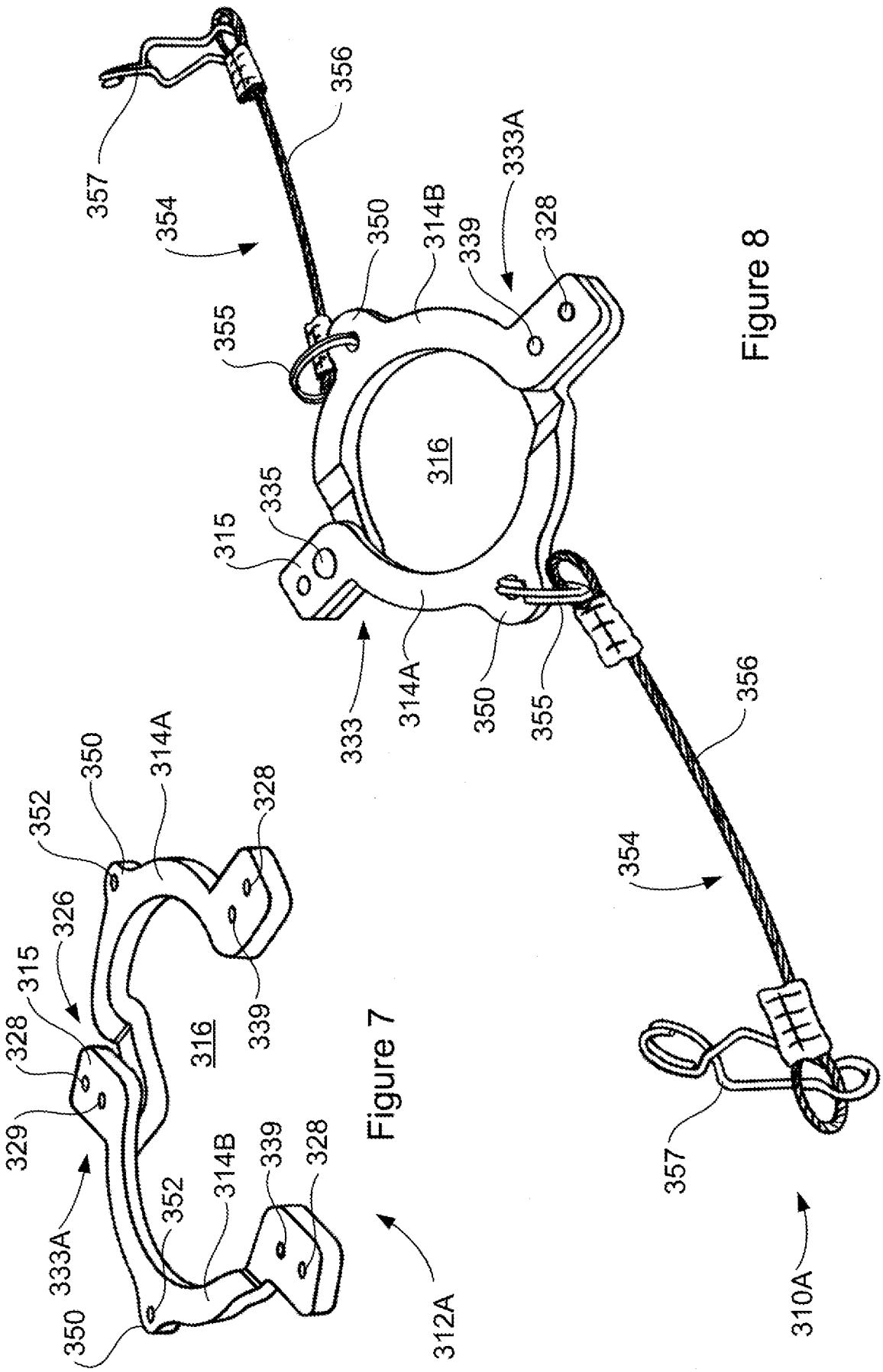


Figure 7

Figure 8

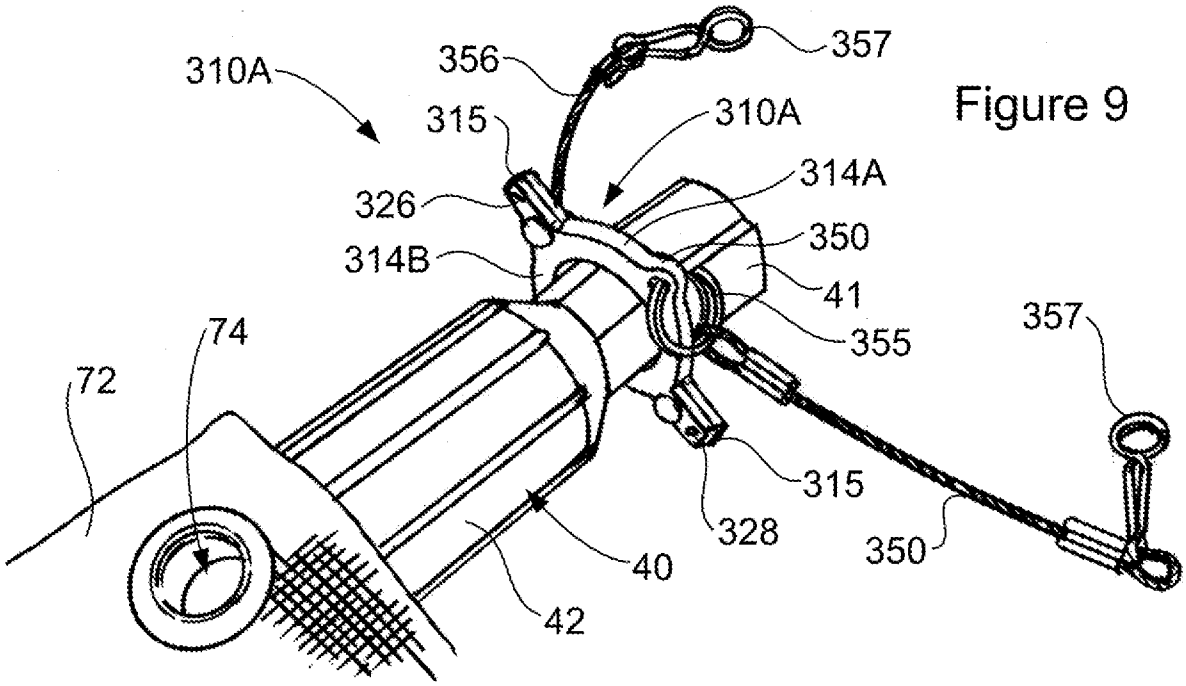


Figure 9

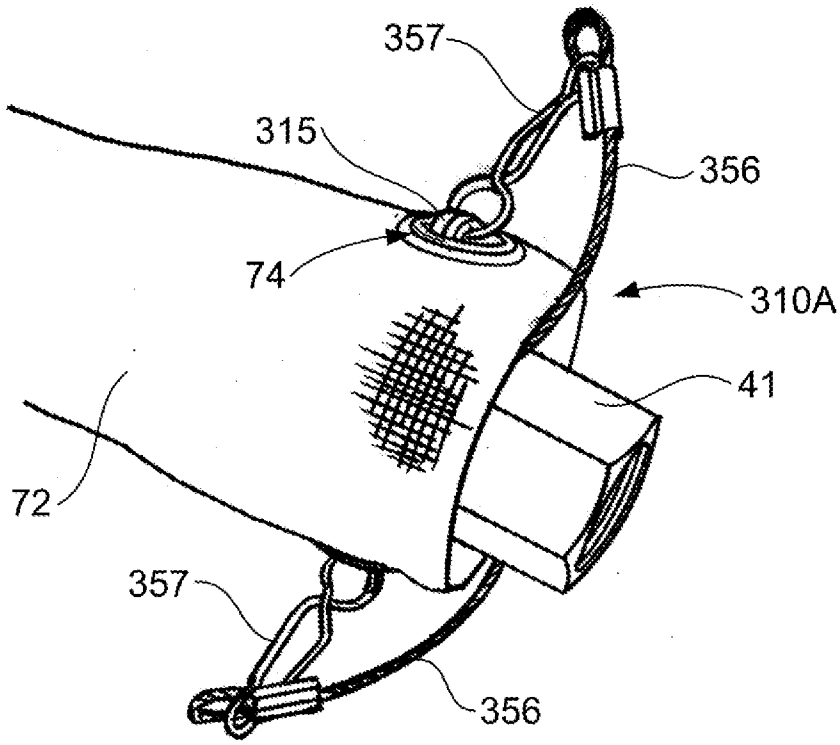


Figure 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2014/000551

A. CLASSIFICATION OF SUBJECT MATTER

F16L 55/00 (2006.01) F16L 57/00 (2006.01) F16L 35/00 (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

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

WPI & EPODOC: IPC/CPC (F16L, F16L35/LOW, F16L39/LOW, F16L57/LOW, F16L55/00+, F16L11/20, F16L59/12/LOW, F16L3/LOW, F16L3/133) and (CPC (F16B13/0808 F16B7) or keywords (REMOV??BL+, DETACH??BL+, COVER+, SHEATH+, JACKET+, SLEEV+, SHIELD+, SHROUD+, SKID+,CLIP?, PIN?, COTTER+, R_CLIP+, SPLIT_PIN+, SPLIT_RING+, WIRE_FASTEN+, TOGG+, L#NCH+, KEEPER+, RETAINER?, TIE?, LOOP+, HOOK+, TE?THER+, APERTURE+, OPENING?, HOLE?, EYE+, SPACER+, SPACES, STAND_OFF+, STUD+, SPIGOT+, POST?, WHIP+, RESTRAIN+, GUARD+, TUB+, RING?, COLLAR+, ANNUL+, BAND?))

Google Patents: "F16L59/123", ("F16L59" OR "F16L57") AND toggle

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 July 2014	11 July 2014
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Simon Ochsenbein AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262833148

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2014/000551**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6755218 B2 (WHITTY) 29 June 2004 Figs. 3-6, abstract, column 3 lines 12-21.	1-14
X	US 4170451 A (LUFF) 09 October 1979 Fig. 1, abstract, column 2 line 10	1, 15-17. 20
X	US 5689862 A (HAYES et al.) 25 November 1997 Figs. 1-3, abstract, column 3 lines 17-19.	1, 15, 18-19
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X	JP 11-280962 A (SHOWA RASENKAN SEISAKUSHO KK) 15 October 1999 & English abstract retrieved from EPODOC database. Figs. 1-4, English abstract.	1, 24-30
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INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2014/000551**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

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End of Annex

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