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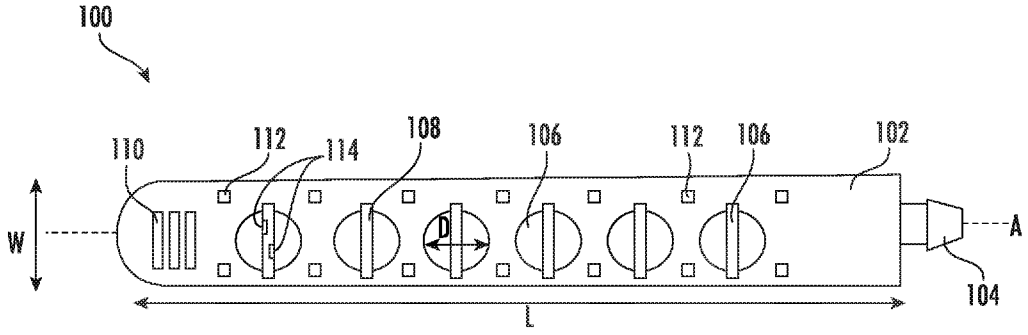

FIG. 1

(57) Abstract: The present disclosure describes devices and assemblies for holding cables. A device adapted for holding one or more discrete cables may include a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, wherein the securing feature is configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables. Methods of holding cables are also provided.

WO 2020/139565 A1

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DEVICES AND METHODS FOR HOLDING CABLES

RELATED APPLICATIONS

[0001] The present application claims priority from and the benefit of U.S. Provisional Patent Application Nos. 62/785,829, filed December 28, 2018 and 62/849,398, filed May 17, 2019, the disclosures of which are hereby incorporated herein by reference in full.

FIELD

[0002] The present invention relates to devices and methods for holding cables.

BACKGROUND

[0003] Currently, there a variety of metallic (*e.g.*, stainless steel) cable hangers that are used to hold or bundle and secure cables to the top of telecommunications towers, such as, for example, U.S. Patent No. 9,306,380 to Vaccaro, U.S. Patent No. 9,866,004 to Vaccaro et al., and U.S. Patent No. 9,903,510 to Joshi, each of which are incorporated herein by reference in their entireties. However, the use of metal components near an antenna on cell sites can be a source of unwanted passive intermodulation (PIM) in the modern radio frequency (RF) environment. There may be a need for non-metallic, non-magnetic cable hangers for cables used in small cell telecommunications towers that reduce costs and allow for easy installation, while alleviating technical performance concerns, such as, PIM.

SUMMARY

[0004] A first aspect of the present invention is directed to a device adapted for holding one or more discrete cables. The device may comprise a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, wherein the securing feature is configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables.

[0005] Another aspect of the present invention is directed to a device for holding cables, in combination with one or more discrete cables. The device may comprise a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, each aperture adapted to receive the securing feature, wherein the main body is wrapped around the one or more discrete cables and the securing feature is received through one of the plurality of apertures, thereby holding the one or more discrete cables.

[0006] Another aspect of the present invention is directed to a device adapted for holding one or more discrete cables. The device may comprise a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, each aperture adapted to receive the securing feature; and one or more conforming members along the length of a bottom of the wrapping portion of the main body, the one or more conforming members configured to further secure the one or more discrete cables when the one or more cables are circumscribed by the main body.

[0007] Another aspect of the present invention is directed to a method for holding one or more discrete cables. The method may comprise providing a device adapted for holding one or more discrete cables, the device comprising: a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, wherein the securing feature is configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables; wrapping the wrapping portion of the main

body of the device around the one or more discrete cables; and inserting the securing feature through one of the apertures, thereby holding the one or more discrete cables.

[0008] Another aspect of the present invention is directed to a device adapted for holding one or more discrete cables. The device may comprise a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion, a mounting portion, and a frangible portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, wherein the securing feature comprises a threaded post and a capture member, the threaded post configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables, the capture member attached to the main body by the frangible portion and configured to be detached from the main body and secured onto the threaded post.

[0009] Another aspect of the present invention is directed to a method for holding one or more discrete cables. The method may comprise (i) providing a device adapted for holding one or more discrete cables, the device may comprise a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion, a mounting portion, and a frangible portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, wherein the securing feature comprises a threaded post and a capture member, the threaded post configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables, the capture member attached to the main body by the frangible portion and configured to be detached from the main body and secured onto the threaded post; (ii) wrapping the wrapping portion of the main body of the device around the one or more discrete cables; (iii) breaking the frangible portion to detach the capture member from the main body; (iv) inserting the threaded post through one of the apertures; and (v) securing the capture member onto the threaded post, thereby holding the one or more discrete cables.

[0010] It is noted that aspects of the invention described with respect to one embodiment, may be incorporated in a different embodiment although not specifically described relative thereto. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination. Applicant reserves the right to change any originally filed claim and/or file any new claim accordingly, including the right to be able to amend any originally filed claim to depend from and/or incorporate any feature of any other claim or claims although not originally claimed in that manner. These and other objects and/or aspects of the present invention are explained in detail in the specification set forth below. Further features, advantages and details of the present invention will be appreciated by those of ordinary skill in the art from a reading of the figures and the detailed description of the preferred embodiments that follow, such description being merely illustrative of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] **FIG. 1** is a front view of a device adapted for holding one or more discrete cables according to embodiments of the present invention.

[0012] **FIG. 2** is a top view of the device of **FIG. 1**.

[0013] **FIG. 3** is a top view of the device of **FIG. 1**, in combination with a plurality of discrete cables, being secured to a mounting structure according to embodiments of the present invention.

[0014] **FIG. 4** is a top view of the device in combination with a plurality of discrete cables shown in **FIG. 3** secured to a mounting structure.

[0015] **FIG. 5** is an enlarged top view of an alternative embodiment of the mounting portion of the device of **FIG. 1**.

[0016] **FIG. 6** is a top view of a device adapted for holding one or more discrete cables according to embodiments of the present invention.

[0017] **FIG. 7** is a top view of the device of **FIG. 6** in combination with a plurality of discrete cables.

[0018] **FIG. 8** is a front view of a device adapted for holding one or more discrete cables according embodiments of the present invention.

[0019] **FIG. 9** is a side perspective view of a securing feature according to embodiments of the present invention.

DETAILED DESCRIPTION

[0020] The present invention now is described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown. This invention

may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0021] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which illustrative embodiments of the invention are shown.

[0022] In the figures, certain layers, components or features may be exaggerated for clarity, and broken lines illustrate optional features or operations unless specified otherwise. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0023] It will be understood that, although the terms first, second, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the present invention. The sequence of operations (or steps) is not limited to the order presented in the claims or figures unless specifically indicated otherwise.

[0024] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the specification and relevant art and should not be interpreted in an idealized or overly formal sense unless expressly so defined herein. Well-known functions or constructions may not be described in detail for brevity and/or clarity.

[0025] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising", when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or

addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0026] As used herein, phrases such as "between X and Y" and "between about X and Y" should be interpreted to include X and Y. As used herein, phrases such as "between about X and Y" mean "between about X and about Y." As used herein, phrases such as "from about X to Y" mean "from about X to about Y."

[0027] Referring now to the figures, devices adapted for holding one or more discrete cables are illustrated in **FIGS. 1-9**. Referring to **FIGS. 1-4**, a device **100** adapted for holding one or more discrete cables **130** may comprise a flexible main body **102**, a securing feature **104**, and a plurality of apertures **106**. Each of these features will be described in greater detail below.

[0028] As shown in **FIGS. 1** and **2**, the main body **102** of the device **100** may comprise a wrapping portion **102a** and a mounting portion **102b**. The main body **102** has a length (**L**), a width (**W**), a thickness (T_1/T_2), and a longitudinal axis (**A**). In some embodiments, the main body **102** has a length (**L**) in the range of about 7 inches to about 12 inches, a width (**W**) in the range of about 1 inch to about 2 inches, and a thickness (T_1/T_2) in the range of about 0.062 inches to about 0.5 inches. The main body **102** is flexible and configured to be wrapped such that the main body **102** can circumscribe one or more discrete cables **130** (*see, e.g.*, **FIGS. 3** and **4**). In some embodiments, the main body **102** may be formed of a polymeric material. For example, in some embodiments, the main body **102** may comprise rubber, polypropylene, nylon 6,6, or acetal.

[0029] The device **100** of the present invention comprises a securing feature **104**. The securing feature **104** may be attached to or integral with the mounting portion **102b** of the main body **102**. The securing feature **104** may be configured to be secured to a mounting structure **150** (*see, e.g.*, **FIGS. 3** and **4**). For example, in some embodiments, the securing feature **104** may be configured to be secured to a telecommunications tower or monopole. As shown in **FIGS. 2-7**, in some embodiments, the securing feature **104** may comprise two barbs **104a** separated by a cavity **120**. As discussed in further detail below, in some embodiments, the cavity **120** is configured to cooperate with a rib **108** when holding or bundling together one or more discrete cables **130** (*see, e.g.*, **FIGS. 3-5**).

[0030] As shown in **FIG. 2**, in some embodiments, the thickness (T_2) of the mounting portion **102b** of the main body **102** may be greater than the thickness (T_1) of the wrapping portion **102a** of the main body **102**. For example, in some embodiments, the thickness (T_2)

of the mounting portion **102b** of the main body **102** may be in a range of 0.15 inches to about 0.5 inches and the thickness (T_1) of the wrapping portion **102a** of the main body **102** may be in a range of about 0.062 inches to about 0.25 inches. Having a greater thickness (T_2) of the mounting portion **102b** of the main body **102** may help to increase the structural strength of the device **100** and provide a more solid formation to the device **100** when the device **100** is secured to a mounting structure **150** (*see, e.g.*, **FIGS. 3** and **4**).

[0031] Still referring to **FIGS. 1** and **2**, the device **100** of the present invention may comprise a plurality of apertures **106** spaced apart along the longitudinal axis (**A**) of the wrapping portion **102a** of the main body **102**. Each aperture **106** is spaced apart a distance (L_A). In some embodiments, the distance (L_A) between each aperture **106** is in the range of about 1 inch to about 2 inches. In some embodiments, the securing feature **104** may be configured to be received through one of the apertures **106** when the main body **102** of the device **100** is wrapped around one or more discrete cables **130** (*e.g.*, bundling together a plurality of cables **130**). Thus, each aperture **106** may be sized such that the securing feature **104** may be inserted through a respective aperture **106.** For example, in some embodiments, each aperture **106** may have a diameter (**D**) in the range of about 0.5 inches to about 1 inch (nominally, about 0.75 inches).

[0032] As shown in **FIG. 1**, in some embodiments, each aperture **106** may comprise a rib **108** that extends across the respective aperture **106**. Each rib **108** may be aligned perpendicular or parallel to the longitudinal axis (**A**) of the main body **102.** For example, as shown in **FIG. 1**, the ribs **108** are aligned perpendicular to the longitudinal axis (**A**). In some embodiments, each rib **108** may be configured to cooperate with the securing feature **104** when the device **100** is holding one or more discrete cables **130** and/or when the device **100** is being secured to a mounting structure **150** (*see, e.g.*, **FIG. 3**) to provide additional stability.

[0033] In some embodiments, each rib **108** may have a thickness (T_R) in the range of about 0.25 inches to about 0.5 inches and a width (W_R) in the range of about 0.15 inches to about 0.45 inches. In some embodiments, the thickness (T_R) and width (W_R) of each rib **108** correspond to the depth (D_C) and width (W_C), respectively, of the cavity **120** of the securing feature **104** (*see, e.g.*, **FIG. 4**).

[0034] In some embodiments, the main body **102** of the device **100** may comprise a plurality of stabilizing members (or feet) **112** (*see, e.g.*, **FIGS. 1-4**). The stabilizing members **112** may extend radially outwardly from one side of the wrapping portion **102a** of the main body **102**. The stabilizing members **112** may improve stability of the device **100** by helping to limit or prevent the device **100** from rocking/swaying after the securing feature **104** is

inserted through an aperture **106** and the device **100** is secured to a mounting structure **150** (*see, e.g.*, **FIGS. 3** and **4**).

[0035] Referring now to **FIGS. 3** and **4**, as discussed above, the device **100** of the present invention is adapted for holding one or more discrete cables **130** and securing the one or more cables **130** to a mounting structure **150**. As shown in **FIG. 3**, the main body **102** of the device **100** may have sufficient flexibility to be wrapped around a plurality of discrete cables **130**. In some embodiments, the one or more discrete cables **130** comprise fiber optic cables, hybrid fiber/power cables and/or coaxial cables. After the wrapping portion **102a** of the main body **102** is wrapped to circumscribe the cable(s) **130**, the securing feature **104** may be inserted through one of the apertures **106** such that the main body **102** holds or bundles together the cables **130**. When the securing feature **104** is inserted through one of the apertures **106**, the rib **108** within the aperture **106** cooperates with the securing feature **104** (*e.g.*, the cavity **120** between the barbs **104a** and the shoulders **105** of each barb **104a**) (*see also, e.g.*, **FIG. 5**) to hold the main body **102** of the device **100** circumscribed around the one or more cables **130**.

[0036] As shown in **FIGS. 3** and **4**, the device **100**, in combination with a bundle of cables **130**, may be secured to a mounting structure **150** by further inserting the securing feature **104** into a pre-configured aperture **152** in the mounting structure **150**. For example, in some embodiments, the aperture **152** in the mounting structure **150** may be configured to receive the barbs **104a** of the securing feature **104**, thereby securing the device **100** (and the bundle of cables **130**) to the mounting structure **150**. In some embodiments, the securing feature **104** is configured to be secured in an aperture **152** in the mounting structure **150** having a diameter ($\mathbf{D_{MS}}$) in the range of about 0.5 inches to about 1 inch (nominally, about 0.75 inches).

[0037] As discussed above, each rib **108** may be aligned either perpendicular or parallel to the longitudinal axis (**A**) of the main body **102**. The orientation of each rib **108** within an aperture **106** may correspond with the orientation of the securing feature **104**. This allows the ribs **108** to cooperate with the securing feature **104** when holding or bundling together one or more discrete cables **130** and/or securing the device **100** to a mounting structure **150**. For example, when the securing feature **104** comprises two barbs **104a**, if the orientation of each rib **108** is perpendicular to the longitudinal axis (**A**) of the main body **102**, then the orientation of the two barbs **104a** should be parallel to the longitudinal axis (**A**) of the main body **102**. This orientation allows the ribs **108** to properly align with the cavity **120** between the barbs **104a** of the securing feature **104**. As mentioned above, in some embodiments, the

barbs **104a** may each comprise a shoulder **105** that is configured to engage the rib **108** when the rib **108** is within the cavity **120** (*see also, e.g.*, **FIG. 5**).

[0038] If the orientation of each rib **108** is parallel to the longitudinal axis (**A**) of the main body **102**, then the orientation of the two barbs **104a** should be rotated 90 degrees relative to the longitudinal axis (**A**) of the main body **102** (*i.e.*, perpendicular). The ribs **108**, in cooperation with the cavity **120** (and shoulders **105**) of the securing feature **104**, may provide support to help prevent the securing feature **104** from snapping in and/or out of the aperture **152** in the mounting structure **150**.

[0039] Referring now to **FIG. 5**, in some embodiments, the ribs **108** may comprise a plurality of protrusions **114**. The protrusions **114** may be staggered along the length of each rib **108** (*see also, e.g.*, **FIG. 1**). The protrusions **114** may provide added support to the rib **108** when the rib **108** is secured in the cavity **120** of the securing feature **104**. For example, the protrusions **114** may provide additional support to the barbs **104a** to help prevent the securing feature **104** from snapping in and/or out of the aperture **152** in the mounting structure **150**.

[0040] In some embodiments, the device **100** of the present invention may comprise at least one gripping tab **110** (*see, e.g.*, **FIG. 1**). The at least one gripping tab **110** may be attached to or integral with the main body **102**. The at least one gripping tab **110** may reside at an end of the main body **102** opposite to the securing feature **104** (*i.e.*, opposite to the mounting portion **102b** of the main body **102**). The gripping tab(s) **110** provides the technician a place to hold the device **100** when wrapping the device **100** around the cable(s) **130**. The gripping tab(s) **110** may help to reduce grip slippage during use of the device **100**.

[0041] Referring now to **FIGS. 6** and **7**, a device **200** adapted for holding one or more discrete cables is shown therein. The device **200** is similar to the device **100** shown above, except the device **200** may further comprise one or more conforming members **216**. As shown in **FIG. 6**, the one or more conforming members **216** may reside along the "inside" of the wrapping portion **102a** of the main body **102** of the device **200**. In some embodiments, the conforming members **216** may be configured to further secure or "cushion" the one or more discrete cables **130** when the cable(s) **130** are circumscribed by the main body **102**. The conforming members **216** may be in a variety of different shapes and sizes. For example, in some embodiments, the conforming members **216** have a polygonal or arced shape, and/or may be hollow (*see, e.g.*, **FIGS. 6** and **7**) or solid.

[0042] In some embodiments, the conforming members **216** may comprise a separate unitary member. In some embodiments, the conforming members **216** may comprise a

molded soft polymer material. The molded polymer material may be pliable and/or soft such that the conforming member(s) **216** may mold or "conform" to the one or more cables **130** as the device **200** is wrapped around the cable(s) **130**. For example, in some embodiments, the conforming members **216** may comprise a silicone, a silicone gel or a thermoplastic elastomer.

[0043] The conforming members **216** may take up "slack" and/or provide a "cushion" for the cable(s) **130** in the main body **102** that may result due to the spacing (or periods) (L_A) between the plurality of apertures **106** when the device **200** is wrapped around one or more cables **130**. For example, during wrapping of the device **200**, inserting the securing feature **104** through one aperture **106** may result in the device **200** being too loose around the cable(s) **130**, whereas inserting the securing feature **104** through the next aperture **106** may result in the device being too tight around the cable(s) **130**. The conforming members **216** may assist in taking up (reducing) the "slack" in the device **200** and/or provide additional support ("cushion") to the cable(s) **130** from differences in tightness of the device **200** from aperture **106** to aperture **106**.

[0044] Referring now to **FIG. 8**, a device **300** adapted for holding one or more discrete cables is shown therein. The device **300** is similar to the devices **100**, **200** shown above, except that the device **300** comprises an alternative securing feature **304** and the main body **102** of the device **300** comprises a frangible portion **102c**.

[0045] As shown in **FIG. 8**, in some embodiments, the securing feature **304** may comprise a threaded post **304a** and a capture member **304b**. The threaded post **304a** may be configured to be received through one of the plurality of apertures **106** when the main body **102** of the device **300** is wrapped around the one or more discrete cables **130**. For example, in some embodiments, the threaded post **304a** is configured to be received through an aperture **106** having a diameter (**D**) in the range of about 0.5 inches to about 1 inch (nominally, about 0.75 inches). The capture member **304b** may be configured to be secured (*e.g.*, threaded or snapped) onto to the threaded post **304a**.

[0046] In some embodiments, the main body **102** of the device **300** may comprise a frangible portion **102c**. The frangible portion **102c** may attach the capture member **304b** to the device **300**. The frangible portion **102c** is configured to break away from the main body **102** such that the capture member **304b** may be detached from the main body **102** of the device **300**, thereby allowing the capture member **304b** to be secured onto the threaded post **304a**. In some embodiments, the threaded post **304a** may be a threaded bolt and the capture member **304b** may be a breakaway nut (*see, e.g.*, **FIG. 8**).

[0047] In some embodiments, a capture member **304b'** may comprise an interior ridge **305** (*see, e.g.*, **FIG. 9**). The ridge **305** may be configured to interlock with at least one thread of the post **304a**. For example, in some embodiments, the capture member **304b'** may be pushed onto the threaded post **304a** until the ridge **305** interlocks with at least one of the threads of the post **304a**. Other securing features **304** may be used as an alternative to the breakaway nut **304b, 304b'**, such as, for example, an elastic band or a retaining ring. Also, the post **304a** may have annular, rather than helical, threads, particularly when used with a capture member **304b'** having a ridge **305**.

[0048] A securing feature **104** comprising a threaded bolt **304a** and breakaway nut **304b** may help to mitigate the stress that is applied on the securing feature **304** when the main body **102** of the device **300** circumscribes the cables **130**. The additional retaining capability may reduce the chances of the securing feature **304** failing while the device is holding one or more cables **130**.

[0049] Methods for holding one or more discrete cables are also provided. In some embodiments, a method for holding one or more discrete cables may comprise (i) providing a device adapted for holding one or more discrete cables, the device comprising: a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables; a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, wherein the securing feature is configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables; (ii) wrapping the wrapping portion of the main body of the device around the one or more discrete cables; and (iii) inserting the securing feature through one of the apertures, thereby holding the one or more discrete cables. In some embodiments, the method may further comprise inserting the securing feature through an aperture in the mounting structure, thereby securing the device and the one or more cables to the mounting structure.

[0050] In some embodiments, the method may comprise (i) providing a device adapted for holding one or more discrete cables. The device may comprise a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis. The main body may include a wrapping portion, a mounting portion, and a frangible portion. The wrapping portion may be configured to be wrapped such that the main body circumscribes

the one or more discrete cables. The device may further comprise a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure. The device may further comprise a plurality of apertures along the longitudinal axis of the wrapping portion of the main body. The securing feature may comprise a threaded post and a capture member. The threaded post may be configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables. The capture member may be attached to the main body by the frangible portion and configured to be detached from the main body and threaded onto the threaded post. The method may further comprise (ii) wrapping the wrapping portion of the main body of the device around the one or more discrete cables; (iii) breaking the frangible portion to detach the capture member from the main body; (iv) inserting the threaded post through one of the apertures; and (v) securing the capture member onto the threaded post, thereby holding the one or more discrete cables.

[0051] The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although a few exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.

That which is claimed is:

1. A device adapted for holding one or more discrete cables, comprising:

a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables;

a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and

a plurality of apertures along the longitudinal axis of the wrapping portion of the main body,

wherein the securing feature is configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables.

2. The device of Claim 1, wherein each aperture comprises a rib extending across the aperture, the rib configured to cooperate with the securing feature when holding the one or more discrete cables and/or securing the device to the mounting structure.

3. The device of Claim 2, wherein each rib is perpendicular to the longitudinal axis of the main body.

4. The device of Claim 2, wherein each rib is parallel to the longitudinal axis of the main body.

5. The device of any one of Claims 2-4, wherein the securing feature comprises two barbs separated by a cavity, the cavity configured to cooperate with a respective rib when holding the one or more discrete cables and/or securing the device to the mounting structure.

6. The device of any one of Claims 2-5, wherein each rib comprises a plurality of protrusions configured to engage the securing feature.

7. The device of any one of Claims 2-4, wherein the securing feature comprises a threaded post and a capture member.

8. The device of any one of the preceding claims in combination with one or more discrete cables, wherein the main body is wrapped around the one or more discrete cables and the securing feature is received through one of the plurality of apertures, thereby holding the one or more discrete cables.

9. The device of Claim 8, wherein the device is secured to a mounting structure via insertion of the securing feature into an aperture in the mounting structure.

10. The device of any one of the preceding claims, wherein the device further comprises one or more conforming members along the length of a bottom of the wrapping portion of the main body, the one or more conforming members configured to further secure the one or more discrete cables when the one or more cables are circumscribed by the main body.

11. The device of Claim 10, wherein the one or more conforming members comprise a molded soft polymer material.

12. The device of Claim 11, wherein the molded soft polymer material comprises a silicone, a silicone gel or a thermoplastic elastomer.

13. A device for holding cables, in combination with one or more discrete cables, the device comprising:

a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables;

a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and

a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, each aperture adapted to receive the securing feature,

wherein the main body is wrapped around the one or more discrete cables and the securing feature is received through one of the plurality of apertures, thereby holding the one or more discrete cables.

14. The device of Claim 13, wherein each aperture comprises a rib extending across the aperture, the rib configured to cooperate with the securing feature when holding one or more discrete cables and/or securing the device to the mounting structure.

15. The device of Claim 14, wherein each rib is perpendicular to the longitudinal axis of the main body.

16. The device of Claim 14, wherein each rib is parallel to the longitudinal axis of the main body.

17. The device of Claim 13, wherein the securing feature comprises a threaded post and a capture member.

18. The device of any one of Claims 14-17, wherein the securing feature comprises two barbs separated by a cavity, the cavity configured to cooperate with a respective rib when securing the device to the mounting structure.

19. The device of any one of Claims 14-18, wherein each rib comprises a plurality of protrusions configured to engage the securing feature.

20. The device of any one of Claims 13-19, the device further comprising one or more conforming members along the length of a bottom of the wrapping portion of the main body, the one or more conforming members configured to further secure the one or more discrete cables when the one or more cables are circumscribed by the main body.

21. A device adapted for holding one or more discrete cables, comprising:

a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables;

a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure;

a plurality of apertures along the longitudinal axis of the wrapping portion of the main body, each aperture adapted to receive the securing feature; and

one or more conforming members along the length of a bottom of the wrapping portion of the main body, the one or more conforming members configured to further secure the one or more discrete cables when the one or more cables are circumscribed by the main body.

22. The device of Claim 21, wherein the one or more conforming members have a polygonal or arced shape profile and/or are solid or hollow.

23. The device of Claim 21, wherein the securing feature comprises a threaded post and a capture member.

24. The device of any one of Claims 21-23, wherein each aperture comprises a rib extending across the aperture, the rib configured to cooperate with the securing feature when holding the one or more discrete cables and/or securing the device to the mounting structure.

25. The device of Claim 24, wherein the securing feature comprises two barbs separated by a cavity, the cavity configured to cooperate with a respective rib when holding the one or more discrete cables and/or securing the device to the mounting structure.

26. The device of any one of Claims 21-25, wherein the one or more conforming members comprise a molded soft polymer material.

27. The device of Claim 26, wherein the molded soft polymer material comprises a silicone, a silicone gel or a thermoplastic elastomer.

28. The device of any one of the preceding claims, wherein the main body comprises a plurality of stabilizing members extending radially outwardly from a side of the wrapping portion of the main body.

29. The device of any one of the preceding claims, wherein the device further comprises at least one gripping tab attached to or integral with an end of the main body opposite the securing feature.

30. The device of any one of the preceding claims, wherein the main body has a length in the range of about 7 inches to about 12 inches, a width in the range of about 1 inch to about 2 inches, and thickness in the range of about 0.062 inches to about 0.5 inches.

31. The device of any one of the preceding claims, wherein the mounting portion of the main body has a greater thickness than the wrapping portion of the main body.

32. The device of any one of the preceding claims, wherein the securing feature is configured to be secured in a hole in the mounting structure, the hole having a diameter in the range of about 0.5 inches to about 1 inch.

33. The device of any one of the preceding claims, wherein the device is secured to a mounting structure via insertion of the securing feature into an aperture in the mounting structure.

34. The device of any one of the preceding claims, wherein the polymeric material comprises rubber, polypropylene, or nylon.

35. The device of any one of the preceding claims, wherein the one or more discrete cables comprise cables selected from a group consisting of fiber optic cables, hybrid fiber/power cables and/or coaxial cables.

36. A method for holding one or more discrete cables, the method comprising:

providing a device adapted for holding one or more discrete cables, the device comprising:

a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion and a mounting portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables;

a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and

a plurality of apertures along the longitudinal axis of the wrapping portion of the main body,

wherein the securing feature is configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables;

wrapping the wrapping portion of the main body of the device around the one or more discrete cables; and

inserting the securing feature through one of the apertures, thereby holding the one or more discrete cables.

37. The method of Claim 36, further comprising: inserting the securing feature through an aperture in the mounting structure, thereby securing the device and the one or more cables to the mounting structure.

38. A device adapted for holding one or more discrete cables, comprising:

a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion, a mounting portion, and a frangible portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables;

a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and

a plurality of apertures along the longitudinal axis of the wrapping portion of the main body,

wherein the securing feature comprises a threaded post and a capture member, the threaded post configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables, the capture member attached to the main body by the frangible portion and configured to be detached from the main body and secured onto the threaded post.

39. The device of Claim 38, wherein the threaded post is a threaded bolt and the capture member is a breakaway nut.

40. The device of Claim 38, wherein the threaded post has annular threads and the capture member has an interior ridge configured to interlock with the annular threads of the threaded post to secure the capture member onto the threaded post.

41. A method for holding one or more discrete cables, the method comprising:

providing a device adapted for holding one or more discrete cables, the device comprising:

a flexible main body formed of a polymeric material having a length, a width, a thickness, and a longitudinal axis, the main body including a wrapping portion, a mounting portion, and a frangible portion, wherein the wrapping portion is configured to be wrapped such that the main body circumscribes the one or more discrete cables;

a securing feature attached to or integral with the mounting portion of the main body and configured to be secured to a mounting structure; and

a plurality of apertures along the longitudinal axis of the wrapping portion of the main body,

wherein the securing feature comprises a threaded post and a capture member, the threaded post configured to be received through one of the plurality of apertures when the main body is wrapped around the one or more discrete cables, the capture member attached to the main body by the frangible portion and configured to be detached from the main body and secured onto the threaded post;

wrapping the wrapping portion of the main body of the device around the one or more discrete cables;

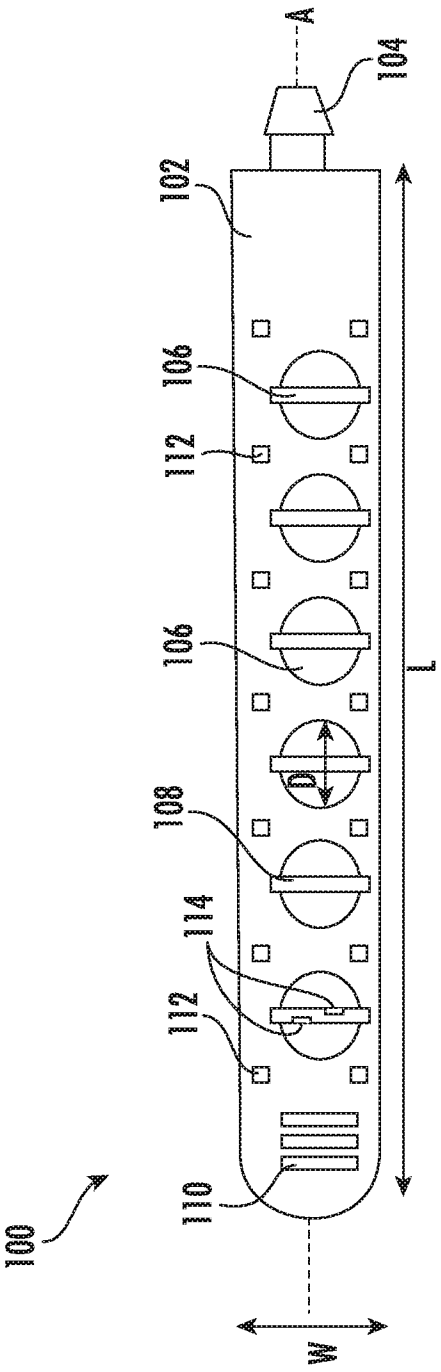
breaking the frangible portion to detach the capture member from the main body;

inserting the threaded post through one of the apertures; and

securing the capture member onto the threaded post, thereby holding the one or more discrete cables.

42. The method of Claim 41, wherein the threaded post is a threaded bolt and the capture member is a breakaway nut.

43. The method of Claim 41, wherein the threaded post has annular threads and the capture member has an interior ridge configured to interlock with the annular threads of the threaded post to secure the capture member onto the threaded post.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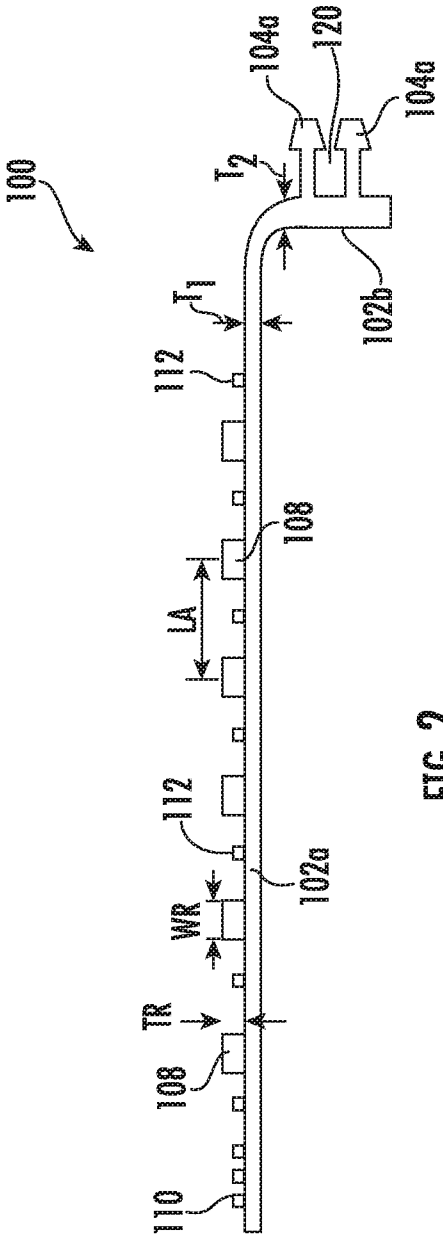
102
104
A
106
112
106
108
114
112
110
D
L
W

FIG. 1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T1
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112
102a
WR
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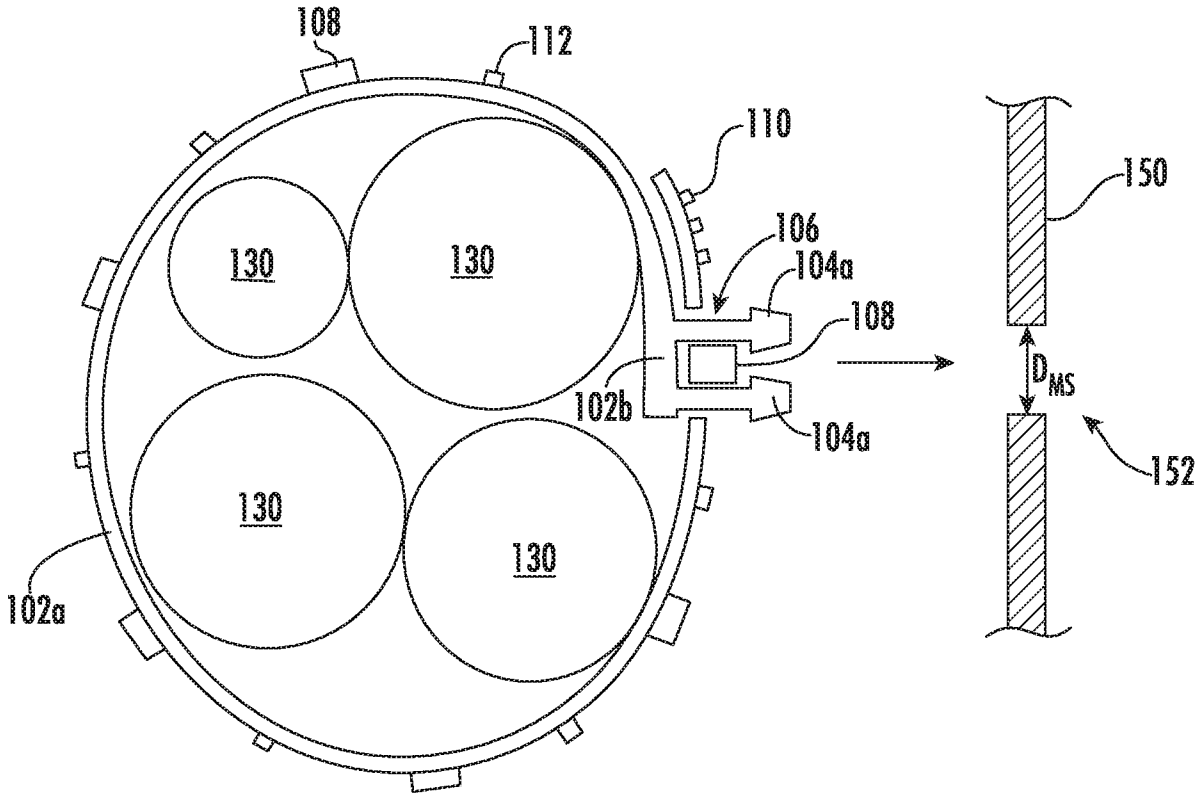
110

FIG. 2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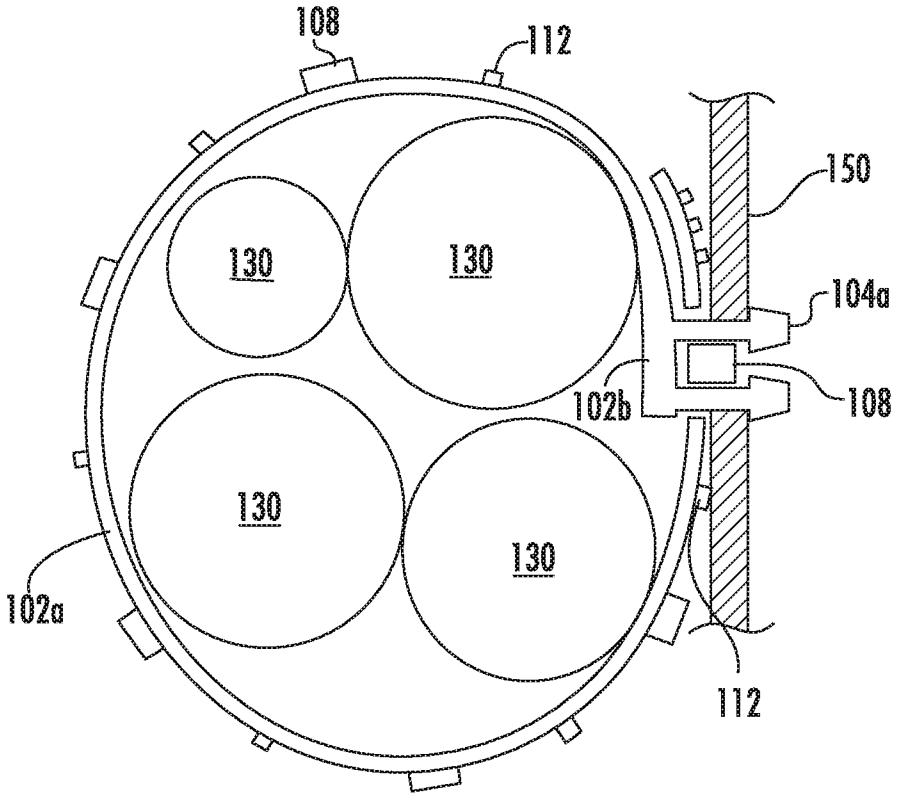
106
104a
130
130
108
D_{MS}
102b
104a
130
130
152
102a

FIG. 3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112
150
130
130
104a
102b
108
130
130
102a
112

FIG. 4

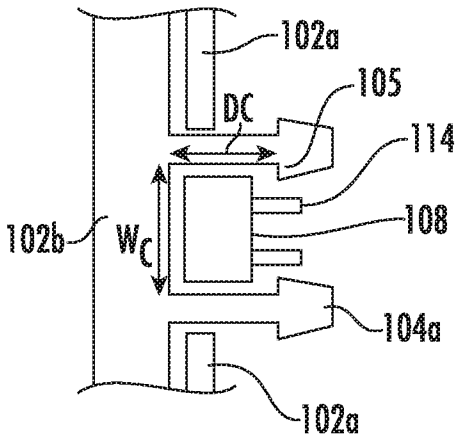
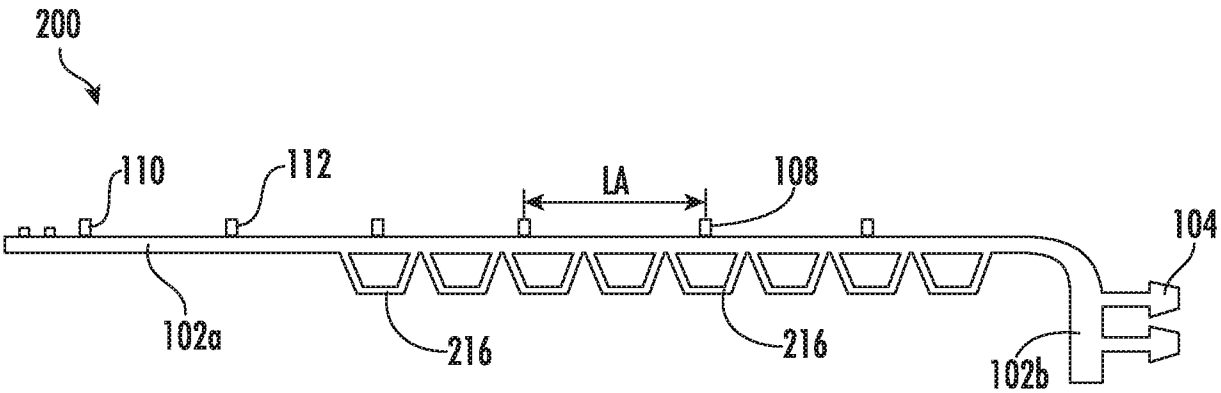

102a
105
DC
114
102b
W_C
108
104a
102a

FIG. 5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112
LA
108
104
102a
216
216
102b

FIG. 6

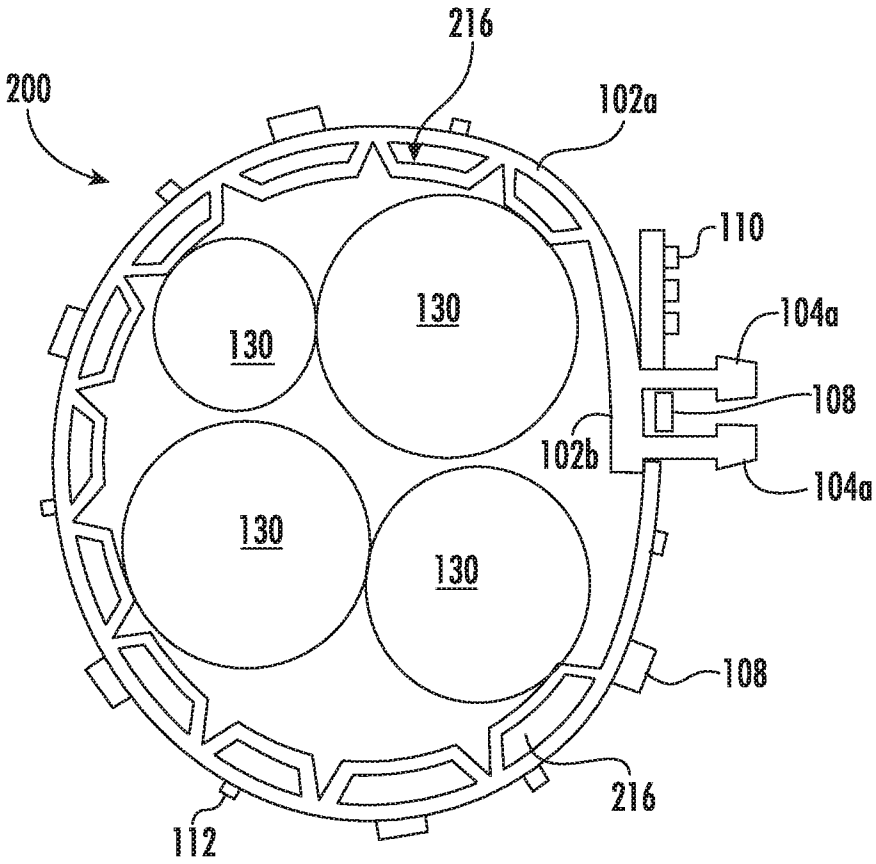

FIG. 7

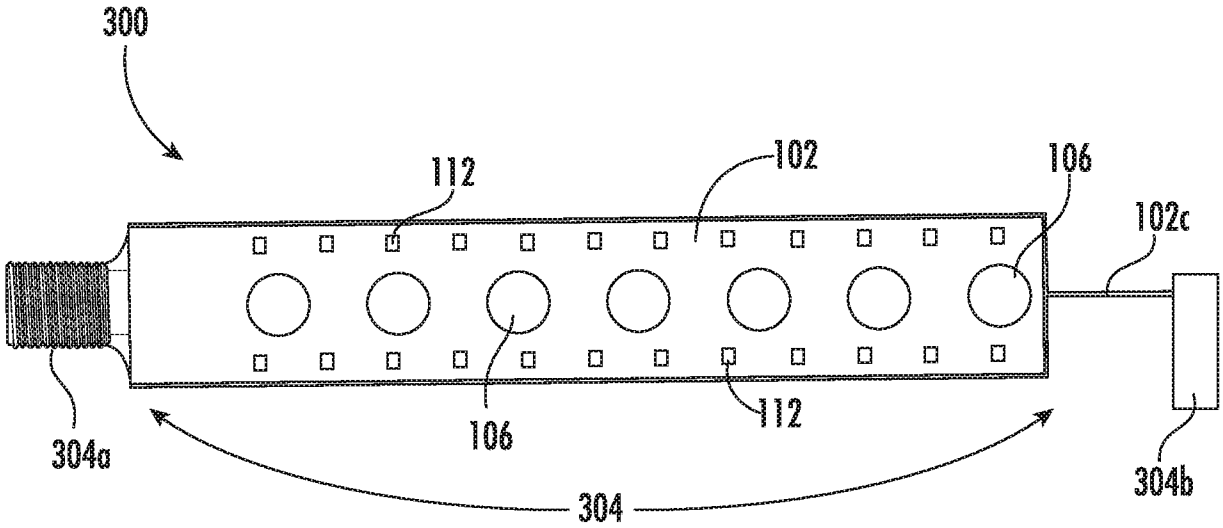

FIG. 8

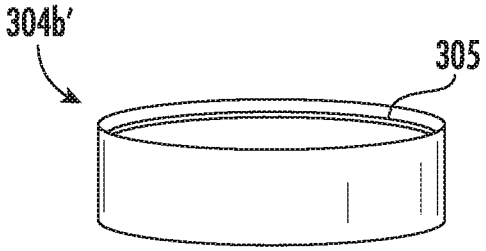

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/065852

A. CLASSIFICATION OF SUBJECT MATTER

H02G 3/02(2006.01)i, F16L 3/233(2006.01)i, F16L 3/137(2006.01)i

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)
H02G 3/02; B60R 16/02; F16L 23/10; F16L 3/08; F16L 41/06; F16L 47/34; H02G 3/26; H02G 3/32; F16L 3/233; F16L 3/137

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: cable, holding, flexible, securing feature, wrapping, aperture

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4342438 A (ROBERT SPEEDIE) 03 August 1982 See column 2, line 45 - column 3, line 47; and figures 1-5.	1-5,7,13-18,21-25,36-43
Y	JP 11-069575 A (SUMITOMO WIRING SYSTEM LTD.) 09 March 1999 See paragraphs 12-13; and figures 2-3.	1-5,7,13-18,36-37
Y	US 2010-0116524 A1 (TATSUHIKO MIZUTANI et al.) 13 May 2010 See paragraph 28; and figure 3.	2-5,7,14-16,24-25
Y	US 2017-0307117 A1 (BDD BETEILIGUNGS GMBH) 26 October 2017 See paragraph 60; and figures 1-5.	21-25
Y	US 2017-0261143 A1 (THOMAS DUDLEY LIMITED) 14 September 2017 See paragraph 50; and figure 2.	38-43

☐ Further documents are listed in the continuation of Box C.

☒ 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
"D" document cited by the applicant in the international application
"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
08 April 2020 (08.04.2020)	**08 April 2020 (08.04.2020)**

Name and mailing address of the ISA/KR
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/065852

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 9,11-12,27
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claims 9, 11-12, 27 are unclear since they refer to claims 8, 10, 26 which do not comply with PCT Rule 6.4(a).

3. ☒ Claims Nos.: 6, 8, 10, 19-20, 26, 28-35
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required addtional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2019/065852

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		WO 2016-083786 A1	02/06/2016