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(54) Title: **DATACOMMUNICATIONS/TELECOMMUNICATIONS PATCHING SYSTEMS WITH BUNDLED PATCH CORD ASSEMBLY**

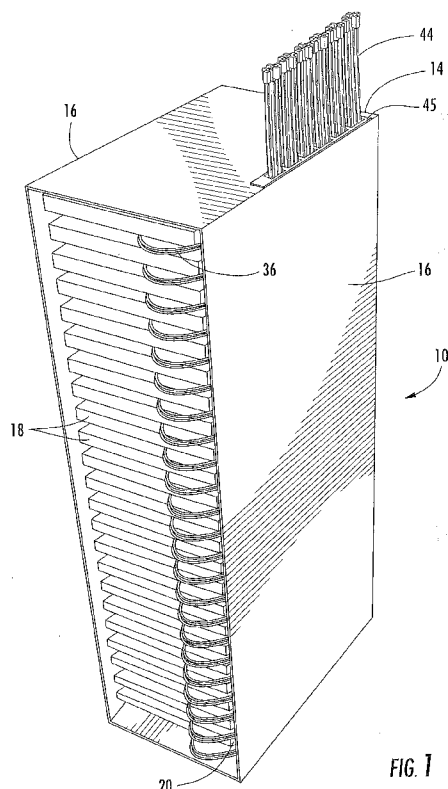


FIG. 1

(57) Abstract: A cord bundle assembly includes: a plurality of communications cords, each of the communications cords comprising a plurality of communications signal-carrying members, the communications cords being grouped as a bundle; and a cord management assembly. The cord management assembly includes: a fixed cuff that encircles and is fixed relative to the plurality of communications cords; a slip cuff that encircles and is slidable relative to the plurality of communications cords; and a generally cylindrical sleeve having first and second ends, the fixed cuff being mounted to the first end, and the slip cuff being mounted to the second end. This configuration can assist in the management and organization of cords arranged in a cord bundle as they are routed between communications equipment.

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DATACOMMUNICATIONS/TELECOMMUNICATIONS PATCHING SYSTEMS WITH BUNDLED PATCH CORD ASSEMBLY

Related Application

[0001] The present application claims the benefit of and priority from U.S. Provisional Patent Application No. 61/436,772, filed January 27, 2011, the disclosure of which is hereby incorporated herein in its entirety.

Field of the Invention

[0002] The present invention relates generally to datacommunications/telecommunications equipment, and more particularly to high-density copper and fiber distribution apparatus.

Background

[0003] In the datacommunications/telecommunications industry, the use of fiber optic cables for carrying transmission signals is rapidly and continually growing. To interconnect communication devices such as servers, routers and switches, fiber optic equipment, fiber distribution frames, racks and cabinets have been developed. Such frames, racks and cabinets are typically located in a communications closet, data room, data center or the like, where technicians can easily connect and reconnect, or "patch," equipment in an organized and efficient manner. Examples of fiber distribution frames and racks are shown in U.S. Pat. Nos. 5,497,444 and 5,758,003, which are hereby incorporated by reference.

[0004] With the increase in server deployments and use of other active network equipment utilizing fiber optic cables in the datacommunications/telecommunications industry (and often in conjunction with copper communications cables, cords and connections), it is desirable to provide fiber distribution frames/racks with increased density. "Density" refers to the number of locations, or ports, per

unit volume or unit area for providing connections within the rack; thus, increased density can provide more connection/patching sites per rack. Many racks are configured to include multiple shelves or trays of a specific size (a standard height of 1.75 inches is known in the industry as a "U"); the size of a rack or cabinet may be described in terms of "U" (e.g., a "6U" rack), and the shelves and trays may be described by the number of connections per "U" (e.g., 48 connections/U). Some cabinets (so-called "0U" cabinets) have even been created that reserve all of the rack units for active computing equipment by utilizing space in the cabinet that is usually occupied by components for patching and cable/cord management. One benefit of this approach is the ability to preconfigure cabinets with the required copper and fiber connectivity for specific network equipment. This can allow for the rapid deployment of network equipment.

[0005] The space constraints associated with high-density distribution frames can cause cable and cord management problems. Effective cable/cord management can prevent excessive bending of fiber optic cables/cords within the frames. Effective cable/cord management may also reduce tangling of cables and cords, and may provide improved accessibility to components that may require servicing. Easily-understood labeling can also improve operator efficiency and accuracy. However, increased density can hamper desirable cable management practices, and the reduced volume available (such as in 0U cabinets) can make cable management more critical. There is a desire to make cabinets "plug and play" to make deployments of cabinets more rapid and to increase reliability.

Summary

[0006] As a first aspect, embodiments of the invention are directed to a cord bundle assembly. The cord bundle assembly comprises: a plurality of communications cords, each of the communications cords comprising a plurality of communications signal-carrying members, the communications cords being grouped as a bundle; and a cord management assembly. The cord management assembly comprises: a fixed cuff that encircles and is fixed relative to the plurality of communications cords; a slip cuff that encircles and is slidable relative to the plurality of communications cords; and a generally cylindrical sleeve having first and second ends, the fixed cuff being mounted to the first end, and the slip cuff being mounted to the second end. This configuration can assist in the management and organization of cords arranged in a cord bundle as they are routed between communications equipment.

[0007] As a second aspect, embodiments of the invention are directed to a module adapted for use with a telecommunications rack, frame or cabinet, comprising: a generally upright divider panel; a cover panel disposed generally parallel to the divider panel, the cover panel and divider panel being spaced apart from each other to form a gap; and a plurality of telecommunications cords, each of the telecommunications cords comprising a plurality of telecommunications patch cords, the cords being positioned in the gap between the divider panel and cover panel. The cords are received in a cord management assembly that comprises: a fixed cuff that encircles and is fixed relative to the plurality of communications cords; a slip cuff that encircles and is slidable relative to the plurality of communications cords; and a generally cylindrical sleeve having first and second ends, the fixed cuff being mounted to the first end, and the slip cuff being mounted to the second end.

[0008] As a third aspect, embodiments of the present invention are directed to a module adapted for use with a telecommunications rack, frame or cabinet, comprising: a generally upright divider panel; a cover panel disposed generally parallel to the divider panel, the cover panel and divider panel being spaced apart from each other to form a gap; and a plurality of telecommunications cords, each of the telecommunications cords comprising a plurality of telecommunications patch cords, the cords being positioned in the gap between the divider panel and cover panel. The cords are received in a cord management assembly that comprises: a fixed cuff that encircles and is fixed relative to the plurality of communications cords; a slip cuff that encircles and is slidable relative to the plurality of communications cords; and a generally cylindrical sleeve having first and second ends, the fixed cuff being mounted to the first end, and the slip cuff being mounted to the second end. The cylindrical sleeve comprises a material that enables the sleeve to shrink in length as it expands in circumference. The slip cuff is fixedly mounted relative to at least one of the divider panel and the cover panel.

Brief Description of the Figures

[0009] **Figure 1** is a perspective view of a communications cabinet that comprises an interconnection module according to embodiments of the present invention.

[0010] **Figure 2** is an exploded perspective view of the cabinet and module of **Figure 1**.

[0011] **Figure 3** is a further exploded perspective view of the module of **Figure 1**.

[0012] **Figure 4** is a side view of an interconnection module similar to that shown in **Figure 1** showing the cord bundles with slack loops.

[0013] **Figure 5** is an enlarged side view of the cord management assembly of **Figure 4**, with the cord bundles retracted and the sleeve covering the slack loop in a relaxed condition.

[0014] **Figure 6** is an enlarged side view of the cord management assembly of **Figure 5** with a patch cord extended and the sleeve covering the slack loop contracted.

[0015] **Figure 7** is a greatly enlarged perspective view of the slip cuff and cords of the cord bundle assembly of **Figure 5** showing the patch cords extended to different lengths.

[0016] **Figure 8** is an exploded side view of the slip cuff and sleeve of the cord assembly of **Figure 5**.

[0017] **Figure 9** is a side view of the slip cuff and sleeve of the cord assembly of **Figure 5** showing the patch cords secured into place.

Detailed Description

[0018] The present invention will be described more particularly hereinafter with reference to the accompanying drawings. The invention is not intended to be limited to the illustrated embodiments; rather, these embodiments are intended to fully and completely disclose the invention to those skilled in this art. In the drawings, like numbers refer to like elements throughout. Thicknesses and dimensions of some components may be exaggerated for clarity. Well-known functions or constructions may not be described in detail for brevity and/or clarity.

[0019] 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 relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0019] 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 expression "and/or" includes any and all combinations of one or more of the associated listed items. In addition, spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0021] Referring now to the figures, a communications cabinet, designated broadly at **10**, is shown in **Figure 1**. The cabinet **10** includes a front wall (not shown), a rear wall **14**, and opposing side panels **16**. A plurality of datacommunications servers **18** (or other active network equipment) are mounted within the cabinet **10**. Those skilled in this art will recognize that in some embodiments the cabinet may be replaced with a frame, rack or other datacommunications equipment mounting structure.

[0022] Referring now to **Figure 2**, the cabinet **10** also includes an interconnection module **20** positioned just inwardly from one of the side panels **16**. The module **20** may be integrated into the cabinet **10**, or may be added separately to an existing cabinet **10**. As can be seen in **Figures 2** and **3**, the module **20** includes a divider panel **22** that separates the module **20** from the cavity of the cabinet **10** and a cover panel **24** (in some embodiments, one of the side walls **16** of the cabinet **10** may serve as the cover panel **24**). An upper panel **25** spans the upper edges of the divider panel **22** and the cover panel **24**. The divider panel **22** and the cover panel **24** form a narrow gap **23**; in some embodiments, the gap **23** is between about 0.5 and 3.5 inches in width, such that the entire module **20** is between about 1 and 4 inches in width. The divider panel **22** includes multiple horizontally-disposed cassette guides **26** (see **Figure 3**).

[0023] **Figure 3** also illustrates one exemplary patch cord cassette **30** that engages one or more of the cassette guides **26**; in a typical module **20**, multiple cassettes **30**

are included and are arranged in a vertical stack separated by the cassette guides **26** (see **Figure 2**). Details of the structure and function of exemplary cassettes are provided in co-assigned and co-pending U.S. Patent Application No. 12/862,105, filed August 24, 2010, the disclosure of which is hereby incorporated herein in its entirety. A plurality of unbundled (*i.e.*, separated) patch cords **36** are routed into and out of the cassette **30**. Those skilled in this art will recognize that the patch cords **36** may be fiber optic patch cords, copper patch cords, or a combination of fiber optic and copper patch cords that are communications signal-carrying members. The arrangement of the patch cords **36** within the cassette **30** enables the patch cords **36** to move between a stored position and an extended position, in which the terminals **38** of the patch cords **36** extend forwardly away from the housing of the cassette **30**. From this position, the patch cords **36** can be connected to one of the servers **18** of the cabinet **10** (see **Figure 1**).

[0024] Referring back to **Figures 1** and **2**, the ends of the patch cords **36** of each cassette **30** opposite the terminals **38** are gathered into a cord bundle **44** (the bundle may be created by associated loose patch cords with a twist tie or the like, or the patch cords may be joined or connected with a web, jacket or the like). The cord bundle **44** is routed from the entry aperture into a downwardly-extending slack loop **44a** (seen in **Figure 4**), then upwardly to a patch pack organizer **45** (shown in **Figure 3**) that is attached to the upper panel **25** of the module **20**. The cord bundle **44** is able to extend from the module **20** to interconnect with other equipment, such as an overhead patch panel. The distance of cord bundle extension from the module **20** is typically between about 1 and 3 feet, and may be as much as 6 feet or more.

[0025] This arrangement can be seen in **Figure 4**. A cord bundle **44** enters the upper edge of the module **20**. Guides/posts may be present to organize the cord bundle **44** and to form the slack loops **44a** so that they may be extended/retracted from the module **20**. Each of the cord bundles **44** is routed through the guides to an entry aperture of one of the cassettes **30**. The patch cords **36** of the cord bundles **44** are separated, threaded within the structures within the cassettes **30**, and routed out of exit apertures of the cassettes **30**. From this position the patch cord **36** can be interconnected with one of the servers **18** of the cabinet **10**.

[0026] Retraction, extension and management of the cords of the cord bundles **44** can be enhanced by a cord management assembly **200**, which can be seen in **Figures 4-9**. The cord management assembly **200** includes a fixed cuff **202**, a slip cuff **204**, and a sleeve **212**. These components are discussed below.

[0027] Referring first to **Figures 5** and **8**, the sleeve **212** may be of generally cylindrical construction and receives the cords **36** of the cord bundle **44** therewithin. The sleeve **212** is typically formed of an elastic material, and may be formed of an elastic material that shortens in length as it is stretched along its width (or, as in this case, when its circumference increases). An exemplary material for the sleeve **212** is polyester expandable mesh, available from McMaster-Carr, Elmhurst, Illinois.

[0028] Referring again to **Figure 5**, the fixed cuff **202** is attached to one end of the sleeve **212**. The fixed cuff **202** encircles and is fixed to or relative to the patch cords **36** of the cord bundle **44**, such that the patch cords **36** do not move or slide relative to the fixed cuff **202**. The fixed cuff **202** may be fixed relative to the patch cords **36** via an interference fit, adhesives, or the like. The fixed cuff **202** may be formed of any material with sufficient integrity to maintain the fixed relationship with the patch cords **36**. An exemplary material for the fixed cuff **202** is polyolefin (heat-shrink tubing).

[0029] Referring again to **Figures 5** and **8**, the slip cuff **204** is fixed to the end of the sleeve **212** opposite the fixed cuff **202**. In the illustrated embodiment, the slip cuff **204** includes an inner cylinder **206** and an outer sheath **210**. The inner cylinder **206** is typically formed of a relative flexible polymeric material, such as polypropylene. A tab **208** or other projection that extends away from the sleeve **212** and is generally parallel with the patch cords **36** may be included with the inner cylinder **206**. The outer sheath **210** fits over some or all of the inner cylinder **206** and over the end of the sleeve **212**, thereby fixing the slip cuff **204** to the sleeve **212** (see **Figure 9**); attachment of the outer sheath **210** to the sleeve **212** may be via adhesives or any number of other fastening techniques. The inner cylinder **206** encircles the patch cords **36** and is sized such that the patch cords **36** are free to slide relative to the inner cylinder **206**.

[0030] Operation of the cord management assembly **200** can be understood with reference to **Figures 5-7**. Prior to interconnection with communications equipment such as a patch panel, network switch or other termination device, the cord bundle **44** resides in the module **20** with a slack loop **44a** and the cord bundle **44** extending through the top of the cabinet with the slip cuff **204** fixed to the top of the cabinet as is shown in **Figure 4**. In some embodiments, the slip cuff **204** is fixed to one of the divider panel **22** and the cover panel **24** of the interconnection module **20**. The sleeve **212** is relatively relaxed in a U-shaped arrangement, and the patch cords **36** are fully retracted into the sleeve **212** (see **Figure 5**). When the group of patch cords **36** within a cord management assembly **200** is extended to be connected with telecommunications equipment, the slack loop **44a** (along with the cord

management assembly **200**) is shortened. The shortened sleeve **212** expands in diameter (as can be seen in **Figure 6**) and creates space within the sleeve **212** such that individual cords **36** in the bundle **44** can be separated and retracted by varying amounts. As noted above, the decrease in the length causes the sleeve **212** to increase in diameter, as the slack loop **44a** is drawn toward the slip cuff **204**. The result is a somewhat shorter, wider sleeve **212** (**Figure 6**), which maintains the patch cords **36** of a cord bundle **44** in a relatively organized fashion. As other patch cords **36** are extended, as in **Figure 7**, the sleeve **212** may further shrink in length and/or increase in circumference as needed. Irrespective of the number of patch cords **36** that are extended, the patch cords **36** remain organized within the sleeve **212**. If a patch cord **36** is retracted (for example, if it is disconnected from a communications component), it can return to its original position (or a very similar position) within the sleeve **212**.

[0031] As shown in **Figure 9**, when the patch cords **36** have been extended in a desired manner, they can be fixed in place with a tie strap **214** or the like wrapped around the tab **208**. Fixing the patch cords **36** in place with the tie strap **214** can provide strain relief to the patch cords **36**.

[0032] The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although 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 cord bundle assembly, comprising:
a plurality of communications cords, each of the communications cords comprising a plurality of communications signal-carrying members, the communications cords being grouped as a bundle; and
a cord management assembly, comprising:
a fixed cuff that encircles and is fixed relative to the plurality of communications cords;
a slip cuff that encircles and is slidable relative to the plurality of communications cords; and
a generally cylindrical sleeve having first and second ends, the fixed cuff being mounted to the first end, and the slip cuff being mounted to the second end.
2. The cord bundle assembly defined in Claim 1, wherein the sleeve is formed of a material that enables the sleeve to shrink in length as it increases in circumference.
3. The cord bundle assembly defined in Claim 2, wherein the material forming the sleeve comprises an expandable mesh.
4. The cord bundle assembly defined in Claim 3, wherein the expandable mesh comprises polyester.
5. The cord bundle assembly defined in Claim 1, wherein the slip cuff comprises a projection that extends generally parallel to the cords away from the sleeve.
6. The cord bundle assembly defined in Claim 5, further comprising a tie strap wrapped around the cords and the projection.
7. The cord bundle assembly defined in Claim 1, wherein the slip cuff comprises an inner cylinder and an outer sheath that overlies the inner cylinder.
8. A module adapted for use with a telecommunications rack, frame or cabinet, comprising:
a generally upright divider panel;

a cover panel disposed generally parallel to the divider panel, the cover panel and divider panel being spaced apart from each other to form a gap;

a plurality of telecommunications cords, each of the telecommunications cords comprising a plurality of telecommunications patch cords, the cords being positioned in the gap between the divider panel and cover panel;

wherein the cords are received in a cord management assembly, comprising:

a fixed cuff that encircles and is fixed relative to the plurality of communications cords;

a slip cuff that encircles and is slidable relative to the plurality of communications cords; and

a generally cylindrical sleeve having first and second ends, the fixed cuff being mounted to the first end, and the slip cuff being mounted to the second end.

9. The module defined in Claim 8, wherein the slip cuff is fixedly mounted relative to at least one of the divider panel and the cover panel.

10. The module defined in Claim 8, wherein the sleeve is formed of a material that enables the sleeve to shrink in length as it increases in circumference.

11. The module defined in Claim 8, wherein the slip cuff comprises a projection that extends generally parallel to the cords away from the sleeve.

12. The module defined in Claim 11, further comprising a tie strap wrapped around the cords and the projection.

13. The module defined in Claim 8, further comprising at least one patch cord cassette mounted within the gap, wherein the patch cords of the cord bundle are routed into the patch cord cassette.

14. The module defined in Claim 8, in combination with a communications cabinet.

15. A module adapted for use with a telecommunications rack, frame or cabinet, comprising:

a generally upright divider panel;

a cover panel disposed generally parallel to the divider panel, the cover panel and divider panel being spaced apart from each other to form a gap;

a plurality of telecommunications cords, each of the telecommunications cords comprising a plurality of telecommunications patch cords, the cords being positioned in the gap between the divider panel and cover panel;

wherein the cords are received in a cord management assembly, comprising:

a fixed cuff that encircles and is fixed relative to the plurality of communications cords;

a slip cuff that encircles and is slidable relative to the plurality of communications cords; and

a generally cylindrical sleeve having first and second ends, the fixed cuff being mounted to the first end, and the slip cuff being mounted to the second end;

wherein the cylindrical sleeve comprises a material that enables the sleeve to shrink in length as it expands in circumference; and

wherein the slip cuff is fixedly mounted relative to at least one of the divider panel and the cover panel.

16. The module defined in Claim 15, wherein the slip cuff comprises a projection that extends generally parallel to the cords away from the sleeve.

17. The module defined in Claim 16, further comprising a tie strap that encircles the cords and the projection.

18. The module defined in Claim 15, further comprising at least one cassette mounted within the gap, wherein the patch cords of the cord bundle are routed into the cassette.

19. The module defined in Claim 15, in combination with a communications cabinet.

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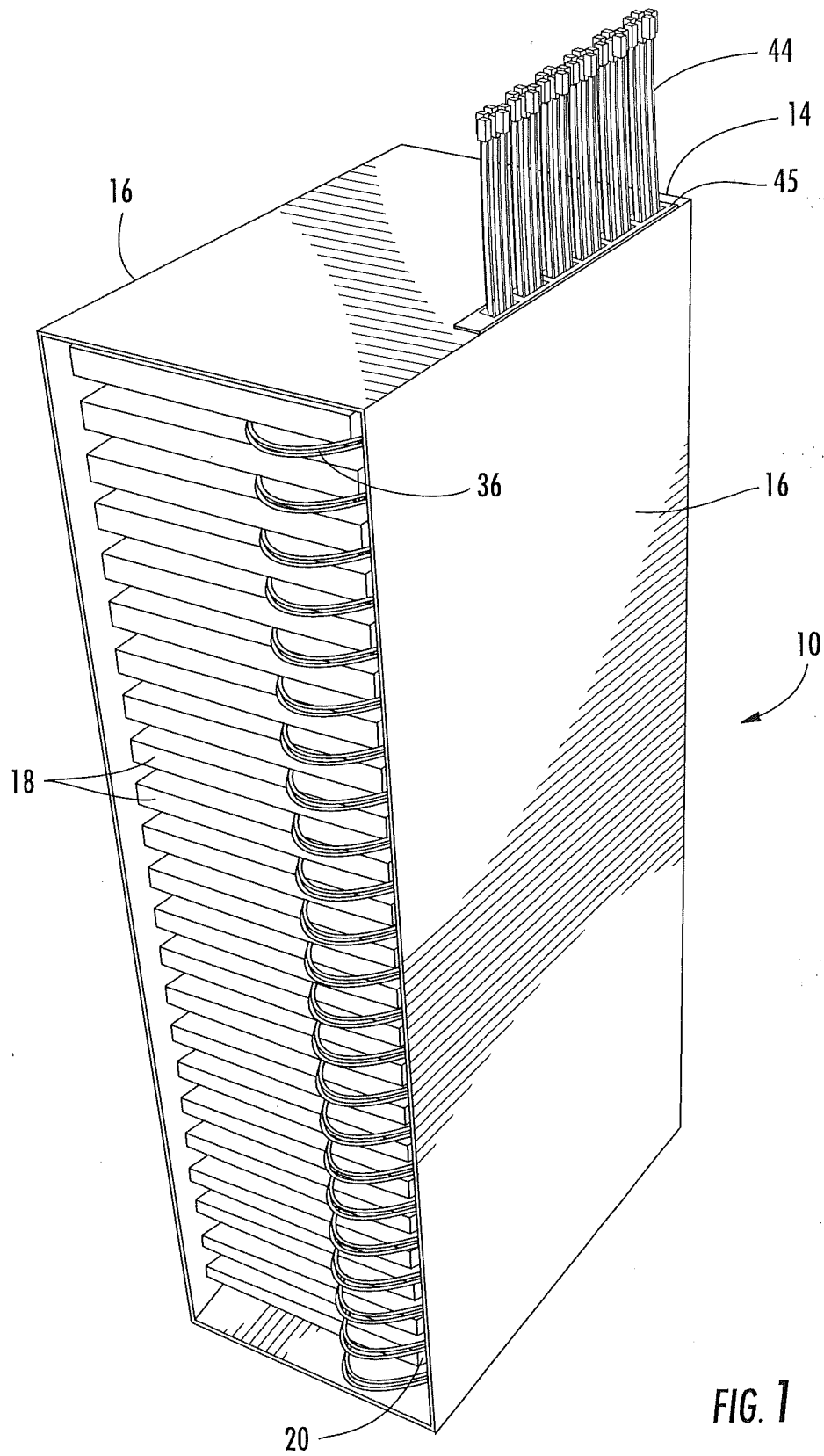


FIG. 1

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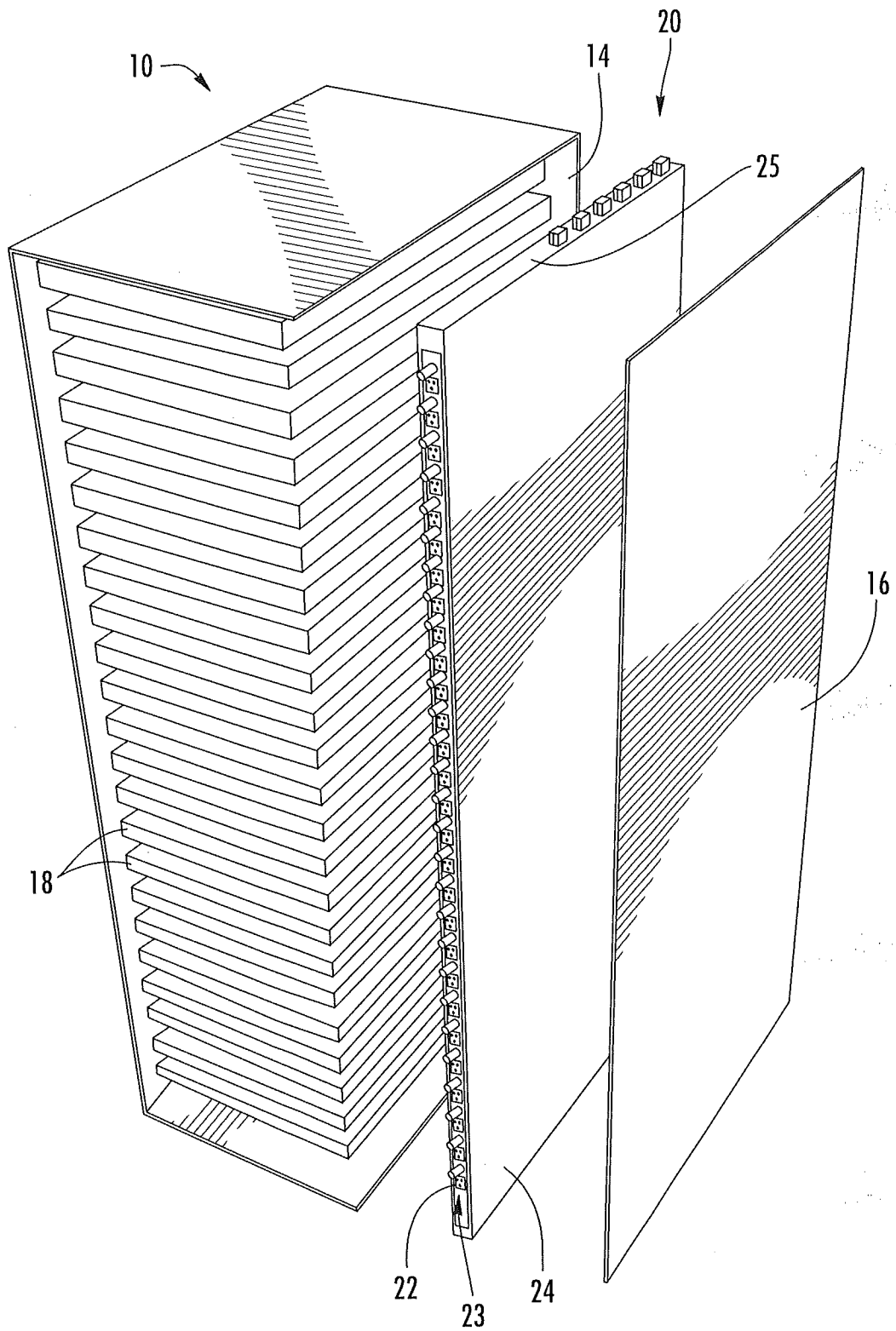
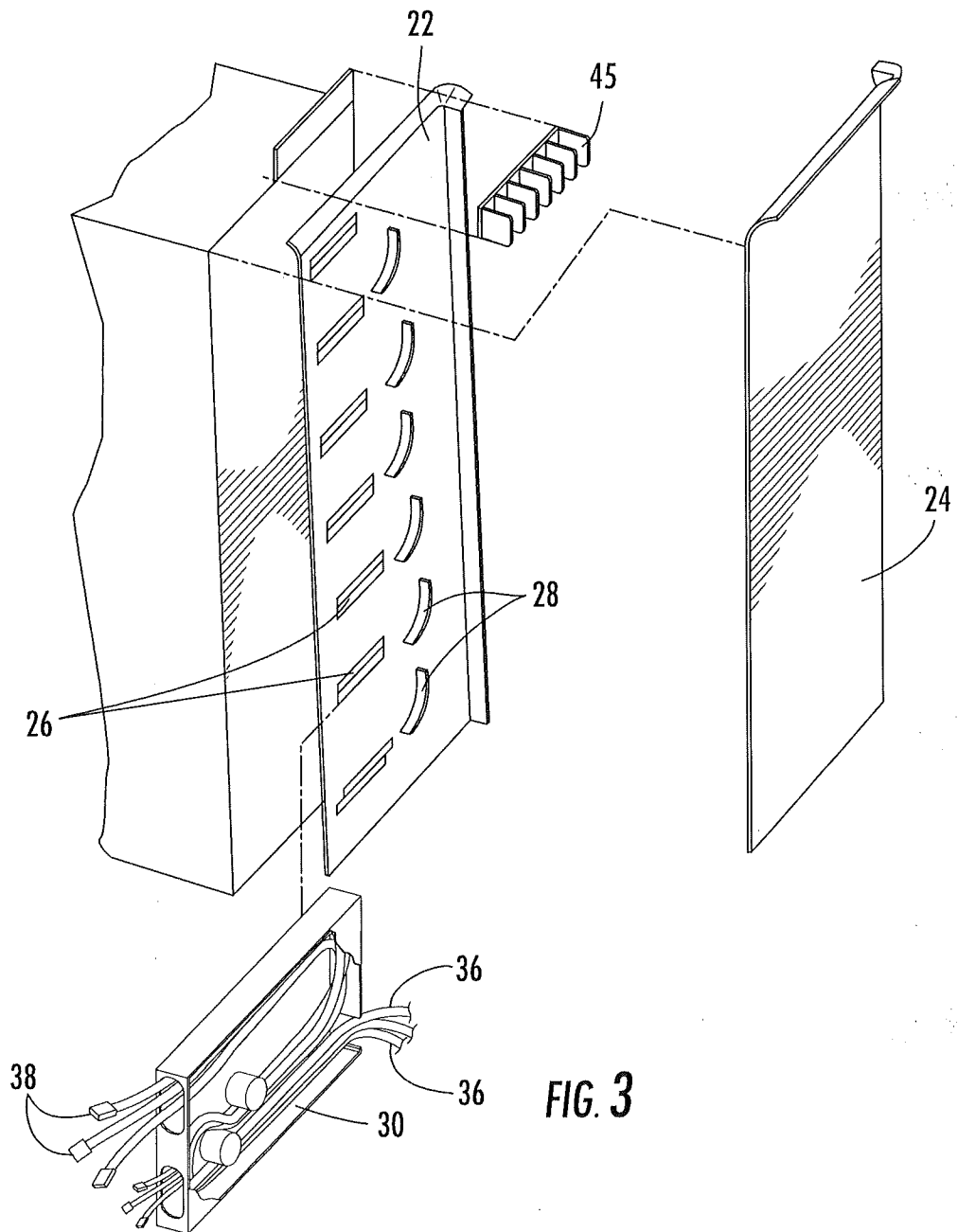


FIG. 2

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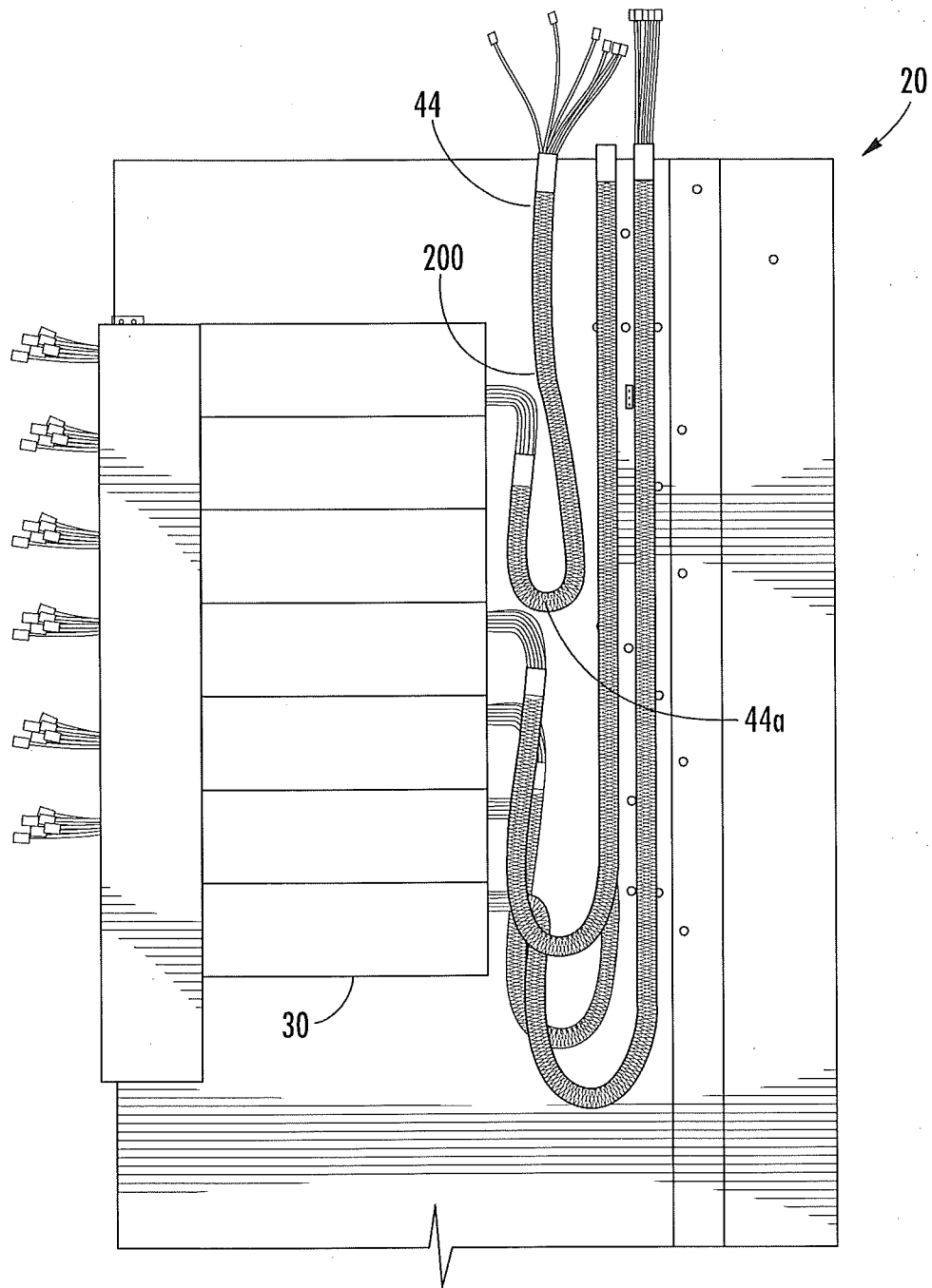


FIG. 4

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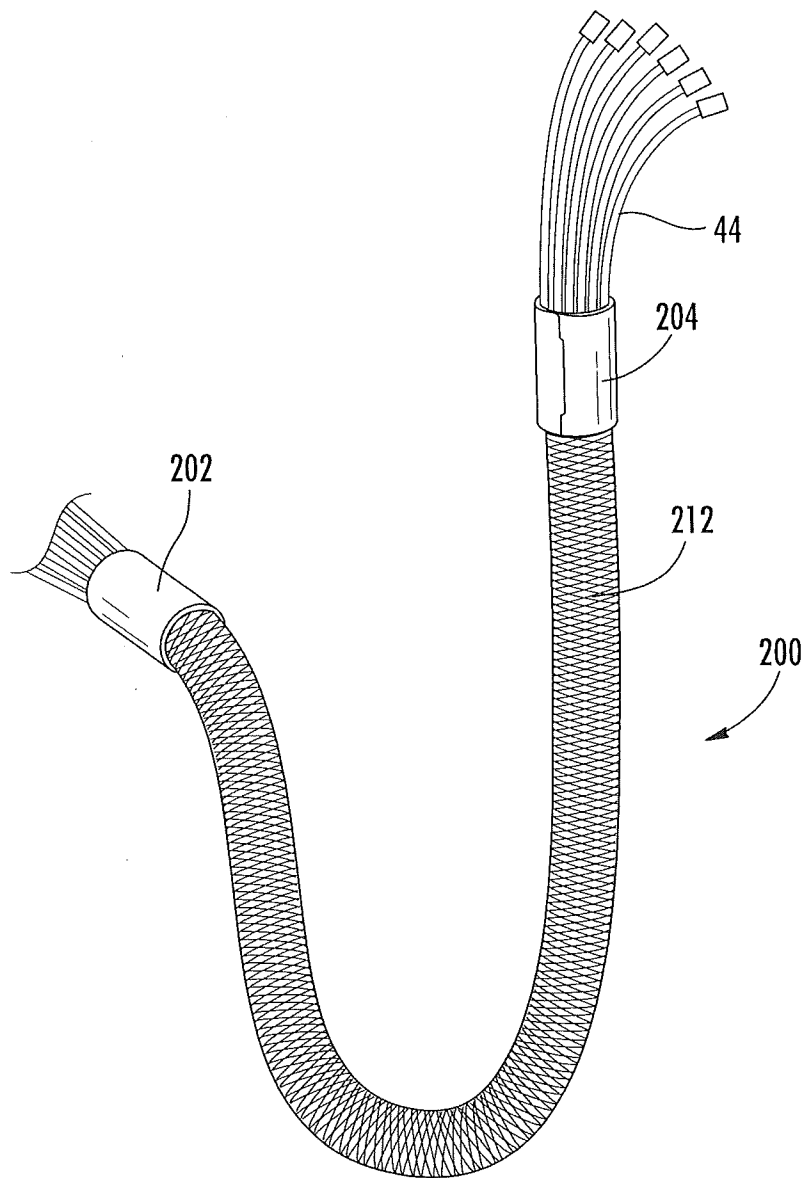


FIG. 5

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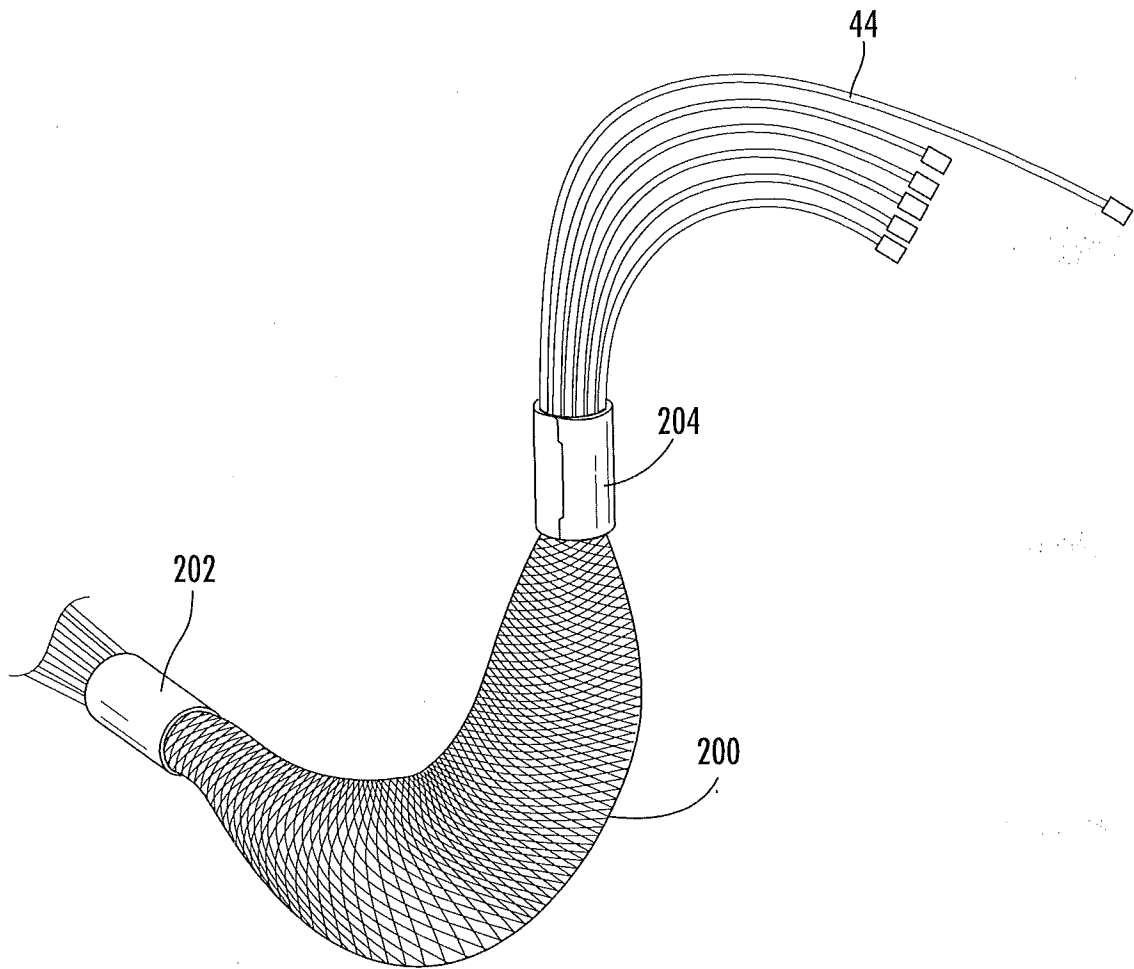
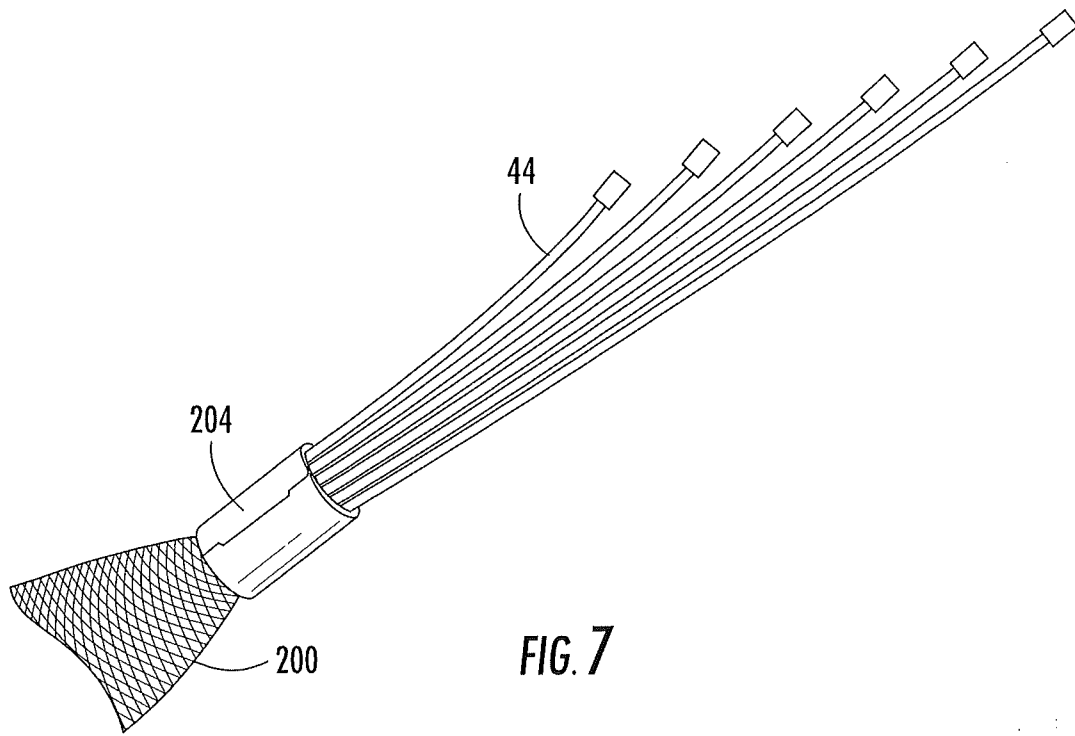
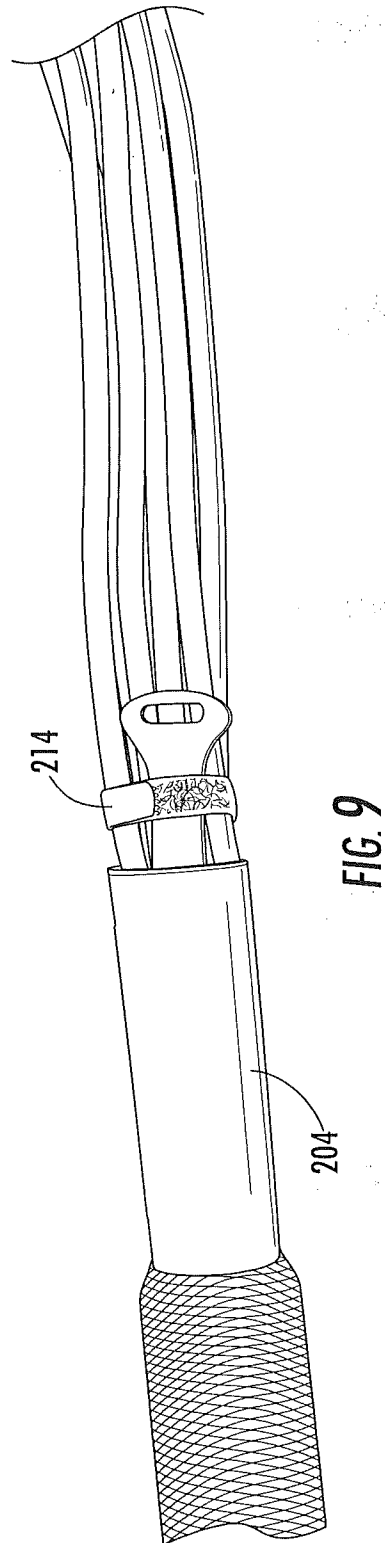
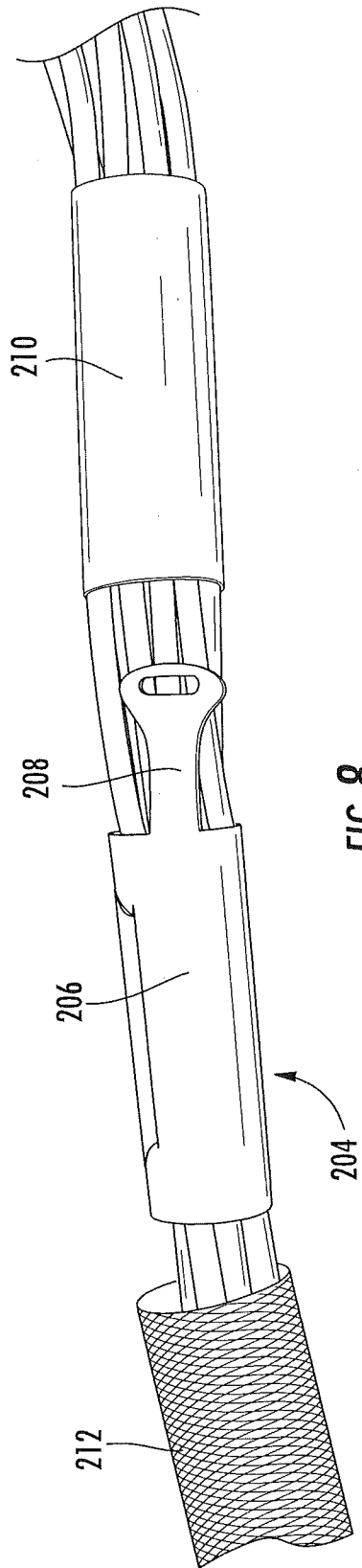


FIG. 6

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/020251

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04Q1/06
ADD.

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)

H04Q G02B H02G A44B B65D

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 practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 934 656 A (CARDER PERRY M [US]) 10 August 1999 (1999-08-10) column 1, lines 21-31	1,3-9, 11-14
Y	US 2005/016617 A1 (SPAIN THOMAS FRANCIS [US]) 27 January 2005 (2005-01-27) paragraphs [0038], [0039]	1,3-9, 11-14



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

27 March 2012

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/020251

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5934656	A	10-08-1999	NONE	

US 2005016617	A1	27-01-2005	NONE	
