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- (71) Applicant: ADC TELECOMMUNICATIOIS, INC.
[US/US]; 1050 Westlakes Drive, Berwyn, PA 19312 (US).
- (72) Inventor: OTT, Michael, James; 800 Walnut Place #106,
Chaska, MN 55318 (US).
- (74) Agent: BRUESS, Steven, C.; Merchant & Gould P.C.,
P.O. Box 2903, Minneapolis, MN 55402-0903 (US).
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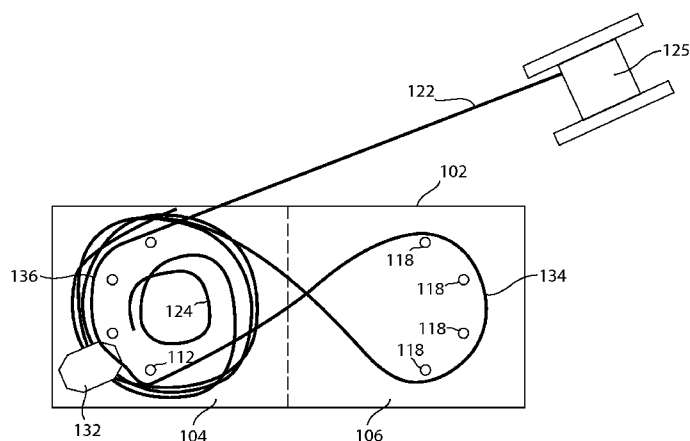


FIG. 7

(57) **Abstract:** A method of packing a plurality of lengths of cable includes routing a first length of cable around a first guide that extends from a first half of a packing system base. A second length of cable is routed around a second guide that extends from a second half of the packing system base. A third length of the cable is routed around the first guide such that the third length of cable is located on the first length. The second half of the packing system base is then folded onto the first half, such that the second length of cable is deposited on top of the third length of cable, around the first guide. The second half is then unfolded from the first half such that the first length of cable, the second length of cable, and the third length of cable form a first cable loop.

Cable Packing Systems and Methods

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is being filed on 29 August 2013, as a PCT International Patent application and claims priority to U.S. Patent Application Serial No.

- 5 61/695,861 filed on 31 August 2012, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

- Various types of cables are used in building trades, information technology systems, or other applications to provide necessary or desired service to locations
- 10 within a building or other structure. These cables may include fiber optic cables, coaxial cables, phone cables, electrical power cables, etc. These cables are manufactured in bulk lengths and stored on cable reels that are too large to be easily manipulated in the field. For example, a bulk reel of cable may weigh hundreds of pounds and store many hundreds of feet of cable. Due to the size of these reels,
- 15 however, shorter lengths of cable must be transferred to some type of field device, such as a smaller reel or discrete coil that is then brought into the field. The cables used in the field, however, must be stored so as to resist tangling and kinking. Typically, cable is unspooled from a cable reel and stacked in a repeated overlapping pattern (in a so-called "figure 8"). Using this pattern helps reduce or
- 20 eliminate twisting and kinking in the unspooled cable, but the completed stack of cable can be large and unwieldy.

SUMMARY

- In one aspect, the technology relates to a method of packing a plurality of
- 25 lengths of a cable, the method including: routing a first length of the cable around a first guide, wherein the first guide extends from a first half of a packing system base; routing a second length of the cable around a second guide, wherein the second guide extends from a second half of the packing system base; routing a third length of the cable around the first guide such that the third length of the cable is located on
- 30 the first length of the cable; folding the second half onto the first half, such that the

second length of the cable is deposited on top of the third length of the cable, around the first guide; and unfolding the second half from the first half, wherein the first length of the cable, the second length of the cable, and the third length of the cable form a first cable loop. In another aspect, the technology relates to a bundle of cable
5 arranged in a folded figure eight pattern using the above method.

A cable storage system including: a foldable base comprising a first half and a second half, wherein the first half and the second half are joined at a hinge; a first guide extending from the first half; a second guide extending from the second half; and a separation element detachably secured to the first half, wherein the separation
10 element is adapted to separate a plurality of loops of a cable.

These and other features and advantages will be apparent from a reading of the following detailed description and a review of the associated drawings. It is to be understood that both the foregoing general description and the following detailed description are explanatory only and are not restrictive of the broad aspects of the
15 disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

There are shown in the drawings, embodiments which are presently preferred, it being understood, however, that the technology is not limited to the
20 precise arrangements and instrumentalities shown.

FIG. 1 is a top view of a cable packing system.

FIGS. 2-11 depict a method of packing cable using the cable packing system of FIG. 1.

FIGS. 12-14 depict a method of packing cable using a cable packing system.

25 FIG. 15 depicts a method of packing cable.

FIGS. 16-18 depict cable packing systems.

DETAILED DESCRIPTION

Reference will now be made in detail to the exemplary aspects of the present
30 disclosure that are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like structure.

FIG. 1 is a top view of a cable packing system 100 that may be placed on a flat surface (table, floor, etc.) during a cable packing process. The system 100

includes a foldable base 102 having a first half 104 and a second half 106. The first half 104 and the second half 106 are joined by or at a hinge 108. The hinge 108 may be a discrete element or elements that join the two halves 104, 106 together.

Alternatively, the halves 104, 106 may be integrally formed with the hinge 108

5 connecting the halves 104, 106. In that case, the hinge 108 may be a foldable portion of the base 102 that enables the two halves 104, 106 to be folded towards each other. A first cable guide 110 extends from the first half 104. In this embodiment, the cable guide 110 is a plurality of first pegs 112. These first pegs 112 are arranged evenly about a central point 114, such that the radius from the
10 central point 114 to each first peg 112 is substantially the same. In this case, the pattern of the first pegs 112 defines a portion of a circle having an outer diameter of about 20 inches. Other peg patterns, layouts, and spacings are contemplated. Similarly, a second cable guide 116 extends from the second half 106. In this embodiment, the cable guide 116 is a plurality of second pegs 118. These second
15 pegs 118 are arranged evenly about a central point 120, such that the radius from the central point 120 to each second peg 118 is substantially the same. In the depicted embodiment, the second pegs 118 are shorter than the first pegs 112, but this is not required. The taller first pegs 112 allow a larger number of loops of cable to be stacked on the first half 104, as described below.

20 In the depicted embodiment, the first pegs 112 and the second pegs 118 are substantially similar mirror images of each other, which allow them to align then the second half 106 is folded onto the first half 104, as described below. While this is not required, such a layout may be advantageous during packing of a cable 122. The cable 122 is unspooled from a bulk reel 125 that may be located at the factory where
25 the cable was manufactured, or at a service provider facility (such as a warehouse or distribution center for a service provider). By unspooling the cable 122 and packing it with the cable packing system 100 as described below, manageable lengths of cable 122 may be brought easily into the field for installation. The length of cable stacked in accordance with the methods described herein resists twisting and kinking
30 but is maintained in a more compact stack than previously available.

FIGS. 2-11 depict a method of packing a cable 122 using the cable packing system 100 of FIG. 1. The accompanying text describes a plurality of lengths of a cable that are packed using the cable packing system 100 of FIG. 1. The term "lengths," as used herein, refer to portions of the cable and is simply used for

reference and for clarity in the following description and figures. In the depicted method, the lengths are portions of a single, unitary cable 122, although the method described herein may be used to pack cables that are comprised of discrete lengths of cable joined at connectors. Additionally, the systems and methods described
5 herein may be used in conjunction with cables that include multiple parallel components, for example, dual coaxial cable and other types of dual cable (e.g., speaker wire).

FIG. 2 depicts a first step of the method of packing the cable 122 with the cable packing system 100. The cable 122 includes an end portion 124 that includes
10 a free end of the cable 122. The end portion 124 is placed on the first half 104 of the base 102, either loosely as depicted, or the end portion 124 may be looped around one or more of the first pegs 112. FIG. 3 depicts a next step of the method of packing the cable 122. Here, a first length 126 of the cable 122 is routed around the first pegs 112. Of course, the first length 126 may be wrapped closer to or taut to
15 the first pegs 112. Here, it is shown spaced from the first pegs 112 for clarity. FIG. 4 depicts a next step of the method, where a second length 128 of the cable 122 (here, the length of the cable next rolled out from the reel 125 after the first length 126) is routed around the second pegs 118 and placed on the second half 106. Thereafter, a third length 130 of the cable 122 is then routed around the first pegs
20 112, such that it rests on top of the first length 126 of the cable 122. The third length 130 of the cable 122 is routed so as to cross over the previously-laid length of cable, generally between the second pegs 118 the first pegs 112, in a so-called "figure 8 pattern."

FIG. 5 depicts a next step, where the second half 106 of the base 102 is lifted
25 and placed on top of the first half 104. In the depicted figure, this is done by folding the base 102 along the hinge 108. The result of this folding action is depicted in FIG. 6, once the second half 106 is unfolded from the first half 104. As can be seen, due to the folding action, the second length 128 is now deposited on top of the third length 130, and the second pegs 118 once again have no length of the cable 122
30 routed there around. The first coil or loop of cable 122 now located on the first half 104 may be temporarily restrained against movement. In one embodiment, a weight such as a bean bag 132 may be placed on the coil to hold it in position. The system is now ready for another portion of the cable 122 to be routed for packing, as depicted in FIG. 7. There, a fourth length 134 of the cable 122 is routed about the

second pegs 118, as described previously. The cable 122 is then crossed over the fourth length of cable 134 and a fifth length 136 of the cable 122 is routed around the first pegs 112. In this way, the fifth length is deposited on the second length 128 of the cable 122. In the depicted embodiment, the fifth length 136 of the cable 122 is not placed under the bean bag 132, but may be if desired.

FIG. 8 depicts a next step, where the second half 106 is again lifted and placed on top of the first half 104, by folding the base 102 along the hinge 108. The result of this folding action is depicted in FIG. 9, once the second half 106 is unfolded from the first half 104. As can be seen, due to the folding action, the fourth length 134 is now deposited on top of the fifth length 136, and the second pegs 118 once again have no length of the cable 122 routed there around. This second coil or loop of cable 122 now located on the first half 104 may be temporarily restrained against movement with the bean bag 132. The steps depicted above may be repeated for any length of cable desired to be packed. Once the desired amount of cable 122 has been coiled onto the first half 104, the cable 122 may be cut, such that an end portion 124a of the remaining length of the cable 122a now hangs loose from the reel 125. This is depicted in FIG. 10. The multiple coils of the cable 122 may then be bound with one or more ties or bands 138 to form a bundled coil 140. These bands may be plastic zip ties, fabric straps utilizing hook-and-loop fasteners (i.e., VELCOTM fasteners), metal or plastic cabling, or other types of bundling elements. As depicted in FIG. 11, the bundled coil 140 may then be packed into a shipping box 142 for delivery to a field site for installation. This bundled coil 140 is arranged in a folded figure eight pattern that is specific to the devices and methods described herein. In this folded figure eight pattern, each length of cable forming one-half of the figure eight is folded onto the opposing length of cable forming the other half of the figure eight, thus forming a manageable bundled coil 140.

An alternative embodiment of a cable packing system 200 is depicted in FIG. 12. This embodiment includes technology that helps reduce tangling of the loops made during the packing process. The major components of the system 200 are similar to those depicted in the previous embodiment of FIG. 1, and include a base 202 having a first half 204 and a second half 206 joined by a hinge 208. First and second guides are also utilized but are not depicted in this embodiment for clarity. In the depicted embodiment, however, four separation arms 210 are utilized, but a

greater or lesser amount may be used in alternative embodiments. The arms 210 are connected at a first end to the first half 204 of the base 202. These arms 210 may be paper or thin paperboard strips, or other material such as flexible plastic or fabric. During use, the first loop 212 of cable completed and rests on the first half 204 of the base. This first loop 212 is the coil of cable formed after the second half 206 has been folded onto the first half 204. This condition is depicted above in FIG. 6.

Prior to continuing the next step of the cable packing process, the arms 210 are folded over the first loop 212 of cable, as depicted in FIG. 13, with the free ends of the arms 210 directed towards a center of the first half 204. In this way, the arms 210 form a separation between the first loop 212 and a subsequent loop. With the arms 210 still directed towards the center of the first half 204, a second loop 214 is arranged so as to be located on top of the first loop 212. This is the condition depicted in FIG. 9, above. Once the second loop 214 is in place, the arms 210 are folded over the second loop 214, such that they are now directed away from the center of the first half 204, as depicted in FIG. 14. This process of forming loops separated by the bands 210 may continue until the required or desired number of loops have been arranged on the base 202. Each fold of the bands 210 separate each of the loops in the coil, thus helping to reduce or eliminate cable tangling during uncoiling. Once the desired number of loops have been obtained, the arms 210 may be disconnected from the base 202 such that they remain in place between the loops once the coil of cable is removed from the first half 204.

FIG. 15 depicts a method of packing cable 300 unreel from a cable reel, with the systems depicted herein. The method 300 includes routing a first length of cable around a first guide (Step 302). Thereafter, a second length of cable is routed around a second guide (Step 304). Continuing to unreel the cable, a third length of cable is crossed over the second length of cable, so as to form a looped figure 8 (Step 306). The third length of cable is then routed around the first guide (Step 308), such that it is deposited on the first length of cable. At this time, a second half of the cable packing system may be folded onto the first half (Step 310). This deposits the second length of cable onto the third length of cable. Thereafter, the second half of the packing system is unfolded (Step 312) and a first loop of cable revealed. If separation elements (such as the bands depicted in FIGS. 12-14) are utilized (Step 314), the elements may be folded over the first loop of cable (Step 316). If required, one or more weights may also be used to hold the first loop in

place while the steps are repeated. To repeat the process, a fourth length of cable is wrapped around the second guide (that is, the method returns to Step 304) and the process continues with fourth and fifth lengths of cable. The packing system is again folded and unfolded to form a second loop which may be separated by the
5 separation elements, and the process repeated with sixth and seventh lengths of cable. This process continues until the desired amount of cable has been packed.

FIGS. 16-18 depict packing systems 400 having a different configurations of guides. FIG. 16 depicts first 402 and second guides 404 that include a unitary curved element. FIG. 17 depicts first 406 and second 408 guides that include a
10 plurality of wide wall elements. In both figures, the first and second guides are substantially mirror images of each other. Mirrored or matched guides are not required, however, as depicted in FIG. 18, where the first guide 410 is the unitary curved element of FIG. 16, and the second guide 412 includes a plurality of pegs.

The packing system may be manufactured of materials typically used in the
15 field of cable storage and distribution, for example cardboard, paper board, plastics, etc. Systems manufactured from such materials may also be utilized to pack the finished coil upon completion for shipping. Alternatively, the packing system may be manufactured of wood, thin metal, or a wire mesh. The guide elements may be manufactured from materials similar to those used in the base of the packing system,
20 although more robust materials such as metal or hard plastic may be more desirable to resist deflection of the guides during use.

While there have been described herein what are to be considered exemplary and preferred embodiments of the present technology, other modifications of the technology will become apparent to those skilled in the art from the teachings
25 herein. The particular methods of manufacture and geometries disclosed herein are exemplary in nature and are not to be considered limiting. It is therefore desired to be secured in the appended claims all such modifications as fall within the spirit and scope of the technology. Accordingly, what is desired to be secured by Letters Patent is the technology as defined and differentiated in the following claims, and all
30 equivalents.

CLAIMS

1. A method of packing a plurality of lengths of a cable, the method comprising:
 - routing a first length of the cable around a first guide, wherein the first guide extends from a first half of a packing system base;
 - routing a second length of the cable around a second guide, wherein the second guide extends from a second half of the packing system base;
 - routing a third length of the cable around the first guide such that the third length of the cable is located on the first length of the cable;
 - folding the second half onto the first half, such that the second length of the cable is deposited on top of the third length of the cable, around the first guide; and
 - unfolding the second half from the first half, wherein the first length of the cable, the second length of the cable, and the third length of the cable form a first cable loop.
2. The method of claim 1, further comprising crossing a portion of the third length of the cable over a portion of the second length of the cable.
3. The method of claim 2, further comprising:
 - after forming the first cable loop, routing a fourth length of the cable around the second guide;
 - routing a fifth length of the cable around the first guide such that the fifth length of the cable is located on the first cable loop;
 - folding the second half onto the first half, such that the fourth length of the cable is deposited on top of the fifth length of the cable, around the first guide; and
 - unfolding the second half from the first half, wherein the fourth length of the cable and the fifth length of the cable form a second cable loop.
4. The method of claim 3, further comprising:
 - after forming the second cable loop, routing a sixth length of the cable around the second guide;
 - routing a seventh length of cable around the first guide such that the seventh length of the cable is located on the second cable loop;

folding the second half onto the first half, such that the sixth length of the cable is deposited on top of the seventh length of the cable, around the first guide; and

unfolding the second half from the first half, wherein the sixth length of the cable and the seventh length of the cable form a third cable loop.

5. The method of claim 1, wherein the first guide comprises a first plurality of pegs extending substantially orthogonally from the first half.

6. The method of claim 5, wherein the second guide comprises a second plurality of pegs extending substantially orthogonally from the second half, wherein the second pegs are shorter than the first pegs.

7. The method of claim 5, wherein the first plurality of pegs are spaced evenly from a central point.

8. The method of claim 7, wherein the first plurality of pegs are each located at a distance of about 20 inches from the central point.

9. The method of claim 1, wherein the first guide and the second guide comprise substantially mirror-image structures located on opposite sides of a hinge connecting the first half and the second half.

10. The method of claim 3, further comprising restraining the first length of the cable, the second length of the cable, and the third length of the cable while routing the fourth length of the cable and the fifth length of the cable.

11. The method of claim 1, further comprising binding together the first length of the cable, the second length of the cable, and the third length of the cable.

12. The method of claim 3, further comprising placing a separation element on the first cable loop, prior to routing the fifth length of the cable.

13. A bundle of cable arranged in a folded figure eight pattern using the method of claim 1.
14. A cable storage system comprising:
 - a foldable base comprising a first half and a second half, wherein the first half and the second half are joined at a hinge;
 - a first guide extending from the first half;
 - a second guide extending from the second half; and
 - a separation element detachably secured to the first half, wherein the separation element is adapted to separate a plurality of loops of a cable.
15. The system of claim 14, wherein the first guide comprises a first plurality of pegs extending substantially orthogonally from the first half.
16. The system of claim 15, wherein the second guide comprises a second plurality of pegs extending substantially orthogonally from the second half, wherein the second pegs are shorter than the first pegs.
17. The system of claim 15, wherein the first plurality of pegs are spaced evenly from a central point.
18. The system of claim 15, wherein the first plurality of pegs are each located at a distance of about 20 inches from the central point.
19. The system of claim 14, wherein the first guide and the second guide comprise substantially mirror-image structures located on opposite sides of the hinge.

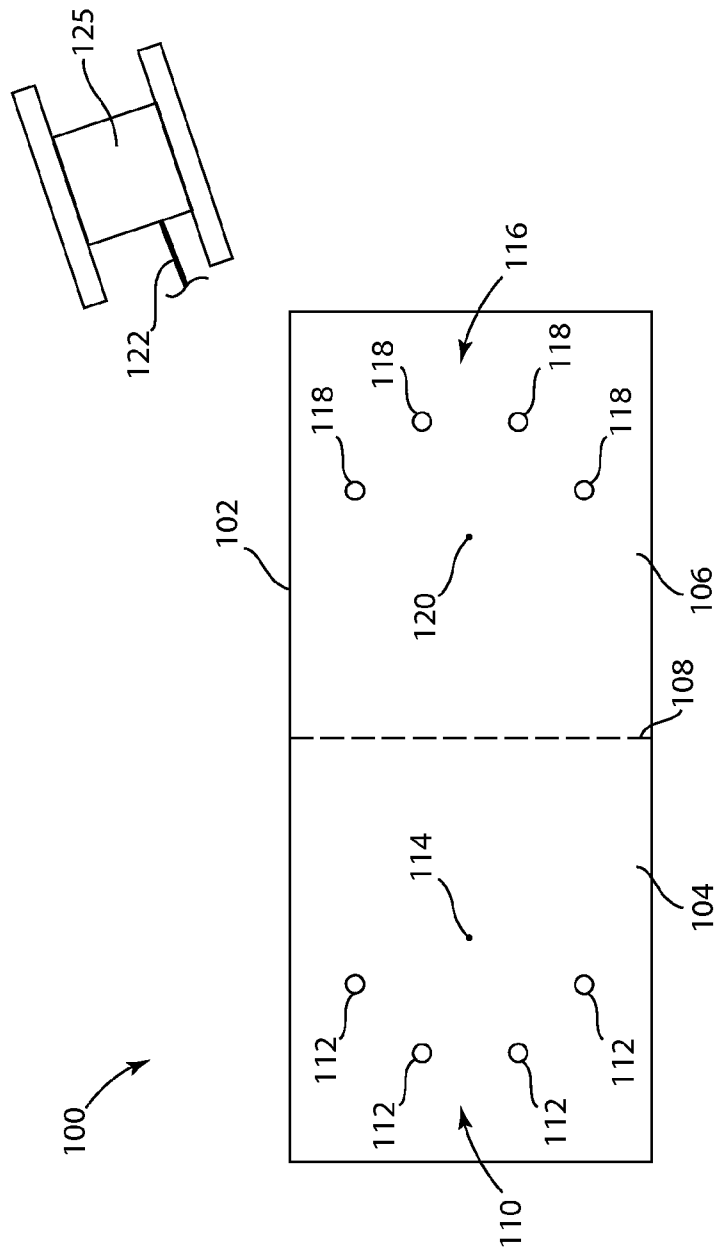


FIG. 1

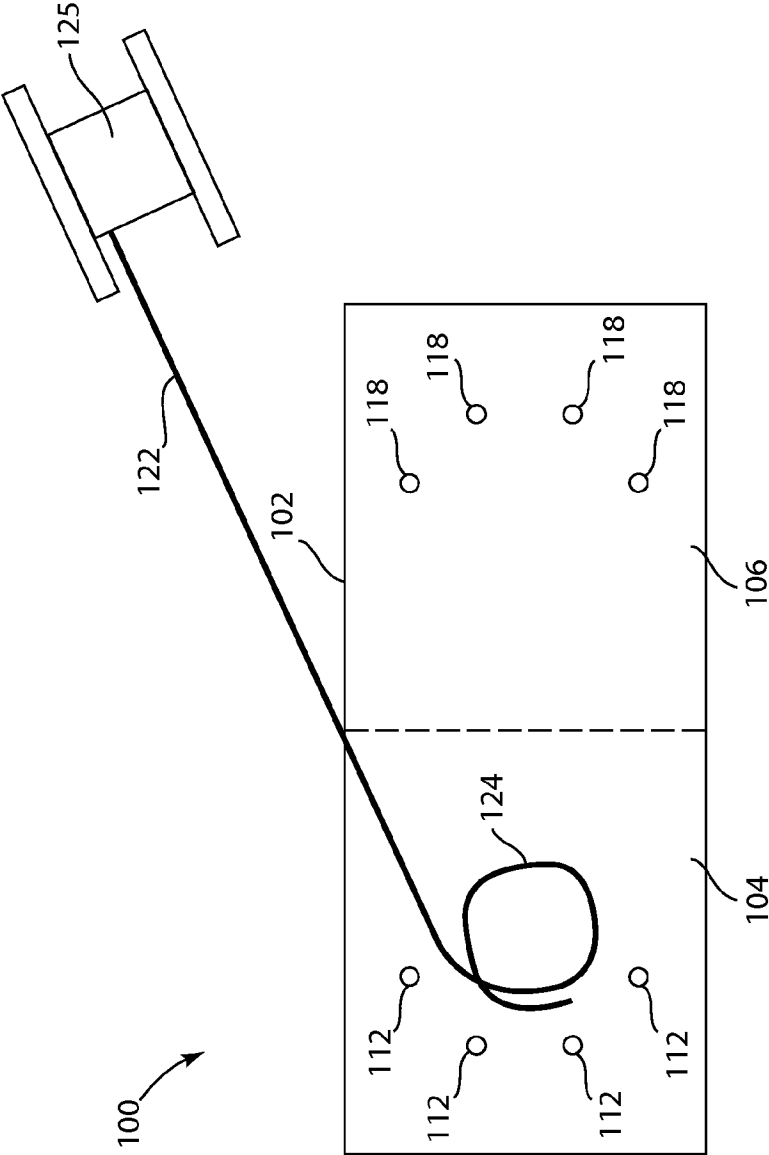


FIG. 2

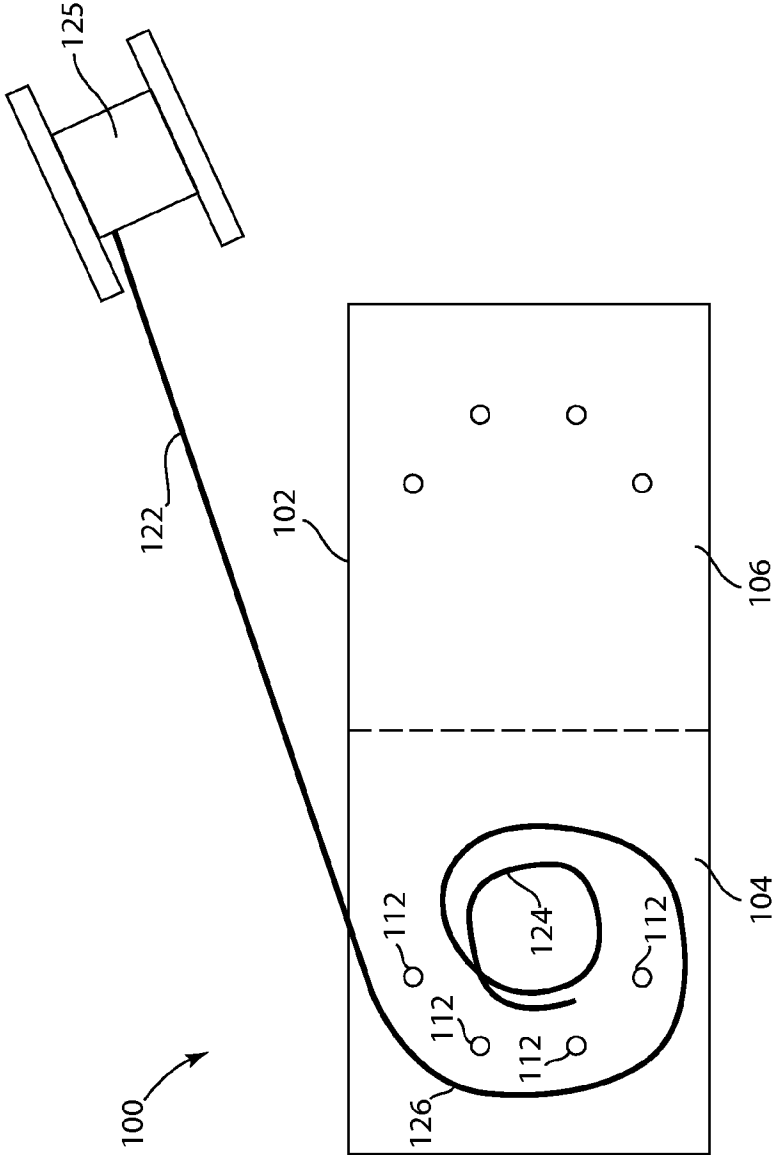


FIG. 3

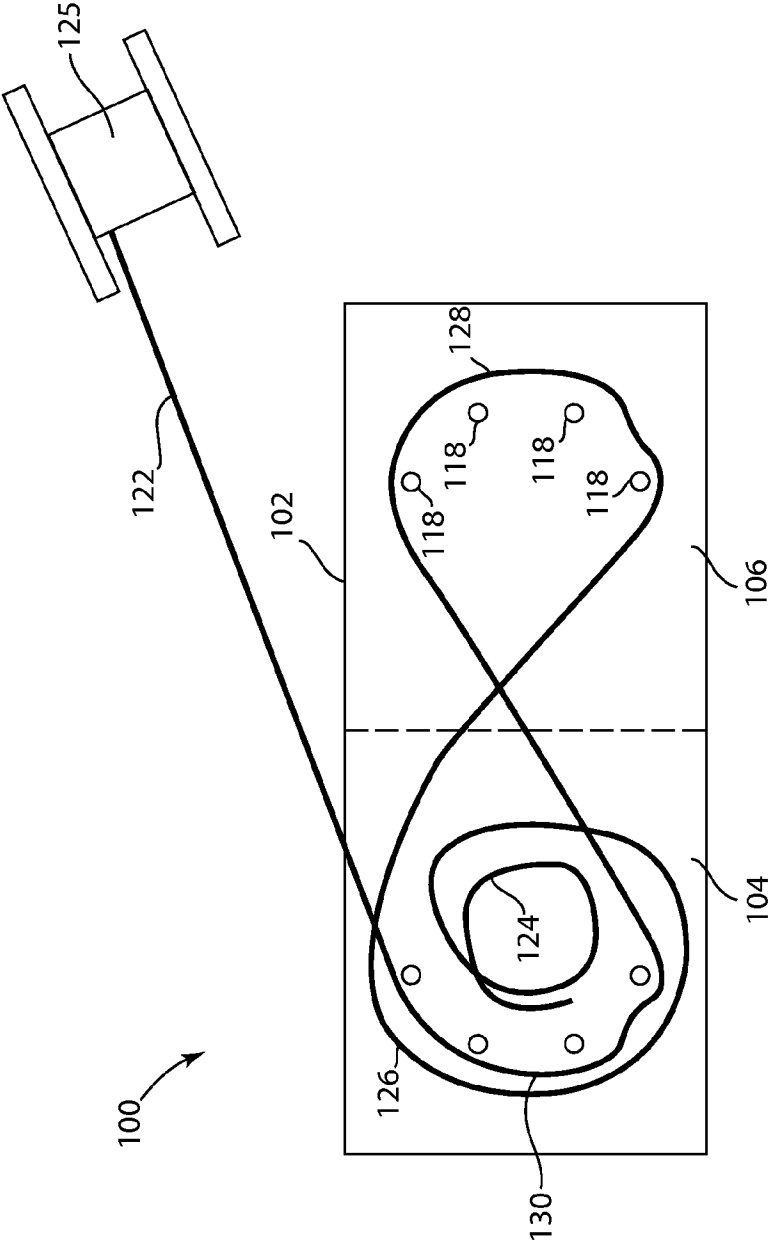


FIG. 4

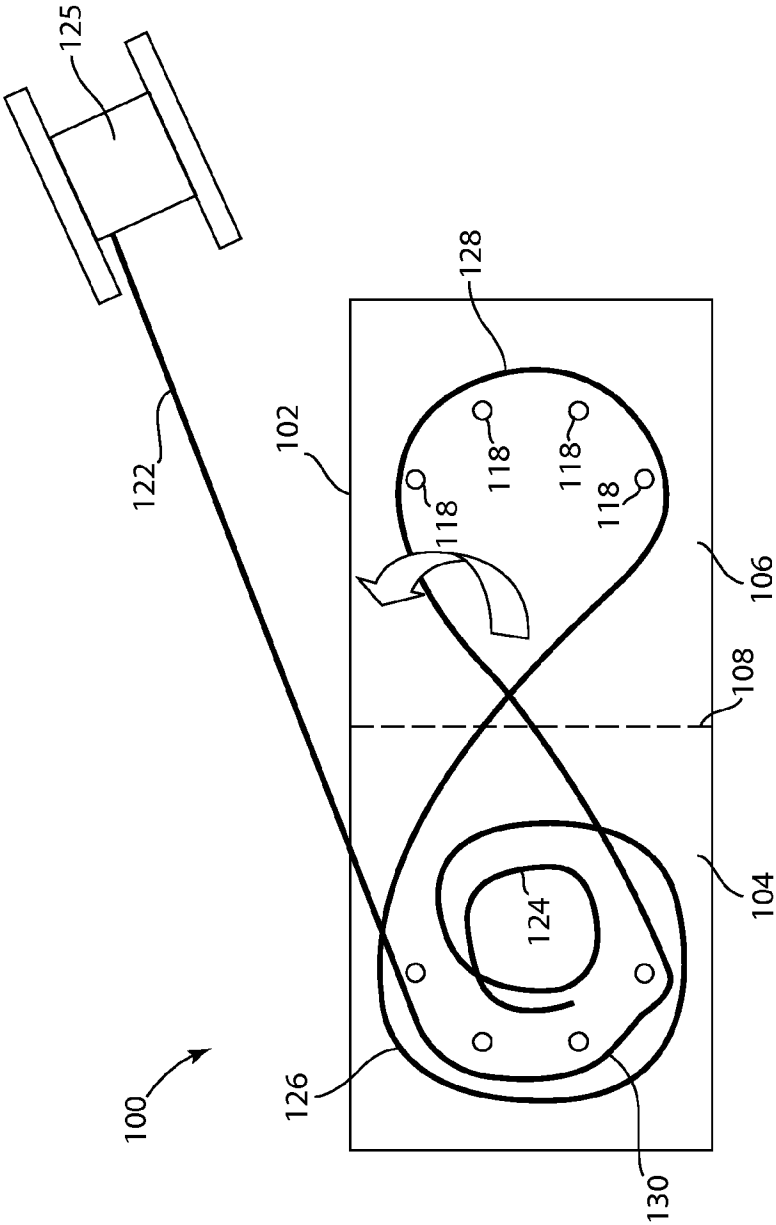


FIG. 5

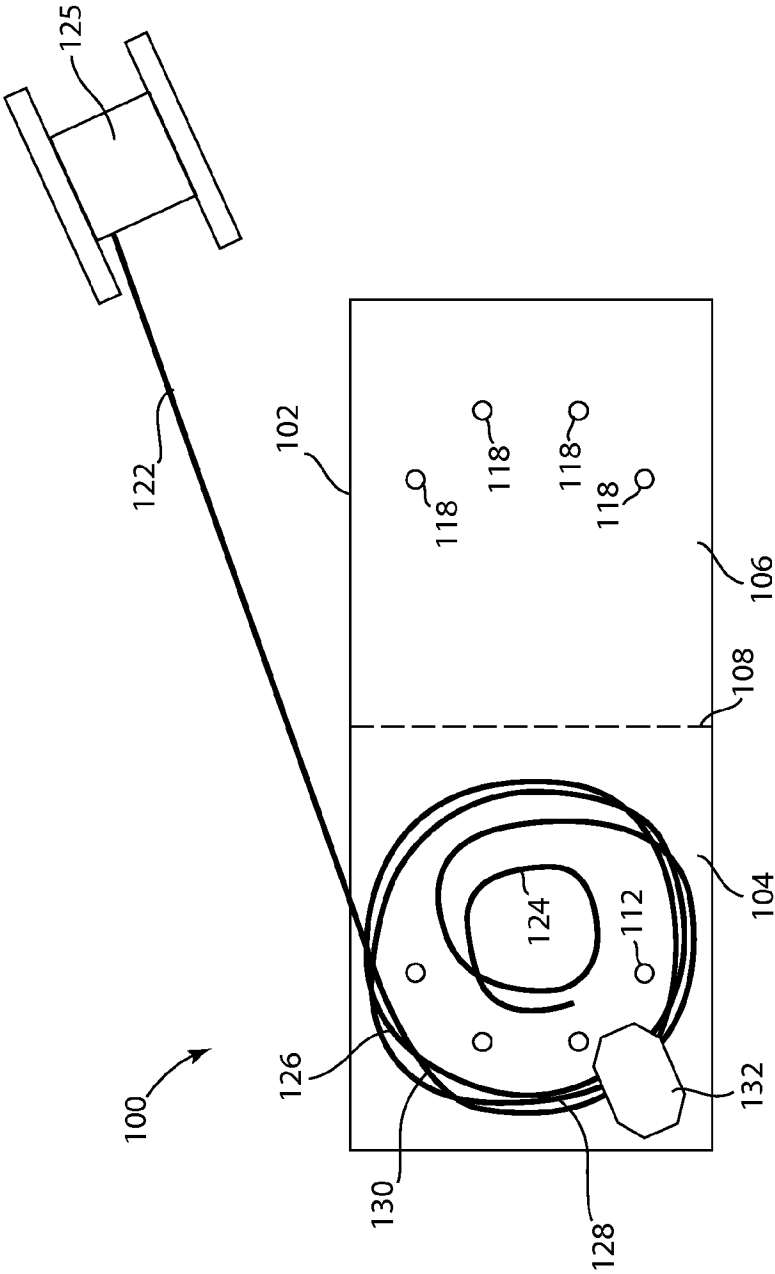


FIG. 6

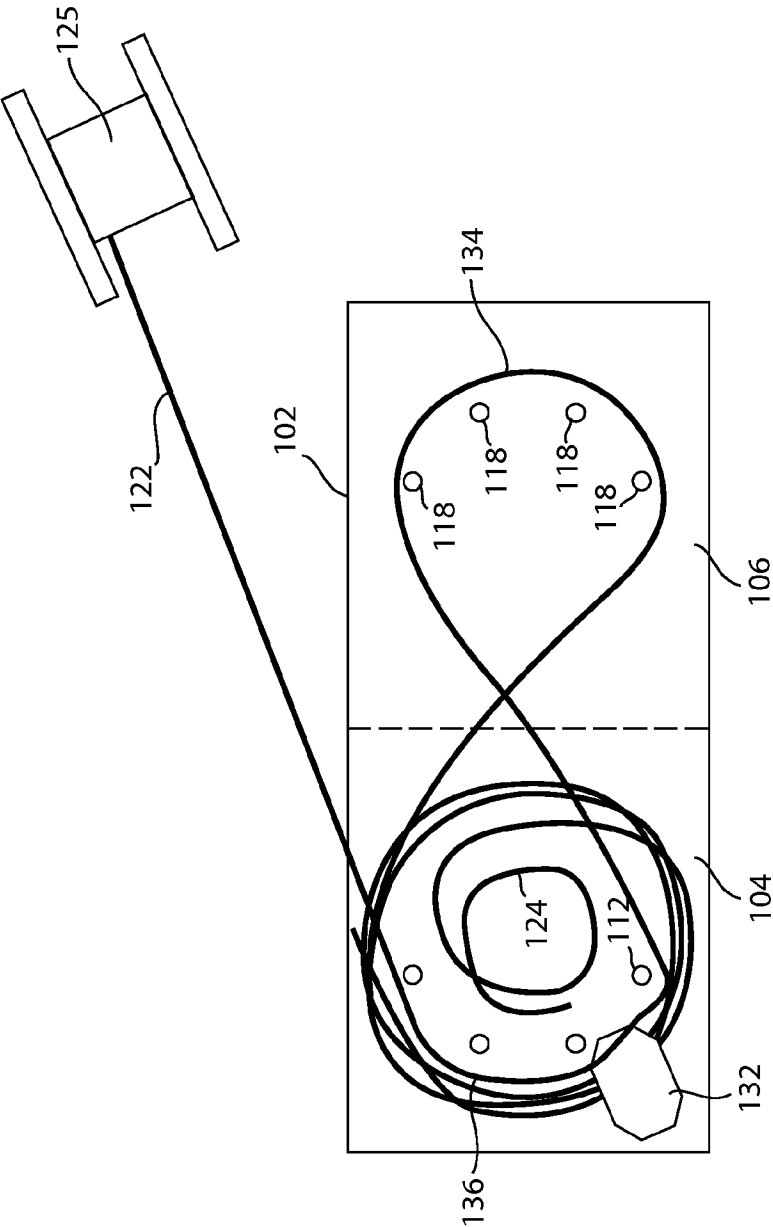


FIG. 7

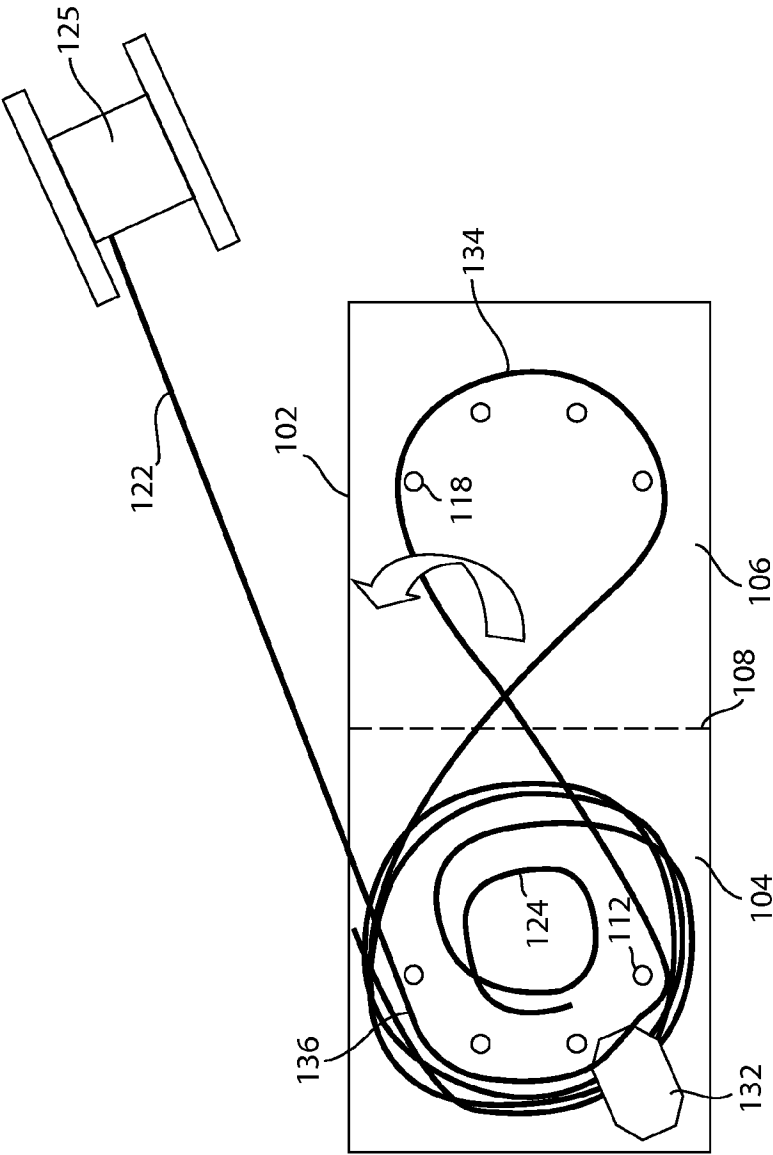


FIG. 8

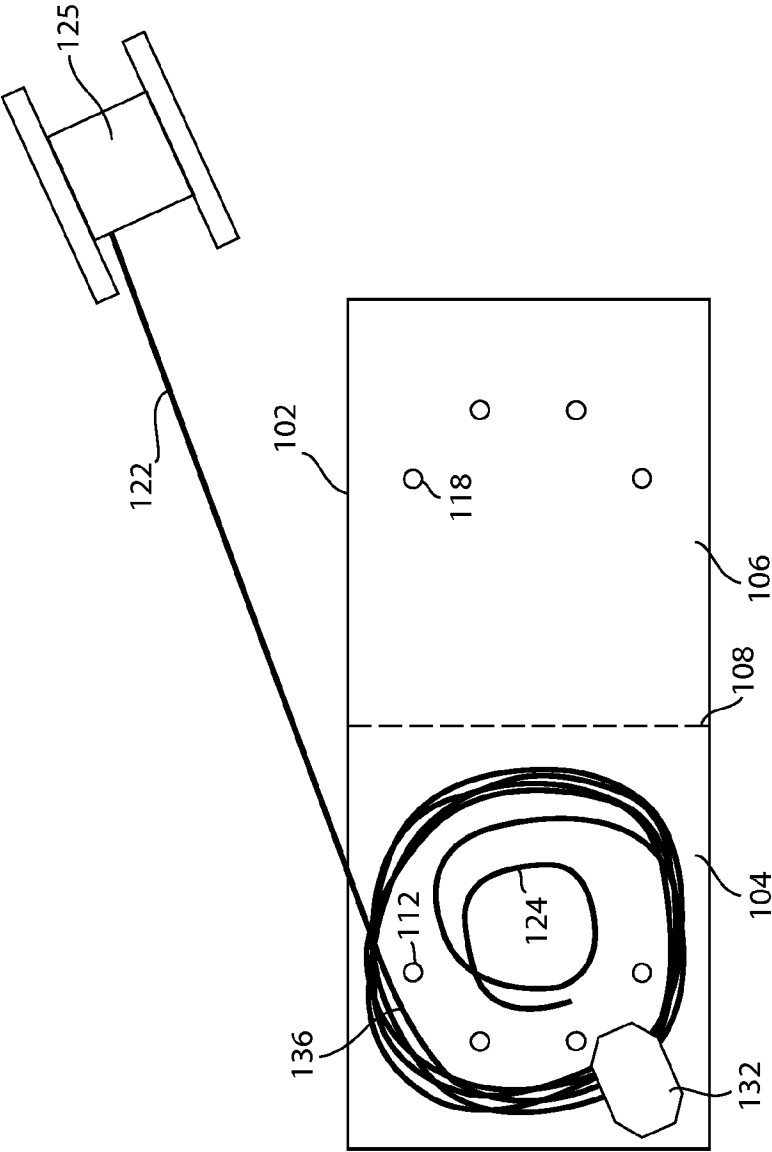


FIG. 9

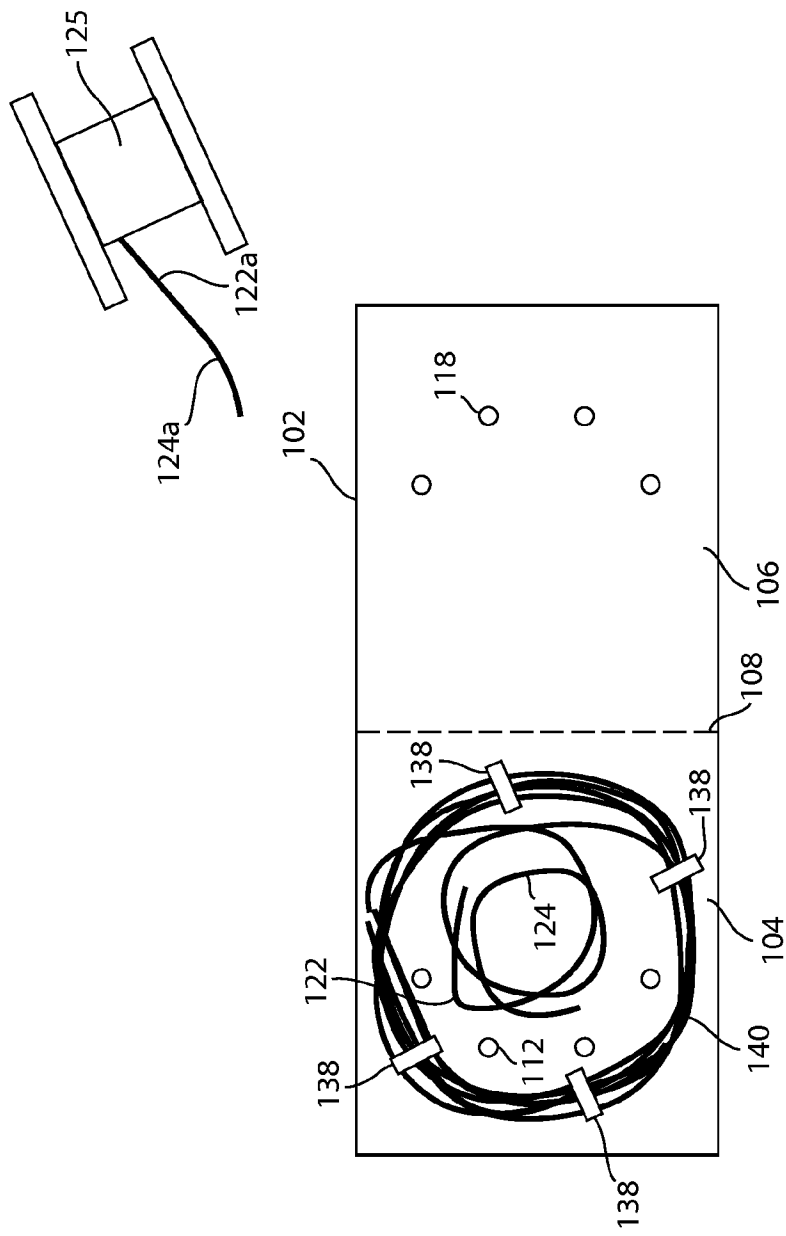


FIG. 10

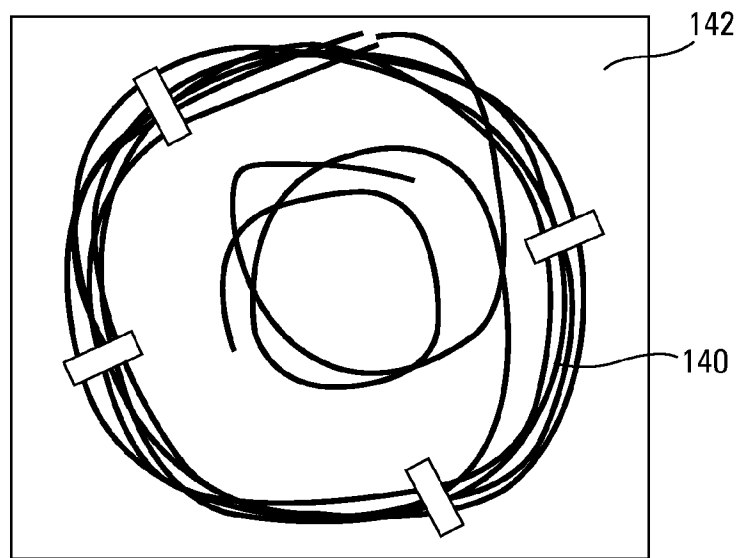


FIG. 11

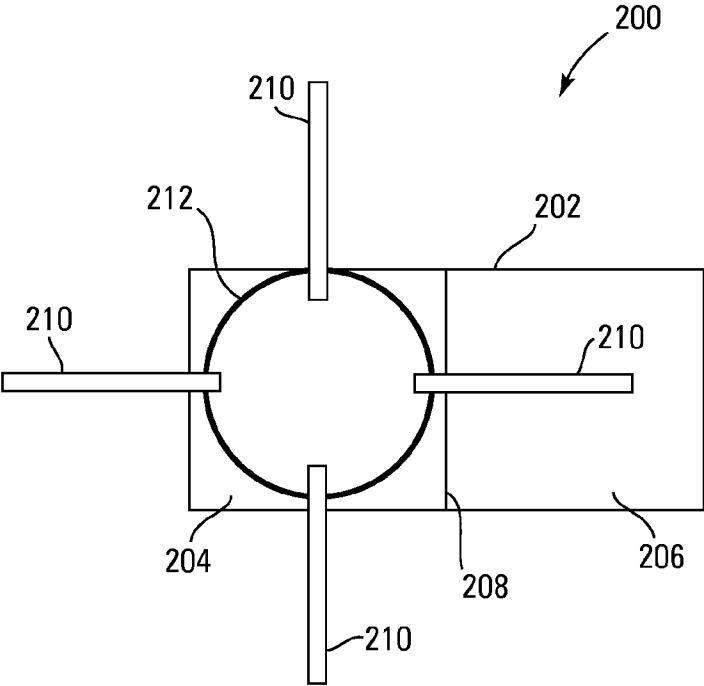


FIG. 12

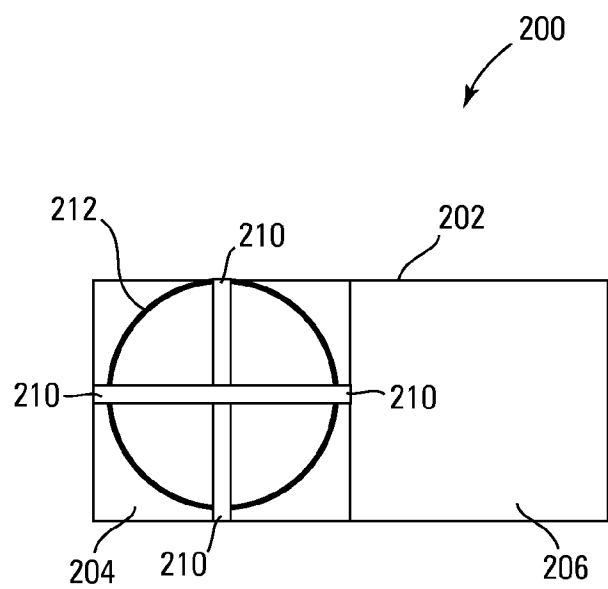


FIG. 13

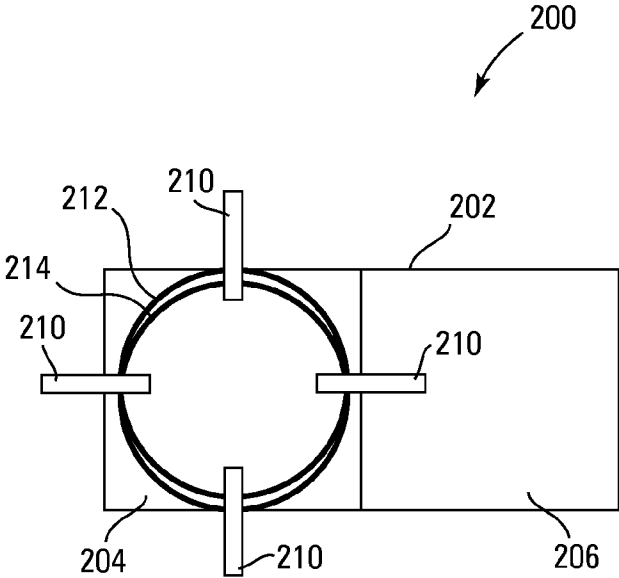
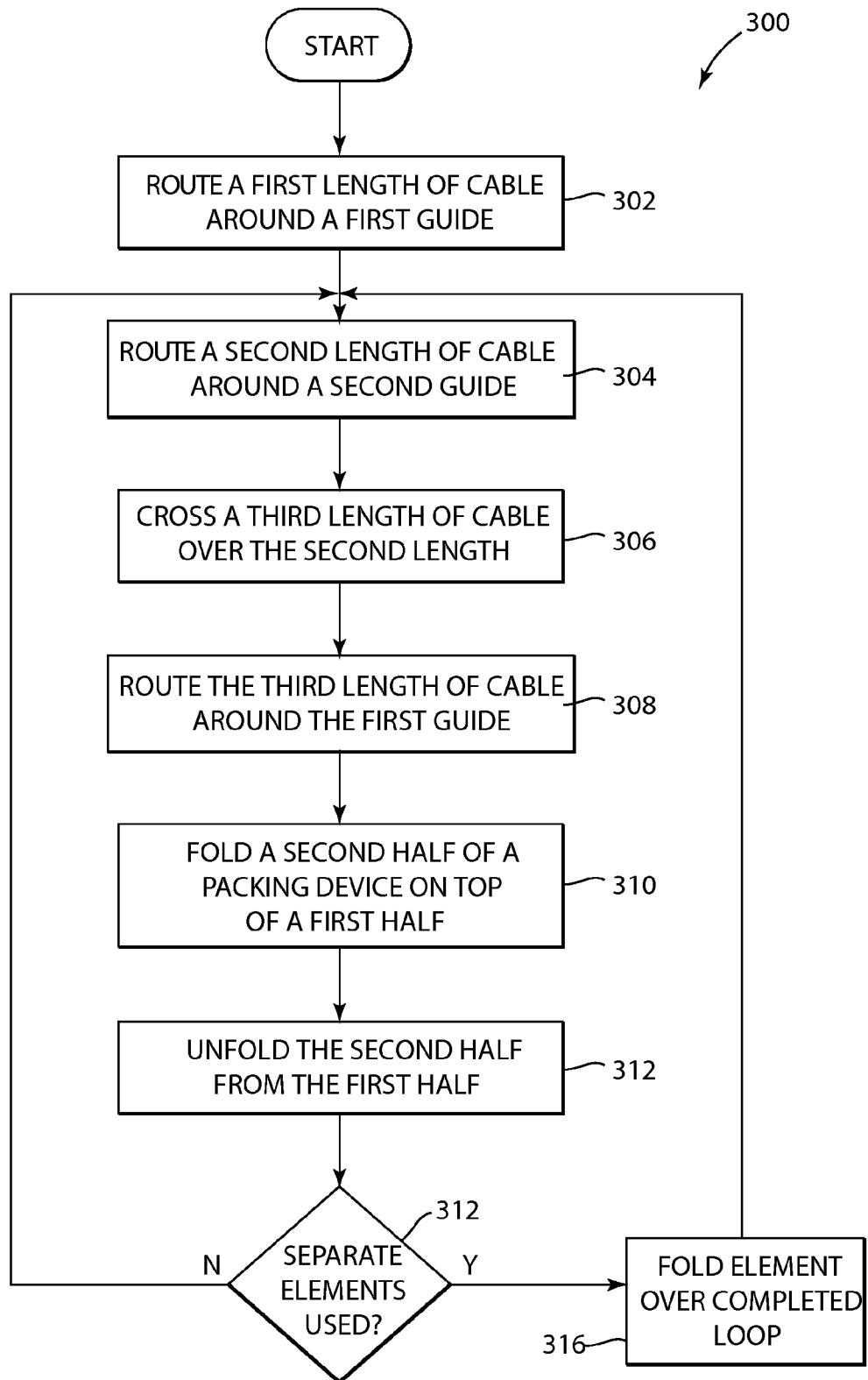


FIG. 14

15/16

**FIG. 15**

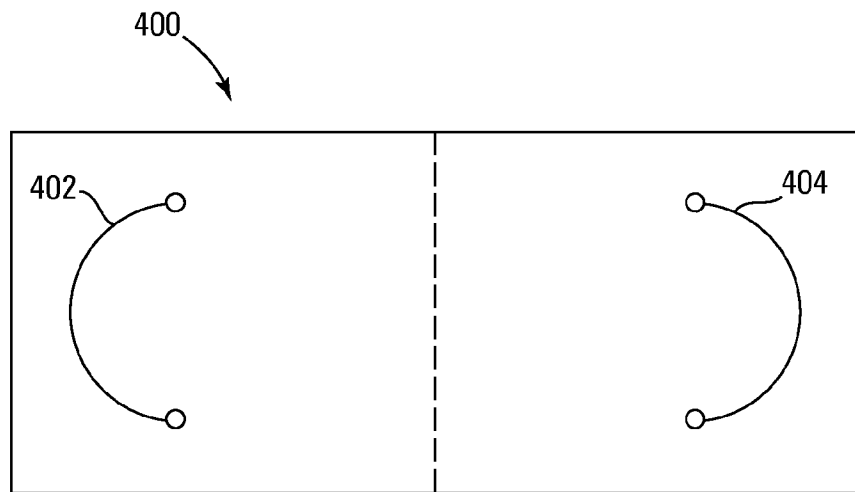


FIG. 16

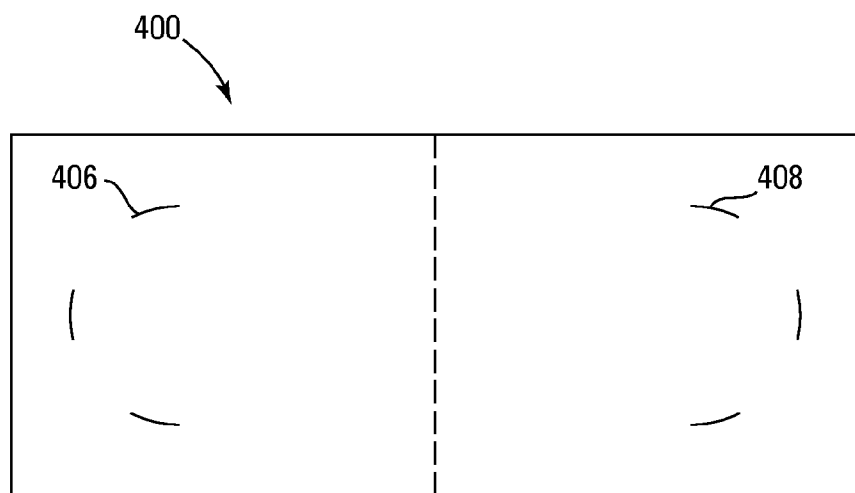


FIG. 17

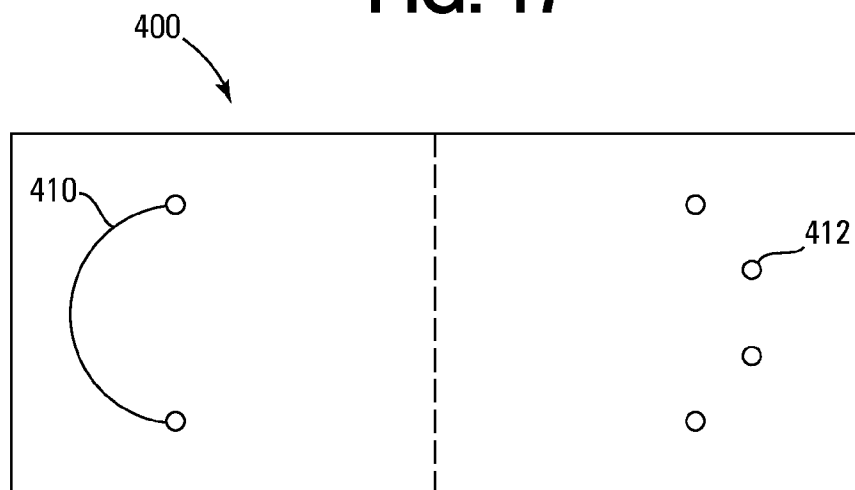


FIG. 18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/057343**A. CLASSIFICATION OF SUBJECT MATTER****B65D 85/04(2006.01)i, B65D 73/00(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)

B65D 85/04; B65B 63/04; B65B 67/00; B65D 85/00; B65D 85/60; B65D 85/62; B65H 75/20; B65D 73/00

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, wire, pack, fold, overlap, rout, and wind

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2010-265069 A (MIRAI IND. CO., LTD.) 25 November 2010 See abstract, paragraphs [0007],[0010], claim 1, and figure 1.	1-19
A	JP 2005-001760 A (KANIYOSHI, TOMOKICHI) 06 January 2005 See abstract, paragraph [0017], claims 1,2, and figures 2,4,17.	1-19
A	US 5005694 A (DAVIS et al.) 09 April 1991 See abstract, column 2, line 65 - column 3, line 11, claim 6, and figures 1,7.	1-19
A	US 5129514 A (LILLEY, JR., THOMAS F.) 14 July 1992 See abstract, column 5, lines 3-31, claim 1, and figures 2A-2C,9.	1-19
A	US 4572370 A (CEDENBLAD et al.) 25 February 1986 See abstract, column 2, lines 27-43; claim 2, and figures 1-3.	1-19



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City,
302-701, Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

CHOI, Hyun Goo

Telephone No. +82-42-481-8288



INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2010-265069 A	25/11/2010	None	
JP 2005-001760 A	06/01/2005	None	
US 5005694 A	09/04/1991	US 4895249 A US 4979352 A	23/01/1990 25/12/1990
US 5129514 A	14/07/1992	None	
US 4572370 A	25/02/1986	EP 0162048 A1 EP 0162048 B1 WO 84-02893 A1	27/11/1985 18/05/1988 02/08/1984