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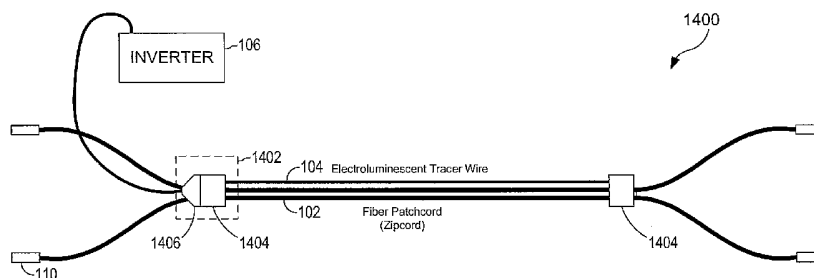
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
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(54) Title: FIBER TRACER PATCH CORD



(57) Abstract: This application provides a connection cable capable of changing states of appearance over a portion of its length in response to operator selection or stimulus. In one embodiment, at least one illuminating wire is attached to the connection cable for a portion of its length. In one embodiment, at least one illuminating wire is embedded in the connection cable. When the illuminating wire is connected to a power supply, the illuminating wire illuminates for the portion of the length of the connection cable. An interface device on the connection cable provides an electrical connection between the illuminating wire and the power supply. This enables a technician to connect a power supply to the interface device and to follow the illuminating wire to locate the full length of the connection cable.

FIBER TRACER PATCH CORD

CROSS-RELATED APPLICATIONS

This application claims priority from U.S. Provisional Patent Application entitled "FIBER TRACER PATCHCORD" by Gino Pulejo, filed October 13, 2004, Serial Number 60/618,214 and is hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates generally to a fiber tracer patch cord, and more particularly, to a patch cord capable of changing states of appearance over a portion of its length in response to operator selection or stimulus to provide the ability to quickly trace the patch cord.

DESCRIPTION OF THE RELATED ART

In the telecommunications industry patch cords are widely used to connect various pieces of equipment either directly together or through the use of patch panels. There are different types of patch cords such as fiber optic, Ethernet and DSX (Digital Signal Cross-Connect) patch cords. A patch panel is a panel of network ports contained together, usually within a telecommunications closet that allows for the interconnectivity of various devices. A technician can set up and organize these circuits by plugging and unplugging the patch cords.

In telecommunications facilities potentially thousands of patch cords may connect various pieces of equipment or various circuits. When these connections need to be tested or repaired, a technician must identify each patch cord connection to ensure that there is a proper connection. This can be difficult and time consuming

when there are thousands of network ports connected by thousands of patch cords in the telecommunications facility. Conventionally, a technician finds one end of the patch cord and manually traces the patch cord to the other end or network port connection. Accordingly, the technician must pull or tug on the patch cord for the length of the patch cord until the other end is found. This process can ultimately lead to damaged patch cords and/or loosened connections due to the pulling on the patch cord to determine where it terminates. Damaged patch cords or loosened connections lead to signal loss and down time.

Accordingly, a need exists for a patch cord that a technician can relatively easily identify with less risk of damaging the cord, loosening or damaging the cord connections and the like in the process.

SUMMARY OF THE INVENTION

This application discloses a connection cable capable of changing states of appearance over a portion of its length in response to operator selection or stimulus. This connection cable provides the ability to quickly trace the patch cord. In one embodiment, at least one illuminating wire is secured to at least a portion or portions of the connection cable. The illuminating wire can be an electroluminescent wire. When the illuminating wire is stimulated, such as being connected to a power supply, the illuminating wire illuminates. In multiple embodiments, the illuminating wire can be attached in a variety of positions on the connection cable.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIGURE 1 illustrates a fiber patch cord attached to an electroluminescent tracer wire;

FIGURE 2 illustrates a cross-sectional view of the electroluminescent wire, which is attached to the fiber patch cord;

FIGURE 3 illustrates the electroluminescent tracer wire attached to the fiber patch cord;

FIGURE 4 illustrates the electroluminescent tracer wire attached to the fiber patch cord;

FIGURE 5 illustrates the electroluminescent tracer wire attached to the fiber patch cord;

FIGURE 6 illustrates two electroluminescent tracer wires attached to the fiber patch cord;

FIGURE 7 illustrates two electroluminescent tracer wires attached to the fiber patch cord;

FIGURE 8 illustrates two electroluminescent tracer wires embedded in the fiber patch cord;

FIGURE 9A illustrates the electroluminescent tracer wire attached to an Ethernet connection cable;

FIGURE 9B illustrates the electroluminescent tracer wire embedded in the Ethernet connection cable;

FIGURE 10 illustrates a connection circuit comprising the electroluminescent wire and an AC power source;

FIGURE 11 illustrates a connection circuit comprising the electroluminescent wire and an inverter which runs on a battery;

FIGURE 12 illustrates a connection circuit comprising the electroluminescent wire and an inverter which runs on an AC power source;

FIGURE 13 illustrates a connection circuit comprising the electroluminescent wire and an inverter which runs on an AC power source and a chargeable battery;

FIGURE 14A illustrates a fiber patch cord connected to an electroluminescent tracer wire, wherein the electroluminescent tracer wire comprises an interface connection to an inverter; and

FIGURE 14B illustrates the components which form the interface connection between the electroluminescent tracer wire and the inverter.

DETAILED DESCRIPTION

This application claims priority from U.S. Provisional Patent Application entitled "FIBER TRACER PATCHCORD" by Gino Pulejo, filed October 13, 2004, Serial Number 60/618,214 and is hereby incorporated by reference.

In the following discussion, numerous specific details are set forth to provide a thorough understanding of the present invention. However, those skilled in the art will appreciate that the present invention may be practiced without such specific details. In other instances, well-known elements have been illustrated in schematic or block diagram form in order not to obscure the present invention in unnecessary detail. Additionally, for the most part, details concerning network communications, electro-magnetic signaling techniques, and the like, have been omitted inasmuch as such details are not considered necessary to obtain a complete understanding of the

present invention, and are considered to be within the understanding of persons of ordinary skill in the relevant art.

FIGURE 1 illustrates a fiber patch cord 102 attached to an electroluminescent tracer wire 104. Fiber patch cords, DSX patch cords, Ethernet patch cords, and other types of patch cords are suitable for use. Furthermore, in one embodiment electroluminescent wire 104 can be attached to any form of communication cabling, such as audio/video cabling. The fiber patch cord 102 consists of two wires (transmit and receive) which are connected for a portion of the lengths of the wires. Each wire has a plug 110 attached on each end. For a patch cord 102, one wire is the transmit wire and one wire is the receive wire, which enables data transmissions to be passed in both directions over the patch cord 102. An electroluminescent tracer wire 104 is attached to the patch cord 102. The attachment of the electroluminescent tracer wire 104 is described in further detail herein. The electroluminescent tracer wire 104 is designed to produce luminescent light when the wire 104 is electrically connected to a power supply. Accordingly, the tracer wire 104 does not emit light when it is not electrically connected to a power supply.

The electroluminescent tracer wire 104 has an electric circuit interface 108 on both ends of the wire 104. These interfaces 108 are designed to provide an electrical connection to a power supply. An inverter 106 is an example of a power supply which can provide the electric current to the electroluminescent tracer wire 104. Other types of power supplies will be described herein. Accordingly, an interface of the inverter 106 connects to the interface of the electroluminescent tracer wire 104, which produces luminescent light throughout a portion of the length of the wire 104.

By connecting a power supply 106 to the interface 108 of the electroluminescent tracer wire 104, a technician can easily locate the opposite ends of the patch cord 102.

The technician can connect a hand-held inverter 106 to the interface 108 at one end of the patch cord 102 and follow the illuminating light to the other end of the patch cord 102. With the present invention, the technician does not need to tug or pull on the patch cord 102 to determine where the other end is connected.

Accordingly, the patch cord 102 is capable of changing states of appearance over a portion of its length in response to operator selection or operator stimulus. In some embodiments, other types of stimuli can cause the patch cord to change states of appearance.

FIGURE 2 illustrates a cross-sectional view of the electroluminescent tracer wire 104, which is attached to the fiber patch cord 102. There are different types of electroluminescent wire that can be used to practice the present invention. One brand of this electroluminescent wire is provided by Elam Ltd., P.O. Box 45071, Jerusalem 91450, Israel. The electroluminescent tracer wire 104 is a light emitting capacitor. This capacitive structure is developed with a light emitting electroluminescent semiconductor layer sandwiched between two conductive electrodes. Although electroluminescent wire is described throughout this patent application, other types of illuminating wire suitable for use.

The electroluminescent wire 104 consists of a copper wire 208, which serves as a core electrode. The copper wire 208 is coated with several layers of dielectric and semi-conductor materials 210, which form a coaxial construction. A transparent conductive layer 204 surrounds the coated copper wire 208. Within the transparent conductive layer 204 are two thin copper wires 206, which serve as the second electrode. An outer insulation layer 202 surrounds the transparent conductive layer 204. The coloring of the outer insulation layer 202 determines the color of luminescent light emitted by the wire 104. When an AC voltage is applied between

the two electrodes and exceeds a defined threshold value, the semi-conductor material 210 between the two electrodes emits light.

FIGURE 3 illustrates a cross-section view of the electroluminescent tracer wire 104 attached to the fiber patch cord 102 (300). The fiber patch cord 102 consists of two fibers connected together. In FIGURES 3-8, the fiber patch cord shown can also represent a DSX patch cord. Accordingly, one fiber is the transmit fiber 308 and one fiber is the receive fiber 310. These two fibers 308 and 310 transmit data in opposite directions. The inner conductors 302 transmit the data from one port to the other port. An insulation layer 312 surrounds the inner conductors 302. The two fibers 308 and 310 are held together by a plastic or similar material connector 304. This connector 304 can be torn to enable the two fibers 308 and 310 to be split apart.

The electroluminescent tracer wire 104 is attached adjacent to the receive fiber 310. The tracer wire 104 is opposite of the connection to the transmit fiber 308. In similar fashion, the tracer wire 104 can also be attached adjacent to the transmit fiber 308. Care should be taken so that the tracer wire 104 can stay attached to the patch cord 102. Care should also be taken so that the tracer wire 104 does not substantially interfere with the inherent properties of the patch cord 102.

FIGURE 4 illustrates the electroluminescent tracer wire 104 attached to the receive fiber 310 and the transmit fiber 308 (400). The connector material 304 is used to hold the tracer wire 104 in this position. Accordingly, the connector 304 can be torn, wherein the tracer wire 104 can detach from one of the fibers 308 or 310.

FIGURE 5 illustrates the electroluminescent tracer wire 104 attached directly between the receive fiber 310 and the transmit fiber 308 (500). The connector material 304 is designed to hold the tracer wire 104 in this position. Accordingly, the connector 304 can be torn, wherein the tracer wire 104 can detach from one of the

fibers 308 or 310.

FIGURE 6 illustrates two electroluminescent tracer wires 104 attached to the receive fiber 310 and the transmit fiber 308 (600). The connector material 304 is used to hold the two tracer wires 104 in this position. Tearing the connector 304 can force one trace wire 104 with the transmit fiber 308 and one tracer wire 104 with the receive fiber 310. Therefore, one tracer wire 104 is attached to each of the receive fiber 310 and the transmit fiber 308.

FIGURE 7 illustrates two electroluminescent tracer wires 104 attached adjacent to the receive fiber 310 and the transmit fiber 308, respectively (700).

FIGURE 8 illustrates two electroluminescent tracer wires 104 secured to the receive fiber 310 and the transmit fiber 308 by being embedded inside of the receive fiber 310 and the transmit fiber 308, respectively (800). Accordingly, the tracer wires 104 are embedded in the insulation layer 312 surrounding the inner conductor 302 of the two fibers 308 and 310. The insulation layer 312 should be designed to allow light emission from the tracer wire 104. It should be noted that the tracer wire 104 does not have to be embedded in both wires 308, 310 as shown. Care should be taken so that the characteristics of the tracer wire 104 do not substantially affect the transmission properties of the patch cord 102.

FIGURES 9A and 9B illustrate an assembly incorporating an Ethernet connection cable 902 commonly known to those skilled in the art. FIGURE 9A illustrates an electroluminescent tracer wire 104 attached to an Ethernet connection cable 902. Two sets of braided wire 904 and 906 transmit data through the Ethernet cable 902. FIGURE 9A shows two sets of braided wire 904 and 906; however, it should be noted that Ethernet cables come in various forms. They can comprise 4 (or more) sets of braided wire and/or be shielded or unshielded or be constructed using a

coaxial cable. A separator 908 surrounds the braided wires 904 and 906 and keeps them separate from a protective foil 910. A shield 912 surrounds the protective foil 910. An insulation layer 914 surrounds the shield 912. An outer sheath 916 surrounds the insulation layer 914 and protects the inner components of the Ethernet cable 902. The electroluminescent tracer wire 104 is attached adjacent to the outer sheath 916 of the Ethernet cable 902. Care should be taken so that the tracer wire 104 can stay attached to the patch cord 102. Care should also be taken so that the tracer wire 104 does not substantially interfere with the inherent properties of the patch cord 102.

FIGURE 9B illustrates an electroluminescent tracer wire 104 secured to the Ethernet connection cable 902 by being embedded inside the Ethernet connection cable 902. Accordingly, the tracer wire 104 is embedded in the insulation layer 914 inside of the outer sheath 916. The insulation layer 914 and the outer sheath 916 should be designed to allow light emission from the tracer wire 104. Care should be taken so that the characteristics of the tracer wire 104 do not affect the transmission properties of the Ethernet cable 902.

FIGURE 10 illustrates a connection circuit 1000 comprising the electroluminescent wire 104 and an AC power source 1002. The AC power source 1002 can be a conventional power supply provided through a wall outlet. Conventional power supplies 1002 have an internal resistance shown by 1010. The electroluminescent wire 104 has an interface 108, which connects to a power supply 1002. The connection 1008 of the AC power source 1002 is shown as a two-way connection 1008. Through the connection 1008, the AC power source 1002 supplies current to the electroluminescent wire 104, which causes the wire 104 to illuminate. This connection circuit 1000 indicates that a technician can use a wall outlet to apply

the necessary power supply to illuminate the electroluminescent wire 104. In this embodiment, the connection 1008 would involve the use of a connection cable that can interface the electroluminescent wire 104 and a conventional wall outlet or other AC power source 1002.

FIGURE 11 illustrates a connection circuit 1100 comprising the electroluminescent wire 104 and an inverter 106 which runs on a battery 1104. The battery 1104 is the DC power supply for the inverter 106. The inverter 106 is an AC power supply for the electroluminescent wire 104. The electroluminescent wire 104 has an interface 108, which connects to the inverter 106. This connection 1008 is shown as a two-way connection 1008. Through the connection 1008, the inverter 106 supplies current to the electroluminescent wire 104, which causes the wire 104 to illuminate. This connection circuit 1100 indicates that a technician can use an inverter (hand-held) 106 with batteries to illuminate the electroluminescent wire 104.

FIGURE 12 illustrates a connection circuit 1200 comprising the electroluminescent wire 104 and an inverter 106 which runs on an AC power source 1002. This connection circuit 1200 involves supplying the inverter 106 with an AC power source 1002. The AC power source 1002 supplies the AC/DC adapter 1202, which is the DC power supply for the inverter 106. This connection circuit 1200 indicates that a technician can use an inverter (hand-held) 106 with a connection to an AC power source 1002 to illuminate the electroluminescent wire 104. Accordingly, the inverter 106 can be plugged into a conventional wall outlet.

FIGURE 13 illustrates a connection circuit 1300 comprising the electroluminescent wire 104 and an inverter 106 which runs on an AC power source 1002 and a chargeable battery 1104. Accordingly, the AC power source 1002 or the battery 1104 may supply the inverter 106, which supplies the electroluminescent wire

104 with electrical current. An added feature of this connection circuit 1300 is that the AC power source 1002 can charge the battery 1104. A charger 1302 is used to charge the battery. This connection circuit 1300 indicates that a technician can use an inverter (hand-held) 106 to illuminate the electroluminescent wire 104, and recharge the battery supply 1104 by connecting the inverter 106 to an AC power source 1002.

FIGURE 14A illustrates a fiber patch cord 102 connected to an electroluminescent tracer wire 104, wherein the electroluminescent tracer wire 104 comprises an interface connection 1402 to an inverter 106. As previously described, an inverter 106 is only one example of a power source which can illuminate the electroluminescent wire 104. The inverter 106 is connected to one component 1406 of the interface connection 1402 and the electroluminescent wire 104 is connected to the other component 1404 of the interface connection 1402. This interface connection 1402 represents the interface connection 108 and 1008 as shown in FIGURES 10-13. On the opposite end of the patch cord 102 is one component 1404 of the interface connection 1402. This component 1404 is connected to the electroluminescent wire 104, but is not connected to the component 1406. Accordingly, a technician can attach the inverter 106 to either side of patch cord 102 to illuminate the electroluminescent wire 104.

FIGURE 14B illustrates components 1404 and 1406, which form the interface connection 1402 between the electroluminescent tracer wire 104 and the inverter 106. In one embodiment, the component 1406 is connected to the hand-held inverter 106, and the component 1404 is connected to the electroluminescent wire 104. When component 1406 is placed inside of component 1404 and locked into place, the interface connection 1402 between the hand-held inverter 106 and the electroluminescent wire 104 is created. The two plugs 1408 indicate that the interface

connection 1402 is a two-way connection 1008 as shown in FIGURES 10-13. Accordingly, to illuminate the electroluminescent wire 104, a technician with a hand-held inverter 106 inserts the component 1406 into the component 1404. This interface connection 1402 illuminates the electroluminescent wire 104, which enables the technician to find the other end of the patch cord 102. It should be noted that the interface connection 1402 can take on many variations including the style, shape, as well as the method of interconnection with regard to pins and sockets or compression contacts.

In one embodiment of the present invention, electroluminescent tape can be used in place of the illuminating wire. Electroluminescent tape is a product that is commonly known in the art. Accordingly, electroluminescent tape can be applied to the connection cable over a portion of the connection cable. When the electroluminescent tape interfaces a power supply, the electroluminescent tape illuminates. This enables the technician to find both ends of the connection cable.

It is understood that the present invention can take many forms and embodiments. Accordingly, several variations of the present design may be made without departing from the scope of the invention. The capabilities outlined herein allow for the possibility of a variety of models. This disclosure should not be read as preferring any particular model, but is instead directed to the underlying concepts on which these models can be built.

Having thus described the present invention by reference to certain of its preferred embodiments, it is noted that the embodiments disclosed are illustrative rather than limiting in nature and that a wide range of variations, modifications, changes, and substitutions are contemplated in the foregoing disclosure and, in some instances, some features of the present invention may be employed without a

corresponding use of the other features. Many such variations and modifications may be considered desirable by those skilled in the art based upon a review of the foregoing description of preferred embodiments. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the invention.

CLAIMS

1. A connection cable for interconnecting two points comprising an electro-luminescent element capable of changing states of appearance in response to an external stimulus and disposed over a portion of the cable such that the cable can be easily identified in response to the external stimulus.
2. A connection cable comprising:
at least one illuminating element attached to at least a portion of the connection cable, wherein, in response to connecting the illuminating wire to a power supply, the illuminating element illuminates.
3. The connection cable of Claim 2, wherein the connection cable further comprises at least one interface device that is at least configured to provide an electrical connection between the illuminating element and a power supply.
4. The connection cable of Claim 2, wherein the illuminating element is an electroluminescent wire.
5. The connection cable of Claim 2, wherein the illuminating element is embedded in at least a portion of the connection cable.

6. The connection cable of Claim 2, wherein the connection cable is a fiber optic patch cord.
7. The connection cable of Claim 2, wherein the connection cable is an Ethernet patch cord.
8. The connection cable of Claim 2, wherein the connection cable is a digital signal cross-connect ("DSX") patch cord.
9. The connection cable of Claim 2, wherein the illuminating element comprises an illuminating tape attached to at least a portion of the connection cable, wherein, in response to connecting the illuminating tape to a power supply, the illuminating tape illuminates.
10. The connection cable of Claim 9, wherein the illuminating tape is electroluminescent tape.

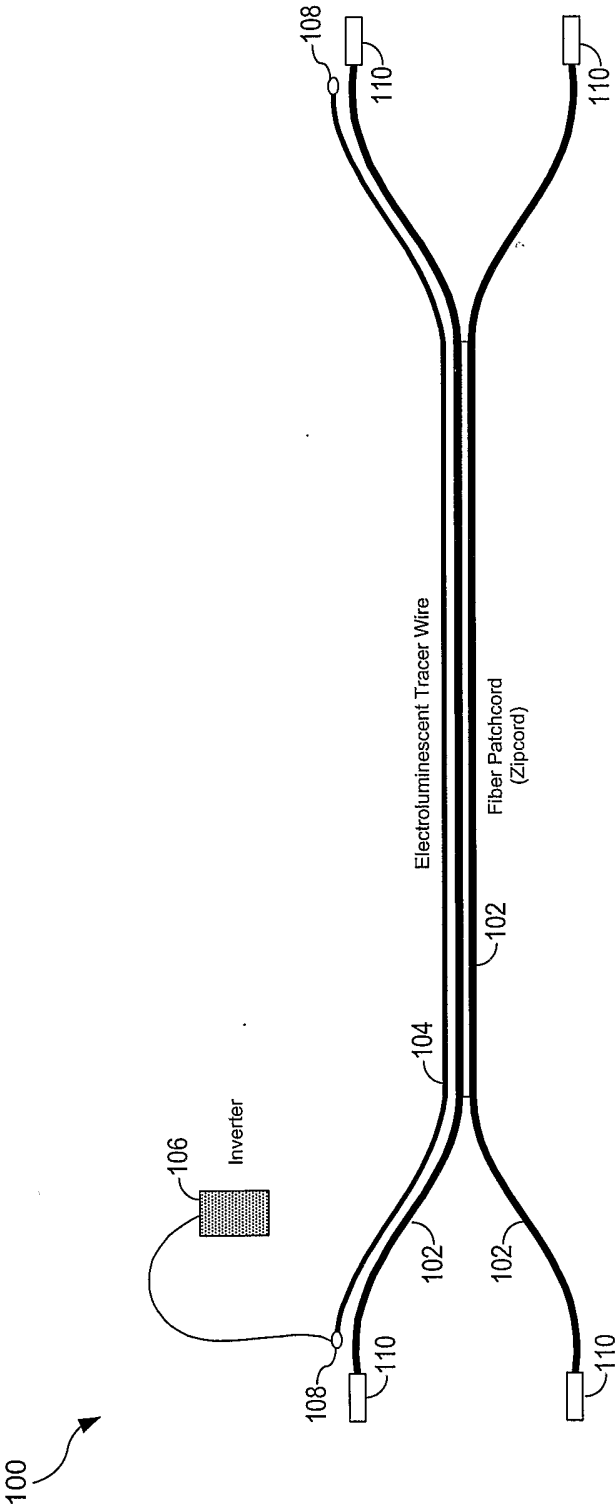


FIG. 1

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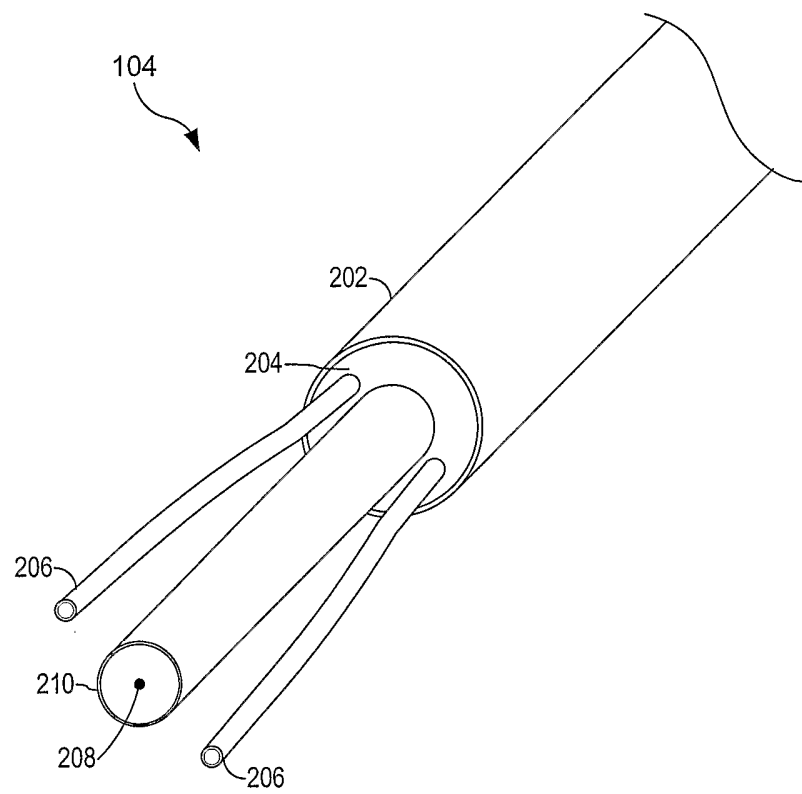


FIG. 2

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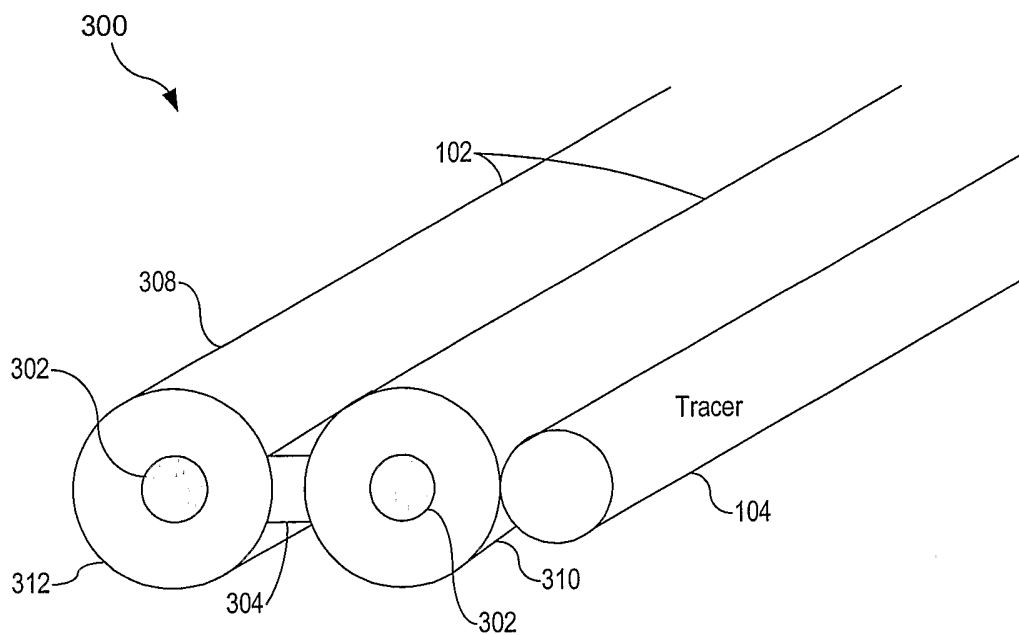


FIG. 3

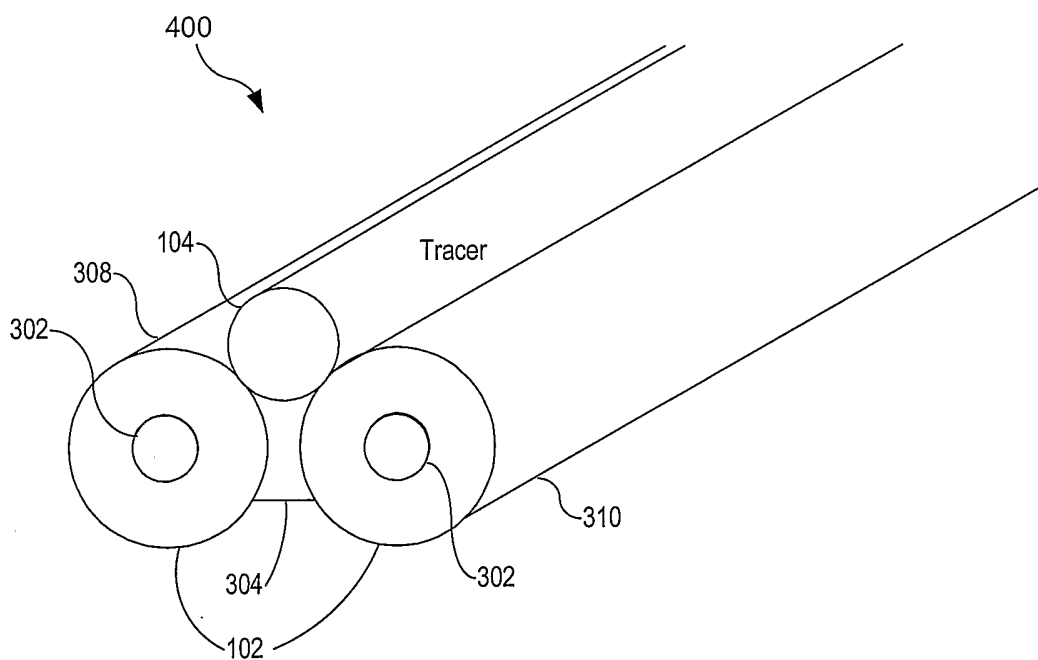


FIG. 4

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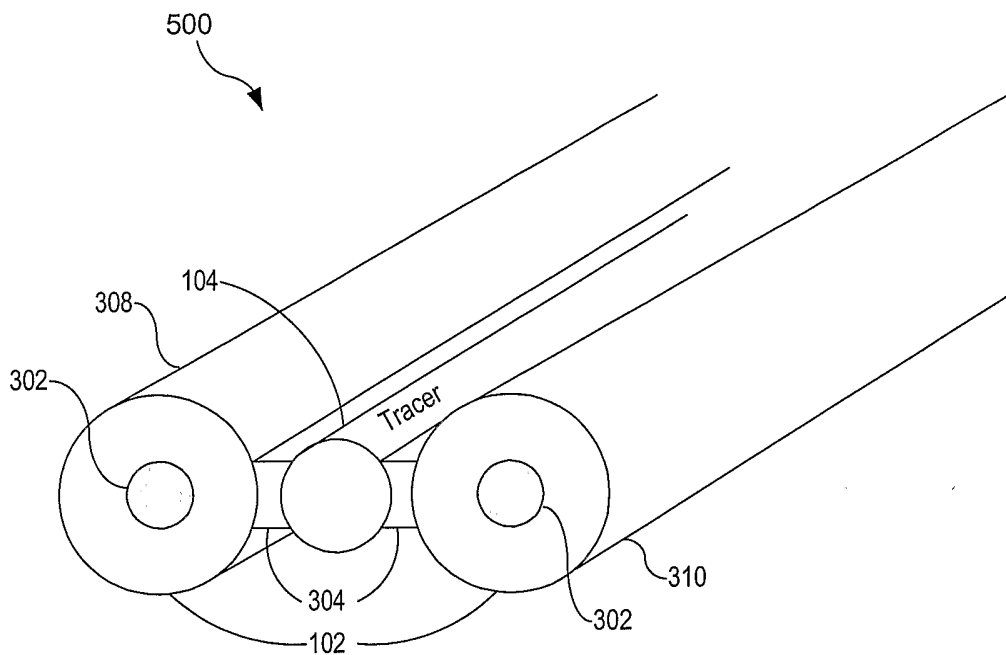


FIG. 5

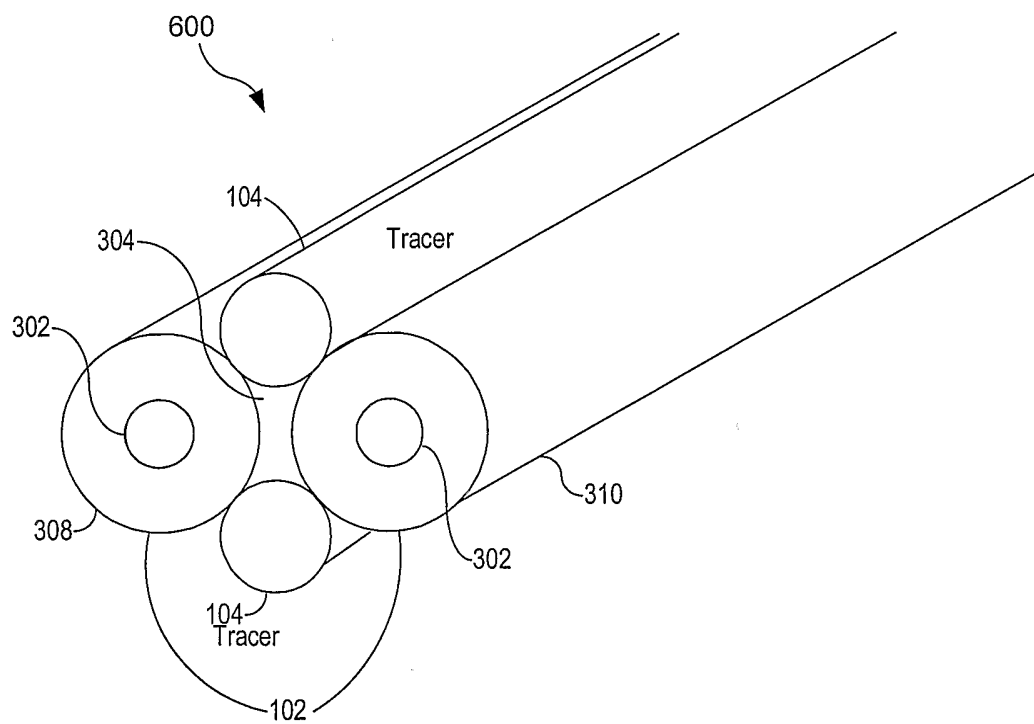


FIG. 6

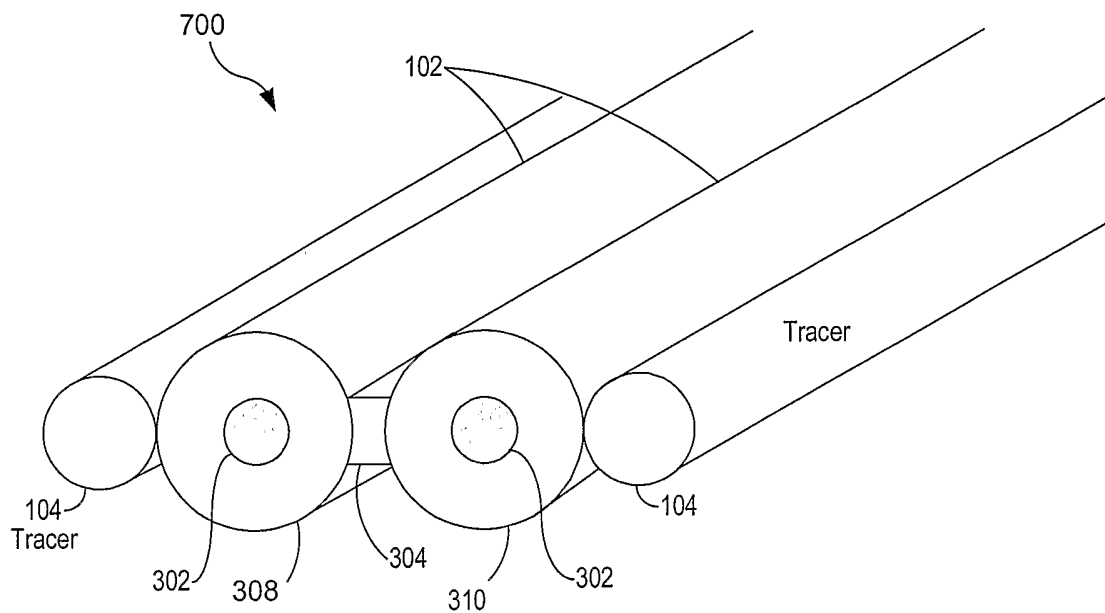


FIG. 7

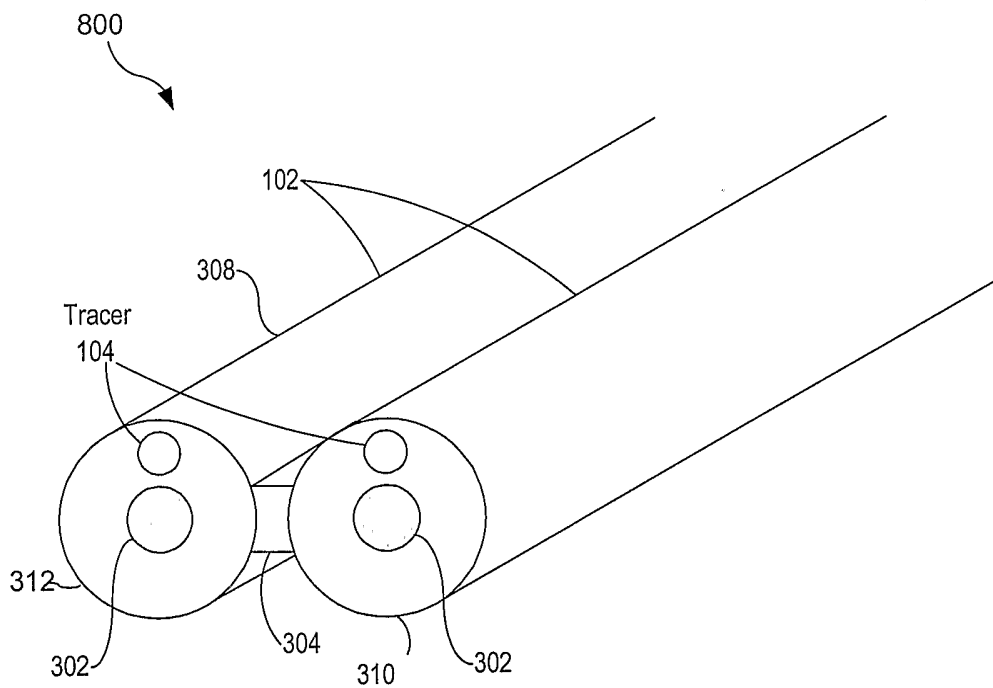


FIG. 8

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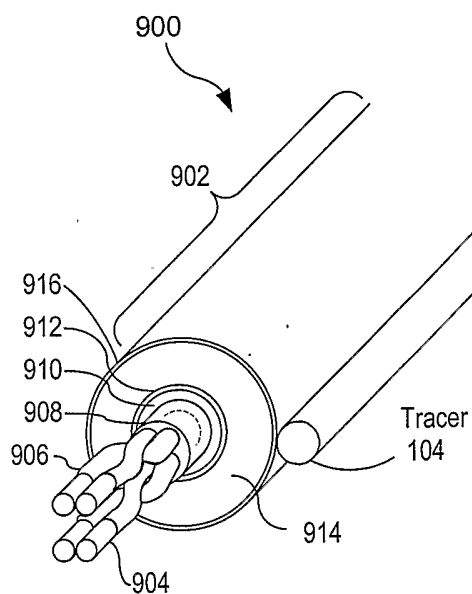


FIG. 9A

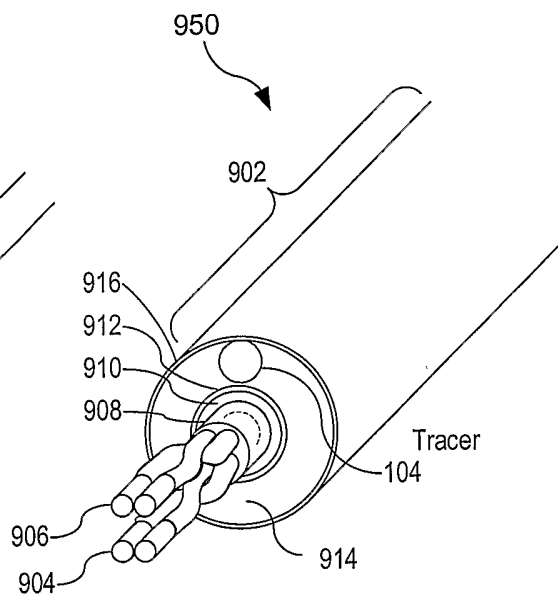


FIG. 9B

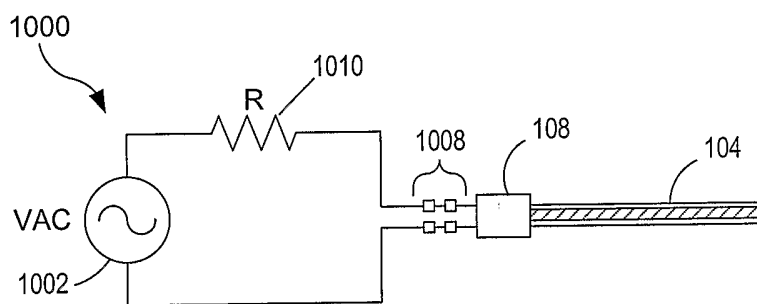


FIG. 10

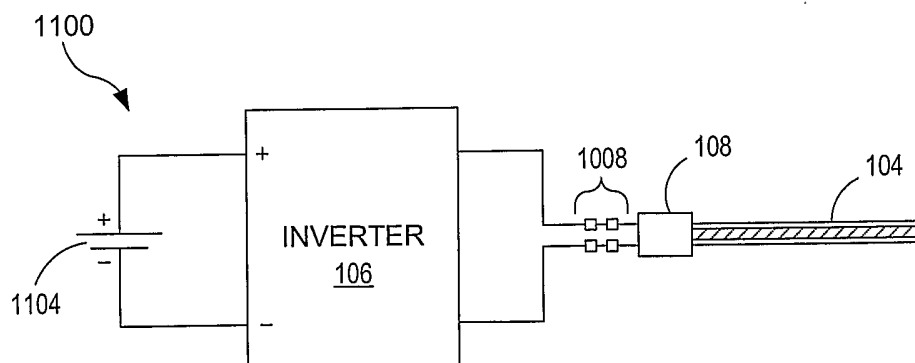
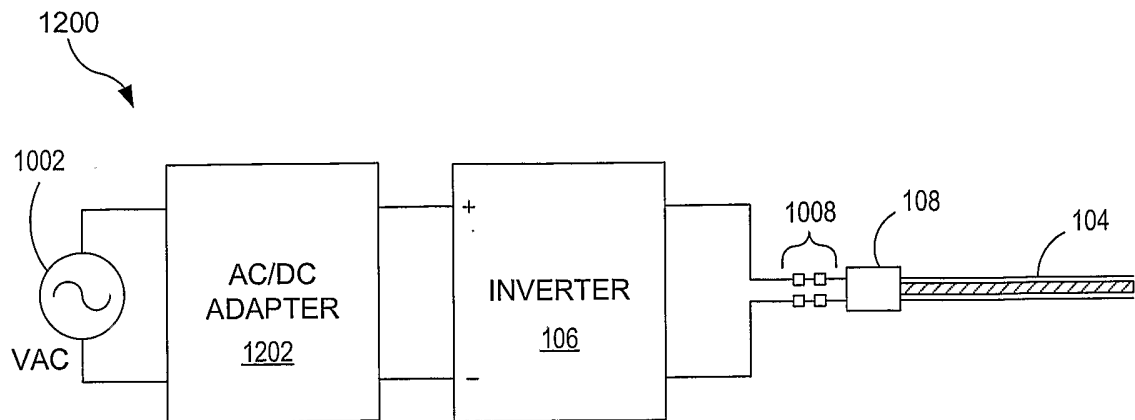
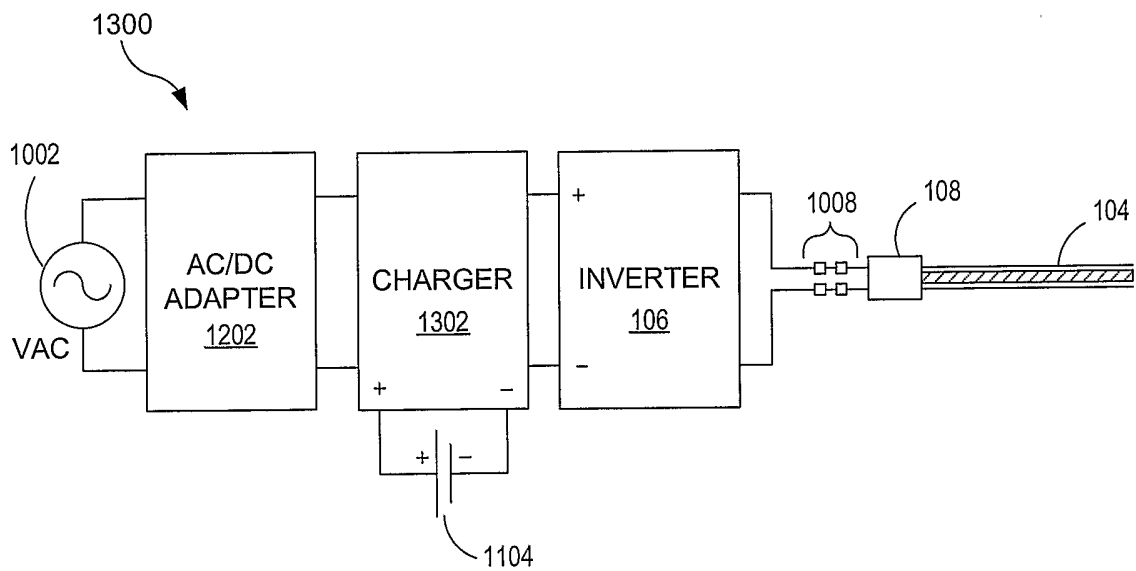


FIG. 11

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**FIG. 12****FIG. 13**

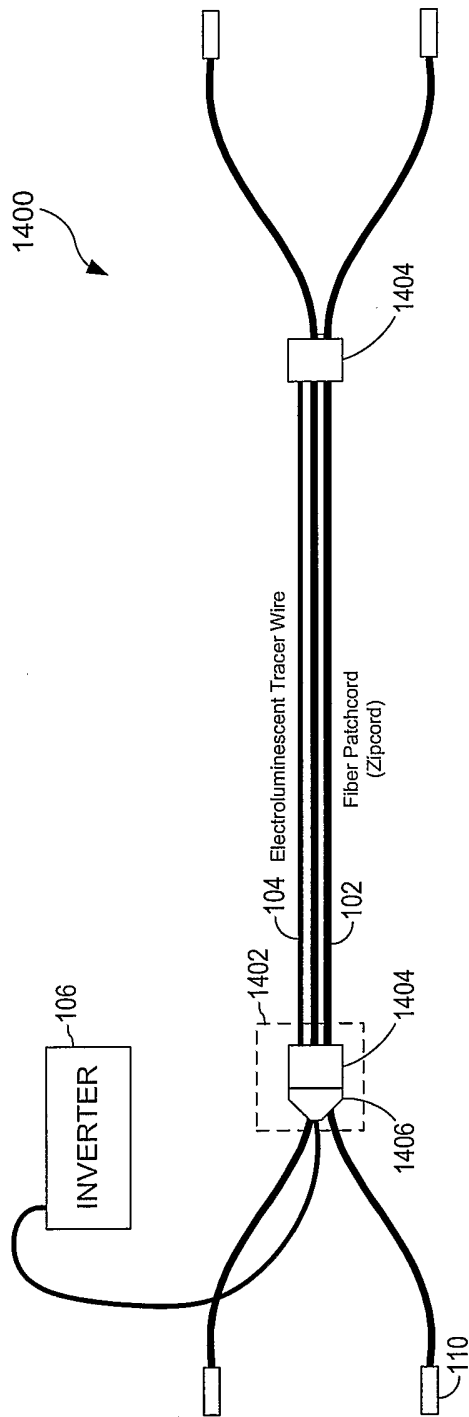


FIG. 14A

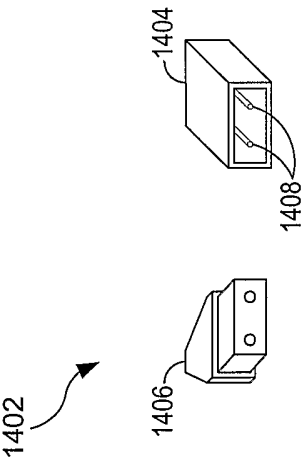


FIG. 14B