(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 February 2016 (04.02.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/016697 A1

(51) International Patent Classification: ***H01B 11/10*** (2006.01)

(21) International Application Number: PCT/IB2015/001128

(22) International Filing Date: 16 June 2015 (16.06.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
14/448,017 31 July 2014 (31.07.2014) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*
— *with information concerning incorporation by reference of missing parts and/or elements (Rule 20.6)*

(54) Title: DISCONTINUOUS SHIELDING TAPE FOR DATA COMMUNICATIONS CABLE AND METHOD FOR MAKING THE SAME

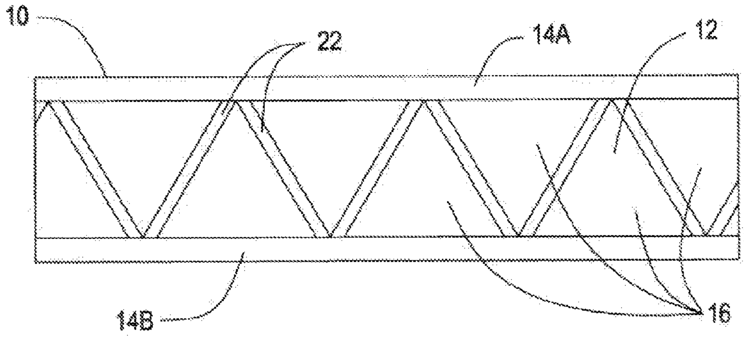

FIG. 3A

(57) Abstract: A discontinuous shielding tape comprises a first tape layer (10) having a first width and a metallic layer (12) disposed on said first tape layer having a second width, wherein said second width of said metallic layer is narrower than said first width of said first tape layer so as to leave at least two metallic free strips (14A, 14B) running the longitudinal length of said first tape layer, one on either side of said metal layer, wherein said metallic layer is scored only within said second width of said metal layer with resultant discrete metallic elements (16) such than when said first tape layer is stretched, said discrete metallic elements are separated each by a gap (22) creating said discontinuous shielding tape, where said two metallic free strips are configured to maintain integrity of said first tape layer.

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DISCONTINUOUS SHIELDING TAPE FOR DATA COMMUNICATIONS CABLE AND METHOD FOR MAKING THE SAME

Background:

Field of the Invention:

This application relates to a shielding tape and method for making the same. More particularly, this application relates to a shielding tape for LAN (Local Area Network) cables and method for the production of such tapes.

Description of the Related Art:

LAN or network type communication cables are typically constructed from a plurality of twisted pairs (two twisted insulated conductors), enclosed within a jacket. A typical construction includes four twisted pairs inside of a jacket, but many other larger pair count cables are available.

Care is taken to construct these cables in a manner to prevent cross talk with adjacent cables. For example, in a typical installation, many LAN cables may be arranged next to one another, and signals in the pairs from a first cable may cause interference or crosstalk with another pair in an adjacent LAN cable. In order to prevent this, the lay length or twist rate of the pairs in a cable is varied differently from one another. Additionally, when pairs in adjacent cables are running parallel to one another the cross talk can be increased so the pairs within a cable are twisted around one another (helically or SZ stranding) to further decrease interference. Spacing elements can also be used so that the jacket is spaced apart from the pairs so that pairs in adjacent cables are as far away as possible.

Nevertheless, despite all of these features, in some cases, the requirements for increased bandwidth may necessitate additional protection from crosstalk. One such common type of protection is shielding. LAN cable shielding is usually in the form of a foil that is wrapped around the pairs inside the cable, under the jacket. This metal foil is usually wrapped around the assembled core of twisted pairs at or prior to jacketing and is constructed of suitable metals, for example aluminum.

Although the shield is effective for preventing alien crosstalk and other external signal interferences, the shield must be grounded to the connector in order to meet safety regulations. This is a time consuming step that increases the cost to install the shielded cable. One typical example requires a drain wire to be helically coiled around the shield which also increases the overall cable cost.

In the prior art, there have been proposals to mitigate the above effect by providing a discontinuous shielding tape having periodic breaks in the shield. This design makes sure that any signals that travel in the shield do not extend continuously from one end to the other end of the cable, obviating the need for grounding the shield.

However, making such a shielding tape is difficult. For example, one method currently used for manufacturing discontinuous tape is by incising the aluminum side of a polyester film backed aluminum tape. This tape is then stretched to separate the aluminum segments. Care must be taken to cut only the aluminum as the polyester film backing is used to keep the tape contiguous. The polyester film must also be kept thin due to its undesirable fuel loading and potential for smoke generation. However this thinness of the polyester backing tape results in uneven aluminum segment spacing separation and also makes tape breakage common during the manufacturing process.

Objects and Summary:

The present arrangement overcomes the drawbacks of the prior art by providing a novel construction and manner for making the same for a discontinuous shield tape, for use for example in LAN cables or other such implementations.

To this end, in accordance with one embodiment, the present arrangement provides for a discontinuous foil shield having a first tape layer having a first width and a metallic layer disposed on the first tape layer having a second width. The second width of the metallic layer is narrower than the first width of the first tape layer so as to leave at least two metallic free strips running the longitudinal length of the first tape layer, one on either side of the metal layer.

The metallic layer is scored only within the second width of the metal layer with resultant discrete metallic elements such than when the first tape layer is stretched, the discrete metallic elements are separated each by a gap creating the discontinuous shielding tape, where the two metallic free strips, running the longitudinal length of the tape, are configured to maintain integrity of the first tape layer.

In accordance with another embodiment, the present arrangement provides a discontinuous shielding tape includes a first tape layer having a first width and a metallic layer disposed on the first tape layer has a second width, where the second width of the metallic layer is narrower than the first width of the first tape layer so as to leave at least two metallic free strips running the longitudinal length of the first tape layer, one on either side of the metal layer.

The metallic layer and the first tape layer are periodically punched completely through only within the second width of the metal layer with resultant discrete metallic elements and corresponding tape layer, such that the discrete metallic elements are separated each by a full air gap created between the discrete metallic elements, where the two metallic free strips are configured to maintain integrity and continuity of the first tape layer.

Brief Description of the Drawings:

The present invention can be best understood through the following description and accompanying drawings, wherein:

Figure 1 shows a shielding tape substrate with a metal layer thereon, in accordance with one embodiment;

Figure 2 shows a shielding tape substrate with a scored metal layer thereon, in accordance with one embodiment;

Figure 3A shows a shielding tape substrate with a metal layer thereon having discrete discontinuous metal segments, in accordance with one embodiment;

Figure 3B shows a shielding tape substrate with a metal layer thereon having discrete discontinuous metal segments, in accordance with another embodiment;

Figure 4 shows a shielding tape substrate with a metal layer thereon having discrete discontinuous metal segments and upper tape layer, in accordance with one embodiment; and

Figure 5 shows a shielding tape substrate with a metal layer thereon having discontinuous metal segments, in accordance with another embodiment.

Detailed Description

In one embodiment of the present arrangement as shown in Figure 1, a first polyester substrate tape 10 is provided having a laminated metallic surface 12 thereon. Tape 10 is preferably made from polyester but it may be made from other polymers. Metal layer 12 is preferably made from an aluminum deposit but other metals may be used. In one preferred arrangement, tape 10 is approximately 0.003" thick and approximately 1.0" - 1.5" wide. The associated metal layer 12 deposited thereon is an aluminum layer approximately 0.001" - 0.002" thick and approximately 0.25" narrower than the width of tape 10. Such a size would be typically applied to a common LAN type cable having four twisted pairs. However, it is understood that the dimensions are only considered exemplary and other thicknesses and widths for tape 10 and metal layer 12 are within the contemplation of the present invention, depending on the desired final structure of the cable in which it will be used.

As shown in Figure 1, tape 10 is constructed having a width that is wider than the metallic layer 12 such that tape 10 has two metallic free segments 14a and 14b on each side of metallic layer 12 running the length of tape 10. According to the above exemplary dimensions, each such metallic free segment 14a and 14b is approximately 0.125" wide on either side of metallic layer 12, running the entire length of tape 10.

As shown in Figure 2, in order to make metallic layer 12 discontinuous, metallic layer 12 is scored by means of a punch or scribing blade that incises across the entirety of the width of metallic layer 12 forming score lines 17. As a result, metallic layer 12 is now formed by a series of discretely scored metallic elements 16, which at this stage have a de minims separation as score lines 17 are at this stage very narrow. Each metallic element 16 is in the form of a triangle, with alternating orientation along the length of tape 10. However, it is to be understood that metallic elements 16 may have other shapes such as rectangles, squares etc... as desired. In one example, the longitudinal width along tape 10 of each metallic segment 16 is between 1.0" - 6.0" (for triangles measured from mid-height) however, the invention is equally applicable to any length metallic segments 16.

As shown in Figure 3A, polyester tape 10 is stretched slightly separating metallic elements 16 of metallic layer 12 so as to make metallic layer 12 discontinuous. The amount of stretching of tape 10 is preferably done so as to create gaps 22 of approximately 0.05" and 0.125" depending on the desired final structure.

The metallic free edges 14a and 14b provide structural integrity to tape 10 during the scoring process, shown in Figure 2. For example during scoring of the metallic layer 12 into elements 16 it is possible that the blade or scoring mechanism may damage tape 10. However, because of metallic free edges 14a and 14b, the scoring process does not need to traverse the entire width of tape 10 in order to complete score across metallic layer 12 to create discrete metallic elements 16. As such, if any incidental scoring of tape 10 occurs during scoring of metallic layer 12, then during stretching, tape 10 will at least have partially un-scored areas in the region of metallic free zones 14a and 14b to maintain tape integrity throughout the stretch.

Another advantage of metallic free zones 14a and 14b is that they can help prevent the unintentional shorting of adjacent metallic segments 16 when the tape is applied around the cable core. For example, if discontinuous metallic segments extended all the way to the edge of a tape, when that tape is applied to a cable core at an angle (spiral wrapped as with typical shielding tape), there is the possibility that the edges of such metal segments may intermittently touch, despite being longitudinally discontinuous, creating electrical continuity due to tape edge curling or deformation during manufacturing or later installation. In the current design with foil free edges 14a and14b, even after tape 10 is applied to a cable core at an angle, the discontinuous metallic elements 16 do not touch and thus do not accidentally create a continuous conducting situation.

As an alternative embodiment, Figure 3B is the same as Figure 3A only it shows a tape 100, with metallic layer 112 and metal free edges 114A and 114B. In this embodiment, metallic elements 116 of metallic layer 112 are in the shape of squares or rectangles as opposed to triangles, but otherwise of substantially the same dimensions.

In another embodiment, as shown in Figure 4, a tape 200 is provided again with metallic layer 212 and metal free edges 214A and 214B. In this embodiment, after tape 210 is stretched to form independent metallic elements 212 as shown above in Figure 3, and optional second tape layer 230 is applied over metallic elements 216 for additional stability. This second tape layer 230 may be made of polyester and is substantially 0.0005" and 0.001" but it is not limited in these respects.

This second tape layer 230 also provides strength to the design to prevent breakage during later cable manufacturing processes. As noted above, accidental scoring of tape 210 during scoring of metallic layer 212 can lead to breakage or at least a generally weakened tape 210 that could break when being applied during cable assembly. The addition of upper tape layer 230 adds a layer of stability to the overall design.

In another embodiment shown in Figure 5, a tape 300 is provided again with metallic layer 312 and metal free edges 314A and 314B. In this embodiment, rather than creating gaps 22 through scoring and stretching as described above with Figures 2 and 3A/3B, segments 316 are formed in metallic layer 312 on tape 310, by completely punching through metal layer 312 and tape 310 (no stretching) forming segments 316 with complete air gaps 323 there between. Such an arrangement still retains metallic free edges 314a and 314b and the advantages appurtenant thereto. Moreover, in this arrangement, the metallic segments 316 and the underlying tape 310 (that was not punched out) act as rungs in a ladder like arrangement with the longitudinally running metal free edges 314a and 314b acting as the ladder rails. Such an arrangement may in some cases have an advantage that complete punching of tape 310 may be accomplished with less variation as opposed to the prior scoring and stretching method from Figures 2 and 3A/3B depending on the various thicknesses dimensions and materials being used.

While only certain features of the invention have been illustrated and described herein, many modifications, substitutions, changes or equivalents will now occur to those skilled in the art. It is therefore, to be understood that this application is intended to cover all such modifications and changes that fall within the true spirit of the invention.

REVERSIBLE POLARITY MPO FIBER OPTIC CONNECTOR

RELATED APPLICATION:

This application is related to U.S. Patent Application No. 13/934,378, filed on July 3, 2013.

BACKGROUND:

FIELD OF THE INVENTION:

The present arrangement relates to fiber optic connectors. More particularly, the present arrangement relates to fiber optic connectors with reversible polarity.

DESCRIPTION OF THE RELATED ART:

In the area of fiber optic connections, typical fiber optic systems usually have to establish a bi-directional pathway between a transmitter port on a first element and receiver port on a second element and vise versa. See for example schematic Figure 1. In order for such a bidirectional systems to function, it is a requirement that one end of a fiber be connected to the light emitting source of a first equipment, often a type of laser or light emitting diode, and the other end connected to a receiver port on a second equipment. For the second fiber in the bi directional pathway, the other fiber needs to be connected to the light source on the second equipment and, at the other end, the receiver port of the first equipment.

Fiber optic connectors used for larger high-speed fiber optic systems often use multi-fiber cables supporting many bi-directional pathways. In one example the cables typically have 12 fibers in the cable, with the corresponding connectors for such cables housing multiple fiber optic members within the same connector body. Such a twelve fiber arrangement can support six of such bi-directional (duplex) pathways.

These connectors used for such high-speed fiber optic systems often employ what are termed multiple fiber optic members, called MPO (Multiple-Fiber Push-On/Pull-off) connectors and they typically support the twelve fiber (six duplex channel) arrangements within the same connector body.

Using Figure 1 showing a single two way channel, there can be many segments of fibers between two components, each representing a fiber optic cable with a connector. In some cases, between segments, the fibers in the connector of a first segment pass directly across to the fibers of the second segment. However, in some cases, in order for the transmission signal to end up at the correct receiver port, at least one segment connection, the connectors must have the pin/fiber input/output on one side flipped so that the transmission signal exits on the other fiber in the channel.

This situation is referred to as connector “polarity” for each segment. A fiber cable segment with two connectors at either end that result in the same polarity across the segment is referred to as method A and a fiber cable segment with two connectors at either end that result in a flip in the polarity across the segment is referred to as method B. In Figure 1, the first four segments are method A polarity, the fifth segment is method B polarity exhibiting a flip in the light pathways across the two fibers. Depending on the various fiber optic equipment arrangements, in the prior art, to make the correct connections, the installer needs to select cable segments (i.e. pre-terminated lengths of cable) that have the correct polarity.

This holds true for larger MPO connectors where the associated cables must still also eventually result in one end of a fiber being connected to a source and the other end connected to a receiver and vice versa for each bi-directional pathway supported. As shown in Figure 2, the top shows Method A polarity where the blue fiber starts on position 1 on one connector on one side of the segment and is at the same location (position 1) on the other connector on the other side of the segment. This method A polarity arrangement would be a straight forward connection that passes the same connection polarity to the next segment of the installation.

The bottom part of Figure 2 shows Method B polarity where the blue fiber starts on position 1 on one connector on one side of the segment and is at the opposite location (position 12) on the other connector on the other side of the segment. With Method B polarity the remaining fibers in the connector on the second side of the segment are all also transposed in position vis-à-vis the first connector. The management of connections in such MPO connectors between sources and receivers and the polarity of such connections is described in the standard TIA-568-C.3. This method B polarity arrangement would be a connection that reverses the connection polarity going forward to the next segment of the installation.

As shown in Figure 1, in order for the light signal from one source to reach a receiver at the other end there typically must be an odd number of ‘flips’ in the cabling, where a ‘flip’ indicates a method B polarity segment, so that the fiber in connector position 1 is connected to position 2 on the other side, the fiber in connector position 2 is connected to position 1 on the other side, etc...

These flips can be achieved via individual fiber assemblies and/or in the adapters that connect different fiber optic cabling segments together for example as shown in the basic design in Figure 1 at segment 5. However, since fiber optic networks are dynamic environments, connections are often added or subtracted and, as such, the number of required flips changes within the cabling arrangement between equipment. Ensuring that there are an odd number of flips then requires one or more of the fiber optic assemblies’ polarity to be changed as the connections are added or subtracted. This requires the installers and/or end users to stock assemblies of different polarities and lengths for every possible network configuration, given that assemblies are pre-terminated with a fixed polarity.

For example, the polarity of fiber optic systems is carefully considered during the design phase and is generally fixed upon completion because many patch cords come pre-terminated and the polarity of the connector(s) is set at manufacture. For example a patch cord having connectors for its end set at a first polarity (i.e. method A or method B) can only be used for example in Figure 1 at certain segment locations. If for any reason the configuration changed, as will be explained in more detail below, the installer may require a new patch cord, possibly of a different length, and having its two connectors set at a different polarity. Consequently, end users must carry a large inventory of pre-terminated assemblies or order additional parts to allow for reconfigurations of the network topology.

The polarity of an MPO (Multiple-Fiber Push-On/Pull-off) style connector, whether it be method A or method B is determined by the relationship between the fibers and a “key” on the connector body, which is why polarity is sometimes referred to as “keying.”

Prior art Figure 3 shows a standard prior art MPO connector that has a single fixed key on its body. Thus, the polarity is set at the time of manufacture. Although some prior art arrangements have the ability to change the key/polarity of the connector, these solutions require the disassembling and reassembling of existing assemblies or the purchase of new assemblies. This increases either labor costs or material costs associated with these networks/connectors.

OBJECTS AND SUMMARY:

The present arrangement overcomes the drawbacks associated with the prior art and provides for a reversible polarity MPO type connector that can be applied without worry of previous installation types or designs. The reversible polarity connector reduces installer's and customer's inventory, installation time, and ultimately lowers their cost.

Such a connector employs a movable key that allows a user to reverse the polarity of the connector without the need to open the connector housing. Additionally, the present connector can be employed in conjunction with a universal connector pin arrangement that also allows a user to push forward or retract the MPO guide pins to assist in accommodating the use of such connectors in both polarities, again without the need for opening the connector.

To this end, the present arrangement provides for a multi-fiber, fiber optic connector, having a housing having a first end for receiving a multi-fiber fiber optic cable and a second end having openings for the fibers from the cable. First and second keys for setting the polarity of the fibers within the connector located on opposing sides of the connector. The connector has either one of guide pins or guide pin receiving holes for guiding the connection with a second connector.

The keys are movable between a first active position and a second retracted position, such that when one of the keys is in the first active position, the fibers are presented within the connector in a first polarity and when the second key is in the first active position, the fibers are presented within the connector in a second polarity reversed from the first polarity.

BRIEF DESCRIPTION OF THE DRAWINGS:

The present invention can be best understood through the following description and accompanying drawings, wherein:

Figure 1 is a schematic view of a typical fiber optic arrangement of fiber optic equipment and connectors;

Figure 2 is a schematic view of a fiber optic arrangement and polarity configuration;

Figure 3 shows a prior art fixed key MPO type connector;

Figures 4A and 4B show a reversible polarity connector, in accordance with one embodiment;

Figure 5 shows two reversible polarity connectors in an adapter, in accordance with one embodiment;

Figures 6A and 6B illustrate an exemplary fiber optic arrangement making use of reversible polarity connectors, in accordance with one embodiment;

Figure 7 shows a reversible polarity connector with retractable guide pins, in accordance with another embodiment;

Figure 8 shows a reversible polarity connector with retractable guide pins, in accordance with another embodiment;

Figure 9 shows a reversible polarity connector with retractable guide pins, in accordance with another embodiment; and

Figure 10 shows a reversible polarity connector with retractable guide pins, in accordance with another embodiment.

DETAILED DESCRIPTION:

In one embodiment of the present arrangement as shown in Figures 4A and 4B a connector 10 is provided at the end of a multi fiber cable 12. Connector 10 has a housing 14, guide pins/guide pin openings 16 and keys 18A and 18B. It is noted that connector 10 is shown with guide pin openings 16 (female) but all of the features of the present arrangement are equally applicable to male/pins extended connectors 10 as well.

As a basic explanation the “key” sets the order for which the fibers in connector 10 are presented to an additional opposing connector 10. A key that is ‘active’ is one that is in position to engage with an adapter. If a key is said to be reversed then it means that the key on the opposite side of the connector (that being the one that was not previously ‘active’) is now ‘active’. If connectors of both regular and reversed active keys are compared, it would be found that the fibers in connector 10 are presented to an opposing connector in opposite order. The setting of the key 18 is what sets the polarity (arrangement of fibers from cable 12) for connector 10 from the perspective of an opposing connector.

Thus, as shown in Figure 4A, key 18A on the top of connector 10 is in a forward extended position. As shown in cut-away Figure 4B, key 18A on the top of connector 10 is in a forward extended position with key 18B on the bottom of connector 10 in the retracted position within housing 14. Such an arrangement allows for keys 18A and 18B, on both sides of connector 10, to be alternately extended and retracted in order to achieve the desired polarity without disassembling the connector body. When cable 12 contains at least one of these connectors 10, keys 18A and 18B on top and bottom can be adjusted to determine whether the assembly (cable with a MPO connector on each end) is a ‘Method A’ or ‘Method B’ as referred to in the standards.

Applicants note that there are two keys 18A and 18B on connector 10 so that a fiber optic segment having two connectors 10 on either end may exhibit both A & B polarities options. When a user wants a fiber optic segment to be polarity A, the user simply sets the keys 18A on the tops of connectors 10 on both ends of the segment to the same setting, i.e. both keys 18A forward and active with both keys 18B retracted within housing 14) so that fibers exhibit the same presentation order on both sides of the fiber optic segment. To reverse to method B polarity, one of the keys such as a key 18A on one of the two connectors 10 is retracted into housing 14 and the other key 18B on that same connectors is pushed forward to active. This allows for the polarity of a single assembly or cable to be changed from A to B or B to A.

When keys 18A or 18B are retracted, nothing physically changes with fibers 12 in connector 10. Rather, the only change with connector 10 is a flipping of the order fibers 12 are presented to opposing connectors because the active or forward key 18A/18B is switched from one side of connector 10 to the opposite side.

It is noted that nothing is moving within housing 14. Fiber position number is always referenced by holding the key up and looking from left to right. By having two keys 18A/18B on opposing sides of connector 10 with the ability to activate one key or the other, this changes the definition of "up" for that connector. In other words with two movable keys 18A and 18B on connector 10 and the ability to easily change which key is active (used to determine which way is "up") a user can reverse the order of the fibers presentation on a connector 10 on one end of an assembly only, switching the segment from a Method A to a Method B or vice-versa.

Moreover, in the cut away example Figure 4b, connector 10 shows top key 18A activated (extended out) and bottom key 18B retracted back into connector 10. As is evident from Figures 4A and 4B, keys 18A and 18B can be used to change the polarity of connector 10 without the need for opening any part of connector 10, such as housing 14, unlike the prior art configurations.

As shown in Figure 5, which shows two connectors 10 fitted into an adapter 20. Such keys 18A (only top keys 18A are visible in Figure 5) can be operated by simply sliding key 18A forward and backward, or by pressing the key below the surface of the housing and locking arrangement, located towards the front of housing 14 of connector 10. Each key 18A and 18B can thus be operated independently with non-specialized tools and without disassembly of the connector, as the tab for keys 18 is accessible through an opening in housing 14. It is noted that in Figure 5, such a tab for adjusting keys 18, during a connection to another connector 10 via adapter 20, would actually fit within adapter 20. The other slide mechanism shown in Figure 5 is related to another feature regarding an adjustable guide pin arrangement discussed in more detail below.

One exemplary arrangement for demonstrating the usefulness of connectors 10 is shown in Figures 6A and 6B. In Figure 6A a first equipment #1 is shown connected to a second equipment #2 using five spans of fiber with MPO type connectors on such spans at four locations (#1 - #4). That is, at each location #1 - #4, there is an adapter 20 and two opposing MPO connectors, one for each segment on either side of the adapter. The connectors at points #1 through #3 each maintain the same polarity from the prior segment (Method A polarity), and at connector #4 the polarity reverses (Method B polarity) before entering equipment 2 as shown in the figure.

Turning now to Figure 6B, assuming that owing to some required connection change, equipment #1 now needs to be connected to equipment #3 at a different location instead of equipment #2. As a result the third segment of fibers after location #2 and their connector facing segment 2 on the opposing side of location #2 now needs to be reversed in polarity (Method B) whereas in the prior Figure 6A arrangement (connected to equipment #2) that same connector/segment would have simply retained the same polarity (Method A). As a practical matter, in the prior art, an installer or user would have had to replace the fiber segment 3 with a new patch fiber segment having a different (opposite) pre-terminated fixed polarity connector to fit into the adapter at location #2 in order to change the polarity of the connection now entering into equipment 3. Or, using prior art connectors that could change polarity, the user would have to open the housing of the connector on the third fiber segment after location #2 and change the polarity, possibly damaging/diminishing that connector and the fiber connections therein.

However using the present arrangement, assuming the connector for fiber segment three exiting location #2 was a connector 10 according to the present arrangement, connector 10 could simply be removed from the adapter 20 at location #2 have the appropriate key 18 retracted/moved forward, and reinserted into the adapter as shown in Figure 6B, changed from Method A to Method B polarity.

In another embodiment of the present invention as shown in the following Figures 7-10, in addition to connector 10 being a reversible polarity connector 10 using keys 18A and 18B as explained above, such connectors 10 may also have a retractable guide pin arrangement 50 so that connector 10, in addition to having reversible polarity also can exchange between male (extended) and female (retracted) guide pin configurations.

As shown in Figure 7, connector 10 has a guide pin arrangement 50 shown in the extended male configuration. Guide pin arrangement 50 includes an attached retraction tabs 52 (one opposing side not shown) located on either side of the connector. In Figure 8 connector 10 has the same retractable guide pin arrangement 50 shown in the extended male configuration. In the embodiment shown in Figure 8, guide pin arrangement 50 includes attached retraction tabs 52B located on the top of connector 10.

In Figure 9 connector 10 again has the same retractable guide pin arrangement 50. In the embodiment shown in Figure 9, guide pin arrangement 50 includes a single attached retraction tab 52C located on the top of connector 10 in between a bifurcated arrangement of tab(s) 18C to change the polarity of key 18A. In Figure 10 connector 10 has the same retractable guide pin arrangement 50. In the embodiment shown in Figure 10, guide pin arrangement 50 are spring biased via biasing springs 51 (internal) and held in position using pin locks 54 on top of connector 10.

As an example of how the embodiment with retractable pins 50 supplements the usefulness of the reversible polarity of connector 10 using keys 18, Applicants note that standard equipment typically has pins in it, but some of the components in given channel (e.g. a 4 connector channel of patch cord, trunk, patch cord, trunk, patch cord etc...) will have pins and the rest will not since it is always required to mate a male to a female. So if a user were to add or subtract fiber segments/elements from the channel, even if the polarity can be changed, they may or may not end up with connectors with pin arrangements that can be mated together. By adding switchable guide pins this possible drawback can be overcome.

While only certain features of the invention have been illustrated and described herein, many modifications, substitutions, changes or equivalents will now occur to those skilled in the art. It is therefore, to be understood that this application is intended to cover all such modifications and changes that fall within the true spirit of the invention.

What is claimed is:

1. A discontinuous shielding tape comprising:

a first tape layer having a first width; and

a metallic layer disposed on said first tape layer having a second width,

wherein said second width of said metallic layer is narrower than said first width of said first tape layer so as to leave at least two metallic free strips running the longitudinal length of said first tape layer, one on either side of said metal layer,

wherein said metallic layer is scored only within said second width of said metal layer with resultant discrete metallic elements such than when said first tape layer is stretched, said discrete metallic elements are separated each by a gap creating said discontinuous shielding tape, where said two metallic free strips are configured to maintain integrity of said first tape layer.

2. The discontinuous shielding tape as claimed in claim 1 wherein said first tape layer is made of polyester.

3. The discontinuous shielding tape as claimed in claim 1, wherein said first tape layer is substantially 0.003" in thickness.

4. The discontinuous shielding tape as claimed in claim 1, wherein said first tape layer is substantially 1.0" - 1.5" in width.

5. The discontinuous shielding tape as claimed in claim 1, wherein said metallic layer is substantially 0.001" - 0.002" in thickness.

6. The discontinuous shielding tape as claimed in claim 1, wherein said metallic layer is substantially 0.25" in width less than the width of said first tape layer.

7. The discontinuous shielding tape as claimed in claim 6, wherein said metallic free strips on either side of said metallic layer are each substantially 0.125" in width.

8. The discontinuous shielding tape as claimed in claim 1, wherein said discrete metallic elements are each separated by a gap that is substantially between 0.05" - 0.125".

9. The discontinuous shielding tape as claimed in claim 1, further comprising a second tape layer disposed over said metal layer.

10. The discontinuous shielding tape as claimed in claim 9, wherein said second tape layer is made of polyester.

11. The discontinuous shielding tape as claimed in claim 9, wherein said second tape layer is substantially between 0.0005" - 0.001" in thickness.

12. The discontinuous shielding tape as claimed in claim 9, wherein said second tape layer is applied after said first tape layer is stretched to form said discrete metallic elements.

13. A discontinuous shielding tape comprising:

a first tape layer having a first width; and

a metallic layer disposed on said first tape layer having a second width,

wherein said second width of said metallic layer is narrower than said first width of said first tape layer so as to leave at least two metallic free strips running the longitudinal length of said first tape layer, one on either side of said metal layer,

wherein said metallic layer and said first tape layer are periodically punched completely through only within said second width of said metal layer with resultant discrete metallic elements and corresponding tape layer, such that said discrete metallic elements are separated each by a full air gap created between said discrete metallic elements, where said two metallic free strips are configured to maintain integrity and continuity of said first tape layer.

CLAIMS

1. A multi-fiber, fiber optic connector, said connector comprising:

a housing having a first end for receiving a multi-fiber fiber optic cable and a second end having openings for said fibers from said cable;

first and second keys for setting the polarity of said fibers within said connector, with said first and second keys located on opposing sides of said connector; and

either one of guide pins or guide pin receiving holes for guiding the connection with a second connector,

wherein said keys are movable between a first active position and a second retracted position, such that when one of said keys is in said first active position, said fibers are presented within said connector in a first polarity and when said second key is in said first active position, said fibers are presented within said connector in a second polarity reversed from said first polarity.

2. The multi-fiber, fiber optic connector as claimed in claim 1, wherein said first and second keys are movable between a first forward position and a second backward position by sliding.

3. The multi-fiber, fiber optic connector as claimed in claim 2, wherein when said first and second keys are in said second backward position they are slid with said housing.

4. The multi-fiber, fiber optic connector as claimed in claim 1, wherein said first and second keys are accessible through said housing such that said keys can be moved between said first and second position without opening said housing.

5. The multi-fiber, fiber optic connector as claimed in claim 1, wherein said first and second keys include a spring biasing mechanism.

6. The multi-fiber, fiber optic connector as claimed in claim 1, wherein said connector has guide pins and said guide pins are configured to be movable from a first forward male position to a second female retracted position.

7. The multi-fiber, fiber optic connector as claimed in claim 6, wherein said guide pins are movable from said first forward male position to said second female retracted position via a tab that extends through said housing so that said guide pins are moved without opening said housing.

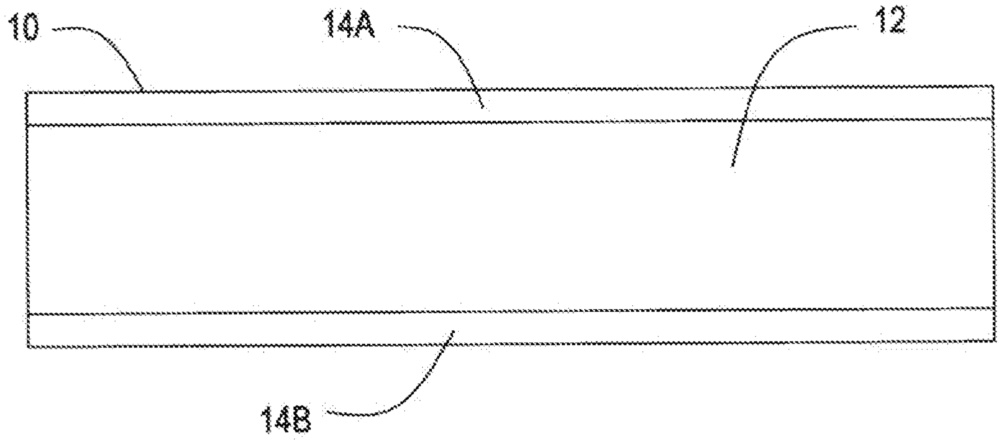

FIG. 1

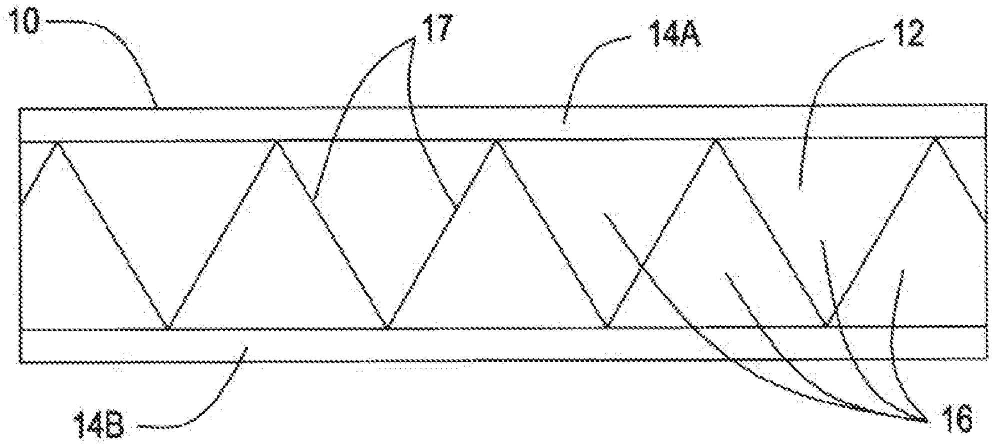

FIG. 2

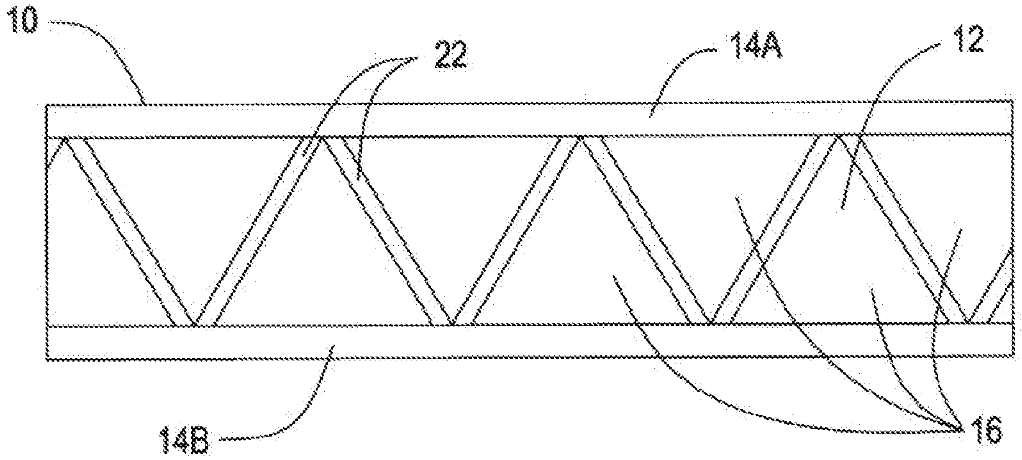

FIG. 3A

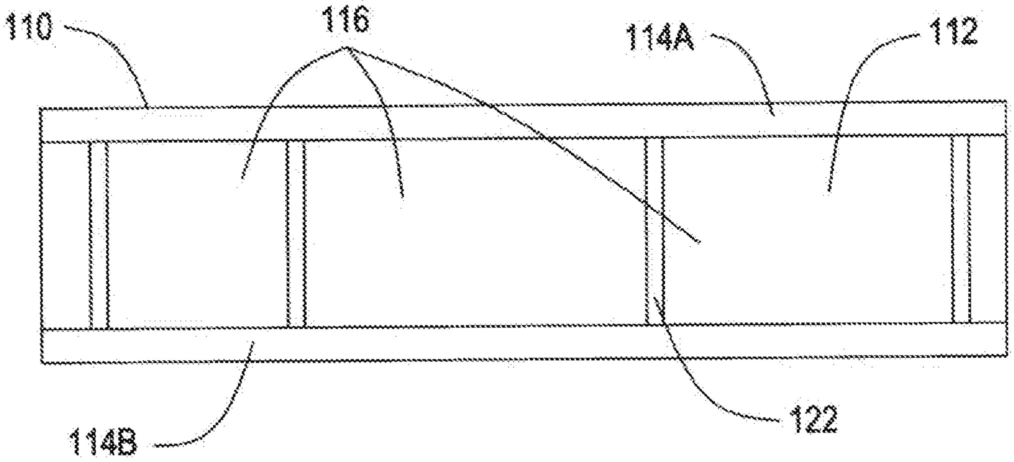

FIG. 3B

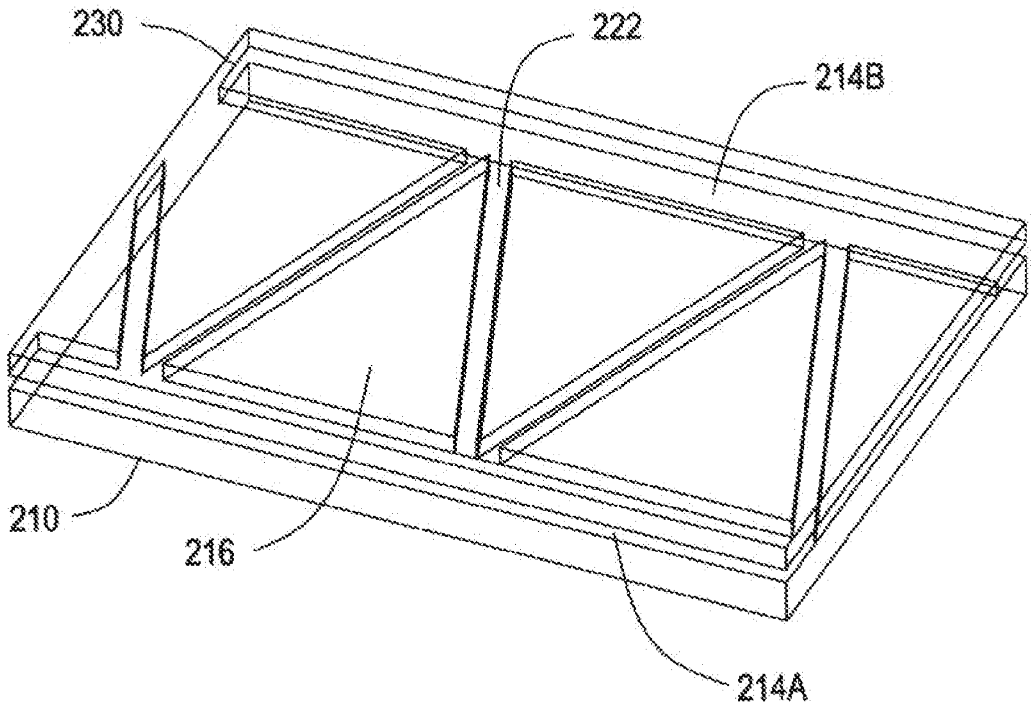

FIG. 4

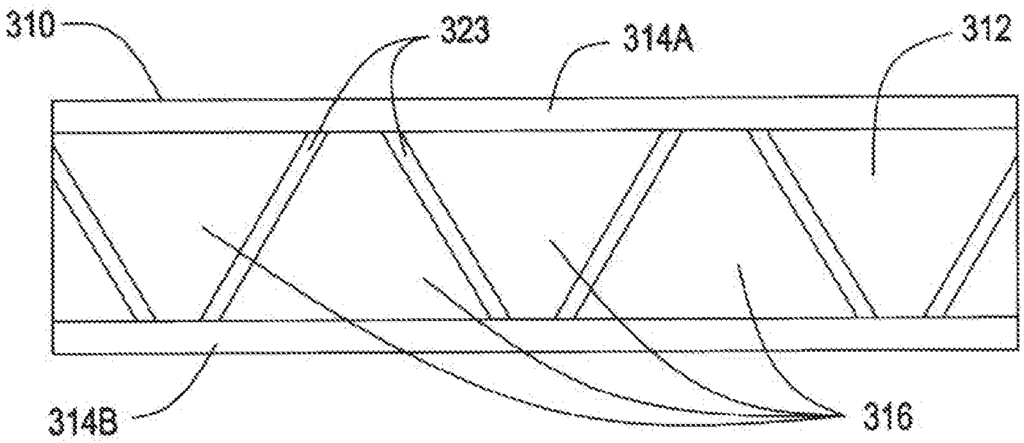

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/001128

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01B11/10
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)
H01B

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2013/159824 A1 (DRAKA COMTEQ BV [NL]; WASSMUTH ANDREAS [DE]; PFEILER CHRISTIAN [DE]) 31 October 2013 (2013-10-31) page 8, line 1 - line 15; figure 3 -----	1,13
A	US 2007/267208 A1 (OGA TATSUYA [JP] ET AL) 22 November 2007 (2007-11-22) paragraph [0043]; figures 5-7 -----	1,13

☐ 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

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"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
8 December 2015	17/12/2015

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2015/001128

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