

wall form a substantially rectangular enclosure. The back wall **30** may include mounting features, such as key hole mounting slots **58** configured for allowing fastening of the cabinet **10** to a wall surface.

[0019] The cabinet may also have a patch panel wall **32** located within the cabinet for connecting fiber optic cable (**108**, **116** in FIG. 2). Such a patch panel wall **32** may extend between the top wall **20** and the bottom wall **28** and substantially parallel to the side wall **22**. The patch panel wall **32** may divide the interior of the cabinet **10** into an incoming chamber **34** and an exiting chamber **36**, thereby creating two surfaces, a first incoming surface **32a** and a second exiting surface **32b**. The cabinet **10** may have an arrangement of slots **38**, **40**, **42**, **44** in the top wall **20** and the bottom wall **28** to route fiber optic cable into the incoming chamber **34** and out of exiting chamber **36**. Incoming fiber optic cables **108** from a cable source may enter the incoming chamber **34** through slot **38** and be terminated on the incoming surface **32a**. In a like manner, fiber optic cable **116** terminated on exiting surface **32b** may be routed out of the cabinet **10** through slot **44** to active equipment, such as a server.

[0020] The cabinet **10** may also be provided with a pair of slack management spools **106** that allow for spooling bulk incoming cables **108** while maintaining a minimum bend radius in the cables. Further, strain relief brackets **110**, **111** may be provided to anchor ties **132**, **134** to the cabinet for bundling the fiber optical cable **108**, **116** that enters and exits each chamber. Other arrangements of the parts of the cabinet **10**, such as the cable slots and patch panel wall are also possible.

[0021] The fiber optic wall mount cabinet **10** may also include lockable first cover **46** and second cover **48** to cover the incoming chamber **34** and exiting chamber **36**, respectively. The first cover **46** may be hingedly connected to the side wall **22** such that the first cover **46** is perpendicular to the side wall **22** and substantially closes the incoming chamber **34**. The second cover **48** may be hingedly connected to the back wall **30**, to form a

second side wall **54** opposite to the side wall **22** when closed, and an exiting front wall **56** level with a closed first cover **46**, when closed. When fully open, the second cover **48** may enable full access to the exiting chamber **36** from both the front and side of the cabinet **10**. The first cover **46** and second cover **48** may also include keyed locks **50** and handles **52**, located preferably on the outer edges of each cover, for providing security and accessibility, respectively, to the respective chambers **34**, **36**. In an alternative embodiment, each cover may be hingeless, completely removable, and releasably secured to the cabinet **10** with snaps, clips, or the like. Other arrangements are also possible.

[0022] The patch panel wall **32** may include a number of removable covers **120** that cover openings in the wall that provide access between the chambers **34**, **36**. Upon removal of an appropriate number of plates **120**, an array **200** of interlocked connector adaptors **202**, **204**, **206** (shown in FIG. 3A and described in greater detail below) may be installed on the wall **32**. As discussed further below, the surfaces **32a**, **32b** of the patch panel wall **32** may be configured to accept direct mounting of the adaptor arrays **200**. The patch panel wall **32** may be configured along with the adaptor arrays **200** in a variety of orientations. In the representative embodiment of FIGS. 1 and 2, for example, two 3 X 6 adaptor arrays **200** are shown fastened to the wall **32**. FIGS. 4A and 4B depict 3 X 5 and 3 X 3 arrays respectively. As will be discussed further below, the connector adaptors may be used in a variety of configurations, for example: as individual connector adaptors; interlocked, multi-member single rows of connector adaptors; interlocked, multi-member single columns of connector adaptors; or multi-row, multi-column arrays of connector adaptors; or any combination thereof.

[0023] The fiber optic connector adaptor arrays **200**, may serve as termination points for incoming fiber optic cables **108**, terminated by connectors **122**, and exiting fiber optic cables **116**, terminated by connectors **60**. To help separate and guide the cables, guide

plates **124**, **126** may also be provided on the wall **32**. While the embodiments in the figures and the discussion below are directed to connector adaptors for MPO type fiber optic connectors, the interlockable connector adaptors may be configured for any type of fiber optic connectors, such as, but not limited to, LC, FC, SC, ST, or MTP types of fiber optic connectors. In addition, each of the adaptors in an array **200** may be configured to accept the same type of connectors, or, individual ones of the adaptors in an array may be configured to individually accept different types of connectors.

[0024] The use of fiber optic connector adaptor arrays **200** on the patch panel wall **32** allows for simplified detachment and reattachment of fiber optic cables **108**, **116**. For example, if a server is to be connected to another cable, only a connection change is required. At the incoming surface **32a**, a connector **122** with a first cable may be removed and replaced by a connector **122** of a second cable. Unlike splicing which is a permanent connection, the use of fiber optic cables with connectors, along with the fiber optic connector adaptors of the patch panel wall, may simplify the process of making connection changes.

[0025] FIG. 3A depicts an embodiment of a 3 X 5 array **200** of connector adaptors **202**, **204**, **206** (shown in greater detail in FIGS. 4A-4C), configured for providing a connection orientation of about 90° with respect to a panel wall **32** when attached to the wall. FIG. 3B depicts a 3 X 3 array **300** of connector adaptors **302**, **304**, **308** (shown in more detail in FIGS. 5A-5C) configured for providing a connection orientation of about 45° with respect to a panel wall **32** when attached to the wall. The connector adaptors **202**, **204**, **206**, **302**, **304**, **308**, may be configured with essentially any angular configuration to provide essentially any connection orientation angle with respect to the panel wall **32**. The angular disposition may be configured as a function of the configuration of the cabinet **10**, the location of the cabinet, and/or the accessibility to the inside of the cabinet. As examples, the adaptors may be configured to provide angular connection orientations with respect to a panel wall of about

20°, about 25°, about 30°, about 35°, about 40°, about 45°, about 50°, about 55°, about 60°, about 65°, about 70°, about 75°, about 80°, about 85°, about 90°, or any angle between any of the listed angles.

[0026] As shown by the representative embodiments of FIGS 1-3, the density of fiber interconnection sites may be maximized by configuring the adaptors **200** to be disposed side-by-side in an interconnected two dimensional or two directional array. In this manner, the adaptors will be abutting one another in adjacent rows and adjacent columns, thereby eliminating wasted space from between adjacent rows and adjacent columns, and essentially providing a maximum density of connection adaptors **200** for the available opening space in the patch panel wall.

[0027] For 90° connection adaptors, there may be at least two types of adaptors as shown in FIGS. 3A and 4A-4C, tabbed adaptors **202** and add-on adaptors **204**, **206**. Tabbed adaptors **202**, as shown in FIG. 4A, may have a rectangular cross-section with a top exterior surface **203a**, a bottom exterior surface **203b**, and two side exterior surfaces **203c** and **203d** connecting the top surface to the bottom surface. Top surface **203a** may have a tab **215** for attaching the tabbed adaptors to a panel wall **32** (FIGS. 1, 2). In an embodiment, the tab **215** may have an orifice **216** for receipt of a fastener, such as a bolt or screw therethrough to fasten the tab to the panel wall. In addition to the tabbed adaptors **202**, adaptors may also be configured as add-on adaptors **204**, **206** as shown in FIGS. 4B and 4C, that may be interconnected with the tabbed adaptors **202** or to others of the add-on adaptors. In an embodiment, there may be at least two types of add-on adaptors, single connector adaptors **204** configured to provide a single cable connection, or multiple connector adaptors **206** that may be configured to provide at least two cable connections. In further embodiments, multiple connector adaptors **206** may be configured to provide more than two cable connections, and may be configured to provide three connections, four connections, five

connections, six connections, seven connections, eight connections, nine connections, ten connections, or more connections depending on the size of the cabinet **10**, the size of the openings into which the connectors fit, and/or the number of connections needed in the cabinet.

[0028] In a similar manner as discussed with reference to the add-on adaptors, while not shown, tabbed adaptors **202** may also be configured as multiple connector adaptors for providing at least two cable connections.

[0029] Add-on adaptors **204** may have a rectangular cross-section with top exterior surface **205a**, a bottom exterior surface **205b**, and two side exterior surfaces **205c** and **205d** connecting the top surface to the bottom surface. Similarly, add-on adaptors **206** may have a rectangular cross-section with top exterior surface **207a**, a bottom exterior surface **207b**, and two side exterior surfaces **207c** and **207d** connecting the top surface to the bottom surface.

[0030] In an embodiment, the top surface **205a** of adaptor **204** may be the same as the top surface **207a** of adaptor **206**, and the bottom surface **205b** of adaptor **204** may be the same as the bottom surface **207b** of adaptor **206**. In addition, for add-on adaptors **204**, **206**, the top and bottom surfaces, **205a**, **205b** and **207a**, **207b** respectfully, may essentially be symmetrically identical, and the sides may be symmetrically identical, such that upon rotation of the adaptors along a longitudinal axis **208**, the tops and bottoms are interchangeable, and the left and right sides are interchangeable.

[0031] FIGS. 4D and 4E depict an alternative embodiment of an adaptor array **200** in which all of the adaptors are configured and arranged so that key slots **251** (described in greater detail below) within the adaptors are aligned in the same direction. Fiber optic connectors will then only fit into the adaptors in one orientation for all of the adaptors. For such an alignment, the internal configuration of the adaptors may be configured appropriately, so that when interconnected, all of the key slots **251** are arranged

appropriately. For example, for the adaptor **202** of FIG. 4A, the key slot **251** is disposed under the surface **203a** which has the tab **215**. FIG. 4D depicts an alternative tabbed adaptor **202-A** where the key slot **251** is disposed on the opposite side, under the surface **203b**, so that when arranged in an array as shown in FIG. 4E, the key slots are appropriately aligned. In a similar manner, the internal arrangement of adaptors **204**, **206** may also be configured as needed to provide an desired alignment of key slots **251**.

[0032] To retain the adaptors **202**, **204**, **206** together in an array **200** as shown in FIG. 3A, the adaptors may be interconnected top-to-bottom to provide an interconnected column of adaptors, interconnected side-to-side to provide interconnected rows of adaptors, or interconnected both top-to-bottom and side-to-side to provide a fully interlocked adaptor array. In an embodiment, the adaptors **202**, **204**, **206** may be interconnected by means of keyed rails **220** and corresponding keyed channels **225** disposed on the corresponding surfaces to be mated. The adaptors **202**, **204**, **206** may then be locked together by aligning the rails **220** and channels **225** of one adaptor end-to-end with the rails and channels of another adaptor, and sliding the corresponding rails and channels together along a longitudinal direction (a direction corresponding to axis **208**).

[0033] While not limited to the following, the rails **220** and channels **225** may have similar cross-sectional configurations (orthogonal to the longitudinal direction) in the shape of an isosceles trapezoid as shown in FIGS. 4A-4C. As such, the portion of the rails **220** disposed outwardly away from the surface may have a width dimension that is larger than the portion disposed adjacent the surface, and in a similar manner the portion of the channels **225** disposed inwardly from the surface may have a width that is greater than the width of the rails at the surface. The rails **220** and channels **225** may have essentially any cross-sectional configuration which provides for an interlocking engagement in orthogonal directions to the sliding longitudinal direction.

[0034] While the adaptors **202**, **204**, **206** depicted in FIGS. 4A-4C have such rails **220** and channels **225** shown on the tops and bottoms **203b**, **205a**, **205b**, **207a**, **207b** thereof, the adaptors may also have similar rails/channels on the sides **203c**, **203d**, **205c**, **205d**, **207c**, **207d** thereof, so that sliding engagement may interlock the adaptors from top-to-bottom and side-to-side with adjoining adaptors. By providing sliding interlocking engagements in both directions, any one adaptor **202**, **204**, **206** may individually be removed from an adaptor array **200** without essentially disturbing any of the other adaptors. As an example, for an adaptor array **200** fastened together and installed in a panel **10** (FIG. 1), if it becomes necessary to replace one, or more of the adaptors **202**, **204**, **206**, the adaptors that need to be replaced may be slid out of the array and removed, and a new adaptor or adaptors may be inserted, without disassembly of all of the fiber optic cable connectors **122**, **60** and removal of the array from the panel.

[0035] In an alternative embodiment, adaptors **202**, **204**, **206** may be interlocked with adjoining adaptors by alternative fastening devices. As shown in FIGS. 6 and 7, one type of fastening device may be a clip **230** that may be configured for fastening two adjoining adaptors together. In the embodiment as shown, the sides **203c**, **203d**, **205c**, **205d**, **207c**, **207d** of the adaptors may have coordinating slots **235** for receiving the clip **230** therein. The clips **230** may have a main body portion **232** and clip projections **233** that are configured to engage within the slots **235** and retain the clips within the slots **235**. Clip projections **233** may have a beveled surface **233a** to provide for an easier insertion of the clips **230** into the slots **235**, and an engaging surface **233b** that engages with a surface **235b** within the slots.

[0036] Clips **230** may be constructed of a variety of materials. In an embodiment, the clips **230** may be made of a material which has at least some resiliency so that upon insertion into the slots **235**, the projections **233** may deform to fit through the slots, and, upon passage through the slots and into an internal space **235a**, return to essentially their original

shape to provide an engagement between surface **233b** and **235b** to retain the clips in the slots. In addition, a resilient material may also allow for the adaptors to be disassembled after one adaptor is interlocked with an adjoining adaptor by means of such a clip **230**. By applying a sufficient amount of force in pulling one adjoining adaptor away from another, the clip **230** and projections **233** may be deformed by an amount which allows for an adaptor to disengage from a clip. The resiliency or deformability of a clip **230** may alter the ability of a clip to be removed from a slot **235** once assembled. In instances when it may not be desirable for a clip **270** to be removable, the clip may be made from a rigid material, for example, a metal or a hard plastic. Such a rigid clip may essentially not be removable from an adaptor without significant force and possible damage to an adaptor, while a clip of a softer polymer, for example, a rubber material, may be separated from engagement with an adaptor upon application of an appropriate force, without damage to the adaptor.

[0037] In an alternative embodiment, instead of rails **220** and channels **225**, as discussed above, the tops and bottoms of the adaptors **203b**, **205a**, **205b**, **207a**, **207b** may also be configured with slots **235** for interconnection via clips **230**.

[0038] In an embodiment in which the adaptors **202**, **204**, **206** are configured for sliding engagement via rails **220** and channels **225**, the adaptors may also include a mechanism for ensuring that the adaptors are properly aligned and/or provide resistance to retain the adaptors in a proper alignment. As represented in FIGS. 4A-4C, the adaptors **202**, **204**, **206** may have a projection **240**, on at least one of the top surfaces **205a**, **207a** and bottom surfaces **203b**, **205b**, **207b** and a corresponding recess **245** on at least the other of the top and bottom surfaces, so that when two adaptors are slid together a projection of one of the adaptors may engage with a recess on the adjoining adaptor to indicate that proper alignment has been attained. As shown in FIGS 4A-4C, each of the top and bottom surfaces may have both a recess **245** and a projection **240** such that the projection of a first adaptor may fit into

the recess of the other adjoining adaptor, and the projection of the other adaptor may fit into the recess of the first adaptor.

[0039] As shown in FIGS 4A-4C and FIG. 8, adaptors **202**, **204**, **206** may have a first end **210a** and a second end **210b**, and may define a longitudinal passage **212** extending from the first end to the second end. FIG. 8 depicts a representative cross-section of an adaptor **204** taken along the section VIII-VIII in FIG. 4B, and FIG. 9 depicts a representative cross-section of an adaptor taken along the section IX-IX in FIG. 4B. As depicted in FIGS 4A-4C, 8 and 9, in an embodiment, the internal configuration within the adaptors may be different within each of the two ends **210a**, **210b**. In alternative embodiments, the internal configuration within the adaptors may be the same within each of the two ends **210a**, **210b**.

[0040] In embodiments wherein the internal configurations are the same within each of the two ends **210a**, **210b**, and if the adaptors **202**, **204**, **206** are interlocked by means of clips **230** from side-to-side and from top-to-bottom, the adaptors **204**, **206** may be configured to be 180° rotationally symmetrical about all three of their major axes. In a similar manner, tabbed adaptors **202** may be configured to be 180° rotationally symmetrical about one of its major axes (a central axis parallel to IX-IX in FIG. 4B) while a 180° rotation about the other two major axes (axis **208** and a central axis parallel to VIII-VIII in FIG. 4B) will result in a tab displacement of 180°, all other features remaining essentially symmetrically the same.

[0041] In an embodiment, the first end **210a** may be configured for directly receiving a fiber optic connector (not shown for simplicity) therein. In an embodiment, the first end **210a** may be keyed with a slot **251** as depicted in FIGS. 4B and 9, to allow a fiber optic connector, having a corresponding tab for the notch, to be inserted into the end **210a** in only one alignment. In alternative configurations, if a keyed alignment is not desired or needed, a slot **251** may be provided on each of the opposing sides, or there may be no notches at all on either side to correspond to a non-keyed connector.

[0042] The first end **210a** may include a retaining arrangement for holding a fiber optic connector within the end once the connector is inserted into the end. In an embodiment as shown, the retaining arrangement may include two oppositely disposed biased retaining arms **250a** and **250b**. The retaining arms **250a**, **250b** may be connected at a distal end thereof within the adaptors to allow for a pivoting movement of the arms, and may have projecting tab portions **252a**, **252b** adjacent the first end **210a**. The internal width **255** between the tab portions **252a**, **252b** may be less than the internal width **257** within the adaptor. A fiber optic connector having a width approximately the same as the width **257** may be inserted into the opening **210a**, displacing the tab portions **252a**, **252b** outwardly away from one another to pass between the retaining arms **250a**, **250b**. The fiber optic connector may be configured with notches, a groove, or an end, etc., so that when seated within the adaptor, the arms **250a**, **250b** and tab portions **252a**, **252b** return to essentially their original location wherein the tab portions may then hold the connector within the adaptor.

[0043] In an embodiment (not shown), the internal configuration within the end **210b** may be configured in the same manner as the internal configuration within the end **210a** as discussed above.

[0044] Alternatively, as depicted in FIGS 4A-4C and 8-10, the internal configuration within the adaptors at the end **210b** may differ from that of the first end **210a**. Ends **210b** of adaptors **202**, **204**, **206** may be configured for receiving an adaptor latch **270** of a type as depicted in FIGS. 10a and 10b. Latches **270** may be insertable into the ends **210b** to convert the ends for receiving and retaining a fiber optic connector therein. The internal cavity within the end **210b** may be configured with at least one keying slot **274** to determine the orientation in which the latch **270** will fit into the end. The latch **270** may correspondingly have a keying projection **276** that fits into the keying slot **274** to orient the

latch within the opening. The keying projection **276** of the latch **270** may likewise define an internal keyed slot **277** (similar to slot **251** as discussed above) for determining the orientation that a fiber optic connector will fit into the latch. With such a configuration, an array of adaptors **202**, **204**, **206** may be assembled with an appropriate keyed orientation and if desired fastened into a panel box. Thereafter, a latch **270** may be inserted into the adaptor end **210b** in accordance with the keyed orientations. Alternatively, latches **270** may be inserted into the adaptors prior to array assembly.

[0045] In an embodiment as shown in FIGS 9 and 10B, each of the opposing faces **278a**, **278b** within the end **210b** may be configured with a keying slot **274** allow a latch **270** to be inserted in either orientation within the adaptors as shown in FIG. 10, wherein the left two latches **270** have keying projections **276** oriented to the left, and right three latches have the keying projections oriented towards the right. With such an embodiment, the adaptors **202**, **204**, **206** may be assembled into an array **200** and the desired orientation of the latch may be determined at a later time.

[0046] The latch **270** may have displaceable catches **280** that engage in slots **285** of the adaptors to retain the latch within the adaptor. The catches **280** may be displaceable inwardly as the latch **270** is being inserted into the adaptor end, and when the latch is full seated, the catches may be configured to return to essentially their original positions as they pass into slots **285**. FIGS. 11A and 11B provide alternative cross-sectional views of latches **270** installed within adaptors **202**, **204**, **206**.

[0047] In an embodiment as shown, the latch **270** may include two oppositely disposed biased retaining arms **290a** and **290b**, similar to the arms **250a** and **250b** as discussed above. The retaining arms **290a**, **290b** may be connected at a distal end thereof to the latch, and may have projecting tab portions **292a**, **292b** adjacent the proximal end of the arms. The internal width between the tab portions **292a**, **292b** may be less than the internal

width within the latch, and a fiber optic connector may be inserted into the opening, displacing the tab portions **292a**, **292b** outwardly away from one another to pass between the retaining arms **290a**, **290b**. Adaptor ends **210b** may be configured with slots **275** (FIG. 9) to allow arms **290a**, **290b** to move outwardly when latches **270** are within the adaptors. Tab portions **292a**, **292b**, upon passage of the connector body portion into the latch, may return to their original position and hold the connector within the latch and adaptor.

[0048] In an additional embodiment, the internal configuration within the end **210a** may be configured for an adaptor latch **270** in the same manner as the internal configuration within the end **210b** as discussed above.

[0049] As mentioned earlier with reference to FIG. 3B, the connector adaptors may also be configured to provide an angular orientation of fiber optic cable with respect to a panel wall. FIGS. 5A-5C show an embodiment of angled adaptors **302**, **304**, **308** configured to provide about a 45° orientation with respect to a panel wall, such as wall **32** of FIGS. 1 and 2. Adaptors **302**, **304**, **308** may have many similar features to those as discussed above with respect to the 90° adaptors, and therefore, most of the above discussion with regard to the adaptors, latches and configurations thereof, may apply to the angled adaptors as well, with exceptions resulting from the angular positioning of the tab **315**.

[0050] As shown in FIGS. 3B and 5A-5C, there may be at least three configurations of angled adaptors, first tabbed adaptors **302**, add-on adaptors **304**, and second tabbed adaptors **308**. In alternative embodiments, for example, if the internal configuration at ends **310a**, **310b** are the same, and if clips **230** and passages **335** are used for interconnecting the adaptors from top-to-bottom and from side-to-side only one type of tabbed angle adaptor may be necessary.

[0051] Tabbed adaptors **302**, as shown in FIG. 5A, may have a rectangular cross-section with a top exterior surface **303a**, a bottom exterior surface **303b**, and two side exterior

surfaces **303c** and **303d** connecting the top surface to the bottom surface. Top surface **303a** may have an angled tab **315a** for attaching the tabbed adaptors to a panel wall **32** (FIGS. 1, 2), wherein the tab is disposed at about a 45° angle with respect to the end **310b** or surface **303a**. In an embodiment, the tab **315a** may have an orifice **316** for receipt of a fastener, such as a bolt or screw therethrough to fasten the tab to the panel wall. Alternatively, other types of fastening arrangements may also be used.

[0052] Tabbed adaptors **308**, as shown in FIG. 5C, may have a rectangular cross-section with a top exterior surface **309a**, a bottom exterior surface **309b**, and two side exterior surfaces **309c** and **309d** connecting the top surface to the bottom surface. Bottom surface **309b** may have a tab **315b** for attaching the tabbed adaptors to a panel wall **32** (FIGS. 1, 2), wherein the tab is disposed at a 45° angle with respect to the end **310a**. In an embodiment, the tab **315b** may have an orifice **316** for receipt of a fastener, such as a bolt or screw therethrough to fasten the tab to the panel wall.

[0053] In addition to the tabbed angled adaptors **302**, **308**, angled adaptors may also be configured as add-on adaptors **304** as shown in FIG. 5B, that may be interconnected with the tabbed adaptors **302**, **308** or to others of the add-on adaptors. While only a single connector add-on adaptor **304** configured to provide a single cable connection is shown, multiple connector adaptors may be configured (in a manner as presented above with respect to adaptor **206**) to provide at least two cable connections. In further embodiments, multiple connector adaptors may also be configured to provide more than two cable connections, and may be configured to provide three connections, four connections, five connections, six connections, seven connections, eight connections, nine connections, ten connections, or more connections depending on the size of the cabinet **10**, the size of the openings into which the connectors fit, and/or the number of connections needed in the cabinet.

[0054] Add-on adaptors **304** may have a rectangular cross-section with top exterior surface **305a**, a bottom exterior surface **305b**, and two side exterior surfaces **305c** and **305d** connecting the top surface to the bottom surface.

[0055] To retain the adaptors **302**, **304**, **308** together, the adaptors may be interconnected top-to-bottom to provide an interconnected column of adaptors, interconnected side-to-side to provide interconnected rows of adaptors, or interconnected both top-to-bottom and side-to-side to provide a fully interlocked adaptor array. In an embodiment, the adaptors **302**, **304**, **308** may be interconnected by means of keyed rails **320** and corresponding keyed channels **325** disposed on the corresponding surfaces to be mated. The adaptors **302**, **304**, **308** may then be locked together by aligning the rails **320** and channels **325** of one adaptor end-to-end with the rails and channels of another adaptor, and sliding the corresponding rails and channels together along a longitudinal direction (a direction corresponding to axis **306**).

[0056] While not limited to the following, the rails **320** and channels **325** may have similar cross-sectional configurations (orthogonal to the longitudinal direction) in the shape of an isosceles trapezoid as shown in FIGS. 5A-5C. As such, the portion of the rails **320** disposed outwardly away from the surface may have a width dimension that is larger than the portion disposed adjacent the surface, and in a similar manner the portion of the channels **325** disposed inwardly from the surface may have a width that is greater than the width of the rails at the surface. The rails **320** and channels **325** may have essentially any cross-sectional configuration which provides for an interlocking engagement in orthogonal directions to the sliding longitudinal direction.

[0057] While the adaptors **302**, **304**, **308** depicted in FIGS. 5A-5C have such rails **320** and channels **325** shown on the tops and bottoms **303b**, **305a**, **305b**, **309a** thereof, the adaptors may also have similar rails/channels on the sides **303c**, **303d**, **305c**, **305d**, **309c**,

309d thereof, so that sliding engagement may interlock the adaptors from top-to-bottom and side-to-side with adjoining adaptors. By providing sliding interlocking engagements in both directions, any one adaptor **302, 304, 308** may individually be removed from an adaptor array **300** without essentially disturbing any of the other adaptors. As an example, for an adaptor array **300** fastened together and installed in a panel **10** (FIG. 1), if it becomes necessary to replace one, or more of the adaptors **302, 304, 308**, the adaptors that need to be replaced may be slid out of the array and removed, and a new adaptor or adaptors may be inserted, without disassembly of all of the fiber optic cable connectors **122, 60** and removal of the array from the panel.

[0058] As shown in FIG. 3B, the adaptors **302, 304, 308** overly each other by about one-half of their length. Therefore, as depicted in FIGS. 3B and 5A-5C, the rails **320** and channels **325** may extend along only one-half of the length. However, full length rails **320** and channels **325** may also be provided, as such may provide for full sliding engagement, especially for adaptors having a sliding interlocking engagement on all sides, as described above.

[0059] In an alternative embodiment, adaptors **302, 304, 308** may be interlocked with adjoining adaptors by alternative fastening devices, such clip **230** described above. In the embodiment as shown, the sides **303c, 303d, 305c, 305d, 309c, 309d** of the adaptors may have coordinating slots **335** (essentially the same as slots **235** described above) for receiving the clip **230** therein.

[0060] In an alternative embodiment, instead of rails **220** and channels **225**, as discussed above, the tops and bottoms of the adaptors **303b, 305a, 305b, 309a** may also be configured with slots for interconnection via clips **230**.

[0061] In an embodiment in which the adaptors **302, 304, 308** are configured for sliding engagement via rails **320** and channels **325**, the adaptors may also include a

mechanism for ensuring that the adaptors are properly aligned and/or provide resistance to retain the adaptors in a proper alignment. For this purpose, projections and recesses may be configured in a manner as described above for the 90° adaptors (**240** and **245** in FIGS. 4A-4C). Alternatively, as represented in FIGS. 5A-5C, the adaptors **302**, **304**, **308** may have at least a projection **340**, on one of the top surface or the bottom surface, and a corresponding recess on at least the other of the top or bottom surfaces. In FIGS. 5A-5C, surfaces **303b** and **305b** have a projection **340**, while surfaces **305a** and **309a** have a recess **345**, and such could be interchanged, with surfaces **303b** and **305b** having a recess, while surfaces **305a** and **309a** have a projection.

[0062] Adaptors **302**, **304**, **308** may have a first end **310a** and a second end **310b** and may define a longitudinal passage **312** extending from the first end to the second end. FIG. 12 depicts a representative cross-section of an adaptor **304** taken along the section XII-XII in FIG. 5B, and FIG. 13 depicts a representative cross-section of an adaptor taken along the section XIII-XIII in FIG. 5B. As depicted in FIGS. 5A-5C, 12 and 13, in an embodiment, the internal configuration within the adaptors may be different within each of the two ends **310a**, **310b**. In alternative embodiments, the internal configuration within the adaptors may be the same within each of the two ends **310a**, **310b**.

[0063] In embodiments wherein the internal configurations are the same within each of the two ends **310a**, **310b**, and if the adaptors **302**, **304**, **308** are interlocked by means of clips **230** from side-to-side and from top-to-bottom, the adaptors **304** may be configured to be 180° rotationally symmetrical about all three of their major axes. In a similar manner, tabbed adaptors **302** and **308** may be interchangeable as discussed above.

[0064] In an embodiment, the first end **310a** may be configured for directly receiving a fiber optic connector (not shown for simplicity) therein. In an embodiment, the first end **310a** may be keyed with a slot **351** as depicted in FIG. 13, to allow a fiber optic

connector, having a corresponding tab for the notch, to be inserted into the end **310a** in only one alignment. In alternative configurations, if a keyed alignment is not desired or needed, a slot **351** may be provided on each of the opposing sides, or there may be no notches at all on either side to correspond to a non-keyed connector.

[0065] The first end **310a** may include a retaining arrangement for holding a fiber optic connector within the end once the connector is inserted into the end. In an embodiment as shown, the retaining arrangement may include two oppositely disposed biased retaining arms **350a** and **350b**. The retaining arms **350a**, **350b** may be connected at a distal end thereof within the adaptors to allow for a pivoting movement of the arms, and may have projecting tab portions **352a**, **352b** adjacent the first end **310a**. The internal width **355** between the tab portions **352a**, **352b** may be less than the internal width **357** within the adaptor. A fiber optic connector having a width approximately the same as the width **357** may be inserted into the opening **310a**, displacing the tab portions **352a**, **352b** outwardly away from one another to pass between the retaining arms **350a**, **350b**. The fiber optic connector may be configured with notches, a groove, or an end, etc., so that when seated within the adaptor, the arms **350a**, **350b** and tab portions **352a**, **352b** return to essentially their original location wherein the tab portions may then hold the connector within the adaptor.

[0066] In an embodiment (not shown), the internal configuration within the end **310b** may be configured in the same manner as the internal configuration within the end **310a** as discussed above.

[0067] Alternatively, as depicted in FIGS 5A-5C, 12 and 13, the internal configuration within the adaptors at the end **310b** may differ from that of the first end **310a**. Ends **310b** of adaptors **302**, **304**, **308** may be configured for receiving the adaptor latch **270** (FIG. 10A) described above. The internal cavity within the end **310b** may be configured with

slots **385** to retain the latch **270** within the adaptor via the catches **280**. The internal cavity within the end **310b** may be configured with at least one keying slot **374** (shown in additional detail in FIG. 5B) to determine the orientation in which the latch **270** will fit into the end. The latch **270** may correspondingly have a keying projection **276** that fits into the keying slot **374** to orient the latch within the opening. The keying projection **276** of the latch **270** may likewise define an internal keyed slot **277** (similar to slot **351** as discussed above) for determining the orientation that a fiber optic connector will fit into the latch. With such a configuration, an array of adaptors **302**, **304**, **308** may be assembled with an appropriate keyed orientation and if desired fastened into a panel box. Thereafter, a latch **270** may be inserted into the adaptor end **310b** in accordance with the keyed orientations. Alternatively, latches **270** may be inserted into the adaptors prior to array assembly.

[0068] In an embodiment as shown in FIG. 13, each of the opposing faces **378a**, **378b** within the end **310b** may be configured with a keying slot **374** allow a latch **270** to be inserted in either orientation within the adaptors (similar to that as shown in FIG. 10b, wherein the left two latches **270** have keying projections **276** oriented to the left, and right three latches have the keying projections oriented towards the right). With such an embodiment, the adaptors **302**, **304**, **308** may be assembled into an array **300** and the desired orientation of the latch may be determined at a later time. FIGS. 14A and 14B provide alternative cross-sectional views of latches **270** installed within adaptors **302**, **304**, **308**. Adaptor ends **310b** may be configured with slots **375** (FIGS. 12, 13) to allow arms **290a**, **290b** of the latches **270** to move outwardly when latches are within the adaptors.

[0069] In an additional embodiment, the internal configuration within the end **310a** may be configured for an adaptor latch **270** in the same manner as the internal configuration within the end **310b** as discussed above.

[0070] As shown in FIGS. 11B and 14B, a plug cap may be provided that also fits within the ends of the adaptors. In the depicted embodiments, when the ends are configured for direct receipt of a connector therein (ends **210a**, **310a** in FIGS. 4A-4C, 5A-5C) a dust cap **400** may fit directly into the ends and may be held in place within the opening via the arms **250a**, **250b**, **350a**, **350b** and the projections **252a**, **252b**, **352a**, **352b** that may engage in a recess of the cap. In addition, when the ends are configured to receive the latches **270** therein (ends **210b**, **310b** in FIGS. 4A-4C, 5A-5C) the dust caps **400** may be configured to fit within the latches **270** to be held in place within the ends **210b**, **310b** via the arms **290a**, **290b** and the projections **292a**, **292b** that may engage in a recess of the cap. As shown in FIGS. 11B and 14B, one configuration of dust caps **400** may fit into both types of ends.

[0071] This disclosure is not limited to the particular systems, devices and methods described, as these may vary. The terminology used in the description is for the purpose of describing the particular versions or embodiments only, and is not intended to limit the scope.

[0072] In the above detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description, drawings, and claims are not meant to be limiting. Other embodiments may be used, and other changes may be made, without departing from the spirit or scope of the subject matter presented herein. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the Figures, can be arranged, substituted, combined, separated, and designed in a wide variety of different configurations, all of which are explicitly contemplated herein.

[0073] The present disclosure is not to be limited in terms of the particular embodiments described in this application, which are intended as illustrations of various

aspects. Many modifications and variations can be made without departing from its spirit and scope, as will be apparent to those skilled in the art. Functionally equivalent methods and apparatuses within the scope of the disclosure, in addition to those enumerated herein, will be apparent to those skilled in the art from the foregoing descriptions. Such modifications and variations are intended to fall within the scope of the appended claims. The present disclosure is to be limited only by the terms of the appended claims, along with the full scope of equivalents to which such claims are entitled. It is to be understood that this disclosure is not limited to particular methods, reagents, compounds, compositions or biological systems, which can, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting.

[0074] As used in this document, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art. Nothing in this disclosure is to be construed as an admission that the embodiments described in this disclosure are not entitled to antedate such disclosure by virtue of prior invention. As used in this document, the term "comprising" means "including, but not limited to."

[0075] While various compositions, methods, and devices are described in terms of "comprising" various components or steps (interpreted as meaning "including, but not limited to"), the compositions, methods, and devices can also "consist essentially of" or "consist of" the various components and steps, and such terminology should be interpreted as defining essentially closed-member groups.

[0076] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from

the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0077] It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (*e.g.*, bodies of the appended claims) are generally intended as “open” terms (*e.g.*, the term “including” should be interpreted as “including but not limited to,” the term “having” should be interpreted as “having at least,” the term “includes” should be interpreted as “includes but is not limited to,” etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases “at least one” and “one or more” to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles “a” or “an” limits any particular claim containing such introduced claim recitation to embodiments containing only one such recitation, even when the same claim includes the introductory phrases “one or more” or “at least one” and indefinite articles such as “a” or “an” (*e.g.*, “a” and/or “an” should be interpreted to mean “at least one” or “one or more”); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation is explicitly recited, those skilled in the art will recognize that such recitation should be interpreted to mean at least the recited number (*e.g.*, the bare recitation of “two recitations,” without other modifiers, means at least two recitations, or two or more recitations). Furthermore, in those instances where a convention analogous to “at least one of A, B, and C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (*e.g.*, “a system having at least one of A, B, and C” would include but not be limited to systems that

have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to “at least one of A, B, or C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., “a system having at least one of A, B, or C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase “A or B” will be understood to include the possibilities of “A” or “B” or “A and B.”

[0078] In addition, where features or aspects of the disclosure are described in terms of Markush groups, those skilled in the art will recognize that the disclosure is also thereby described in terms of any individual member or subgroup of members of the Markush group.

[0079] As will be understood by one skilled in the art, for any and all purposes, such as in terms of providing a written description, all ranges disclosed herein also encompass any and all possible subranges and combinations of subranges thereof. Any listed range can be easily recognized as sufficiently describing and enabling the same range being broken down into at least equal halves, thirds, quarters, fifths, tenths, etc. As a non-limiting example, each range discussed herein can be readily broken down into a lower third, middle third and upper third, etc. As will also be understood by one skilled in the art all language such as “up to,” “at least,” and the like include the number recited and refer to ranges which can be subsequently broken down into subranges as discussed above. Finally, as will be understood by one skilled in the art, a range includes each individual member. Thus, for example, a

group having 1-3 cells refers to groups having 1, 2, or 3 cells. Similarly, a group having 1-5 cells refers to groups having 1, 2, 3, 4, or 5 cells, and so forth.

[0080] Various of the above-disclosed and other features and functions, or alternatives thereof, may be combined into many other different systems or applications. Various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art, each of which is also intended to be encompassed by the disclosed embodiments.

CLAIMS

What Is Claimed Is:

1. A fiber optic adaptor for providing a connection between at least two fiber optic connectors, the adaptor comprising:
 - at least first and second cavities for receiving fiber optic connectors therein; and
 - connecting members configured for directly interconnecting the adaptor with at least two additional adaptors in both first and second directions of a two-directional array to provide an interconnected two-directional array of adaptors with interconnections in each of the two directions.
2. The adaptor of claim 1, wherein the adaptor has an exterior surface for being disposed adjacent and abutting an exterior surface of additional interconnected adaptors in each of the two-directions.
3. The adaptor of claim 2, wherein:
 - the connecting members comprise at least one of:
 - a slot in the external surface of the adaptor, and
 - a projection extending from the external surface of the adaptor; and
 - the at least one of the slot and the projection is configured to interlock with a corresponding other of:
 - a projection extending from an external surface of an additional adaptor, and
 - a slot in an external surface of an additional adaptor.

4. The adaptor of claim 2, wherein the connecting members comprise clips configured for engaging the adaptor and an additional adaptor to interconnect the adaptor with the additional adaptor.

5. The adaptor of claim 1, wherein:

the adaptor has a first end comprising the first cavity, a second end comprising the second cavity and disposed opposite the first end, and defines a first longitudinal bore between the first and second ends, the first longitudinal bore defining a longitudinal axis;

the adaptor defines an exterior surface disposed about the longitudinal bore, and the exterior surface defines at least a first pair of oppositely disposed sides defining a first direction orthogonal to the longitudinal axis, and a second pair of oppositely disposed sides defining a second direction orthogonal to both the longitudinal axis and the first orthogonal direction; and

at least one side of each pair of opposite sides is configured for being disposed adjacent and abutting a side of an additional interconnected adaptor.

6. The adaptor of claim 5, wherein:

the adaptor is configured for being disposed in a panel;

the panel defines a planar surface; and

the adaptor is configured for being disposed in the panel with the longitudinal direction thereof at an angle of about 30 degrees to 90 degrees with respect to the planar surface.

7. The adaptor of claim 5, wherein:

the adaptor is a rectangular cuboid having a length extending from the first end to the second end;

the first pair of oppositely disposed sides comprises a first side and a second side defining a height therebetween;

the second pair of oppositely disposed sides comprises a third side and a fourth side defining a width therebetween;

at least one of the first side and the second side is configured for being disposed adjacent to and interconnected with one of a first side and a second side of an additional interconnected adaptor; and

at least one of the third side and the fourth side is configured for being disposed adjacent to and interconnected with one of a third side and a fourth side of an adjacent interconnected adaptor.

8. The adaptor of claim 7, wherein:

the connecting members are disposed on the at least one of the first side and the second side and on the at least one of the third side and the fourth side;

the connecting members comprise at least one of:

a slot in the external surface of the adaptor extending in a longitudinal direction of the adaptor; and

a projecting rail extending from the external surface of the adaptor and extending in a longitudinal direction of the adaptor;

the at least one of the slot and the projecting rail is configured to interlock via a longitudinal sliding engagement with a corresponding other of:

a projecting rail extending from an external surface of an additional adaptor, and

a slot in an external surface of an additional adaptor; and

the at least one of the first side and the second side and the at least one of the third side and the fourth side comprises a stop for aligning adaptors during sliding engagement.

9. The adaptor of claim 8, wherein:

the first and second cavities are each configured for receiving a type of fiber optic connector selected from the group comprising MPO, LC, FC, SC, ST, and MTP type fiber optic connectors;

the adaptor comprises at least one additional longitudinal bore disposed in longitudinal alignment with the first longitudinal bore and aligned with the first longitudinal bore in the first orthogonal direction, each at least one additional longitudinal bore comprises an additional set of first and second cavities for receiving and aligning fiber optic connectors therein; and

the first orthogonal direction defines a first orthogonal axis to the longitudinal axis, the second orthogonal direction defines a second orthogonal axis to the longitudinal axis, and the adaptor has 180° rotational symmetry about the longitudinal axis, the first orthogonal axis, the second orthogonal axis, or any combination thereof.

10. The adaptor of claim 8, wherein the adaptor is one of a tabbed adaptor for being fastened to a panel assembly and an add-on adaptor configured for being attached to at least one of a tabbed adaptor and an additional add-on adaptor, wherein:

a tabbed adaptor comprises:

a tab extending from the first side and configured for being fastened to a panel assembly; and

at least one connecting member disposed on each of the second, third and fourth sides,

wherein the second side of the tabbed adaptor is configured to be interconnected with each of:

a first side and a second side of an add-on adaptor, and

a second side of an additional tabbed adaptor, and

the third and fourth sides of the tabbed adaptor are configured to be connected to each of:

a third side and a fourth side of an additional tabbed adaptor, and

a third side and a fourth side of an add-on adaptor; and

an add-on adaptor comprises at least one connecting member disposed on each of the first, second, third and fourth sides, wherein the first and second sides of the add-on adaptor are configured to be interconnected with each of:

a first side and a second side of an additional add-on adaptor, and

a second side of a tabbed adaptor, and

the third and fourth sides of the add-on adaptor are configured to be interconnected with each of:

a third side and a fourth side of an additional add-on adaptor, and

a third side and a fourth side of a tabbed adaptor.

11. The adaptor of claim 10, wherein:

the at least one connecting member of each of the second side of the tabbed adaptor, and the first side and the second side of the add-on adaptor comprises a longitudinal rail spaced a first distance from one of the third side and the fourth side, and a longitudinal slot spaced a second distance from the other of the third side and the fourth side, wherein the first distance is the same as the second distance;

each of the longitudinal rail and the longitudinal slot has cross-sectional configuration corresponding to the cross-sectional configuration of the other of the longitudinal rail and the longitudinal slot; and

each longitudinal rail and longitudinal slot of the adaptor is configured to slidably engage with a corresponding other of a longitudinal slot and longitudinal rail of an additional adaptor for interlocking the adaptors.

12. The adaptor of claim 11, wherein the at least one connecting member of each of the third side and the fourth side of the tabbed adaptor and each of the third side and the fourth side of the add-on adaptor comprises at least one clip configured for interlocking a tabbed adaptor or an add-on adaptor with an additional tabbed adaptor or add-on adaptor.

13. The adaptor of claim 12, wherein:

the clip has a first end and a second end, and a longitudinal dimension extending from the first end to the second end;

each of the third side and the fourth side of a tabbed adaptor and each of the third side and the fourth side of an add-on adaptor comprises at least one clip slot configured for receiving one of the first end and the second end of the clip therein, and the at least one clip slot is positioned for being aligned with a clip slot of the third side or the fourth side of another tabbed adaptor or a clip slot of the third side or the fourth side of another add-on adaptor;

each at least one clip slot defines an internal surface, and at least one of:

the internal surface within the clip slot, and

the first and second ends of the clip,

comprises a projection, and at least the other of:

the internal surface within the clip slot, and

the first and second ends of the clip,

comprises a recess for receiving the projection therein for retaining the clip in the clip slot.

14. The adaptor of claim 13, wherein:

the adaptor is configured for being disposed in a panel;

the panel defines a planar surface; and

the adaptor is configured for being disposed in the panel with the longitudinal direction thereof at an angle of about 30 degrees to 90 degrees to the planar surface.

15. The adaptor of claim 14, wherein each of the first and second cavities comprises an internally keyed configuration configured for one of:

directly receiving a fiber optic connector therein in a first orientation; and

directly receiving an adaptor latch therein in each of a first orientation or a second orientation rotated 180° from the first orientation, wherein the adaptor latch further comprises an internally keyed configuration for directly receiving a fiber optic connector therein in a first orientation.

16. The adaptor of claim 15, wherein:

each of the first and second cavities is independently configured for one of:

directly receiving a fiber optic connector therein, and comprises opposed retaining arms configured for releasably retaining a fiber optic connector within the cavity, the retaining arms being resiliently displaceable outwardly for passage of a fiber optic connector therebetween; and

directly receiving an adaptor latch therein, and one of the adaptor latch and the cavity comprises at least one of a first recess and a first resiliently displaceable projection, and the other of the adaptor latch and the cavity comprises a corresponding other of a resiliently displaceable projection and a recess for engaging with the at least one of the first recess and first resiliently displaceable projection to releasably retain the adaptor latch within the cavity, and the adaptor latch comprises opposed retaining arms configured for releasably retaining a fiber optic connector within the cavity, the retaining arms being resiliently displaceable outwardly for passage of a fiber optic connector therebetween.

17. A two-directional array of interconnected fiber optic adaptors for providing connections between fiber optic connectors, the adaptors comprising connection elements for releasably coupling each adaptor to immediately adjacent adaptors in both directions of the array.

18. The array of claim 17, wherein:

each adaptor comprises:

at least first and second cavities for receiving fiber optic connectors therein;

an exterior surface disposed about the cavities; and

the connection elements are configured for directly interconnecting each adaptor with the immediately adjacent adaptors with the exterior surface of each adaptor abutting an exterior surface of each immediately adjacent adaptor in both directions of the array.

19. The array of claim 18, wherein the connecting elements comprise at least one of:

clips configured for engaging immediately adjacent adaptors to interconnect immediately adjacent adaptors; and

projections and slots configured for interlocking engagement, wherein the exterior surface of each adaptor comprises at least one of a slot and a projection configured for interlocking engagement with the other of the at least one slot and projection of another adaptor.

20. The array of claim 18, wherein:

each adaptor has a first end comprising the first cavity, a second end comprising the second cavity and disposed opposite the first end, and defines a longitudinal bore between the first and second ends, the longitudinal bore defining a longitudinal axis;

the exterior surface defines:

first and second oppositely disposed sides defining a first orthogonal direction orthogonal to the longitudinal axis and defining a height therebetween;

third and fourth oppositely disposed sides defining a second orthogonal direction orthogonal to both the longitudinal axis and the first orthogonal direction and defining a width therebetween; and

at least one side of each pair of opposite sides is configured for being disposed adjacent and abutting a side of immediately adjacent adaptors;

each adaptor is one of a tabbed adaptor for being fastened to a panel assembly and an add-on adaptor configured for being attached to at least one of a tabbed adaptor and an additional add-on adaptor, wherein:

each tabbed adaptor comprises:

a tab extending from the first side and configured for being fastened to a panel assembly; and

at least one connecting element disposed on each of the second, third and fourth sides,

wherein the second side of each tabbed adaptor is configured to be interconnected with each of:

a first side and a second side of an add-on adaptor, and

a second side of an additional tabbed adaptor, and

the third and fourth sides of each tabbed adaptor are configured to be connected to each of:

a third side and a fourth side of an additional tabbed adaptor, and

a third side and a fourth side of an add-on adaptor; and

each add-on adaptor comprises at least one connecting element disposed on each of the first, second, third and fourth sides, wherein the first and second sides of each add-on adaptor are configured to be interconnected with each of:

a first side and a second side of an additional add-on adaptor, and
a second side of a tabbed adaptor, and
the third and fourth sides of each add-on adaptor are configured to be interconnected with
each of:

a third side and a fourth side of an additional add-on adaptor, and
a third side and a fourth side of a tabbed adaptor;

the at least one connecting element of each of the second side of the tabbed adaptors,
and the first side and the second side of the add-on adaptors comprises a longitudinal rail
spaced a first distance from one of the third side and the fourth side, and a longitudinal slot
spaced a second distance from the other of the third side and the fourth side, wherein the first
distance is the same as the second distance;

each of the longitudinal rails and the longitudinal slots has a cross-sectional
configuration corresponding to the cross-sectional configuration of the others of the
longitudinal rails and the longitudinal slots; and

each longitudinal rail and longitudinal slot is configured to slidingly engage with a
corresponding other of the longitudinal slots and longitudinal rails of another adaptor for
interlocking the adaptors;

the at least one connecting element of each of the third side and the fourth side of the
tabbed adaptors and each of the third side and the fourth side of the add-on adaptors
comprises at least one clip configured for interlocking the tabbed adaptors or the add-on
adaptors with an additional tabbed adaptor or add-on adaptor;

the clip has a first end and a second end, and a longitudinal dimension extending from
the first end to the second end;

each of the third side and the fourth side of the tabbed adaptors and each of the third
side and the fourth side of the add-on adaptors comprises at least one clip slot configured for

receiving one of the first end and the second end of the clip therein, and the at least one clip slot is positioned for being aligned with the clip slot of the third side or the fourth side of another tabbed adaptor or the clip slot of the third side or the fourth side of another add-on adaptor;

each at least one clip slot defines an internal surface, and at least one of:

the internal surface within the clip slot, and

the first and second ends of the clip,

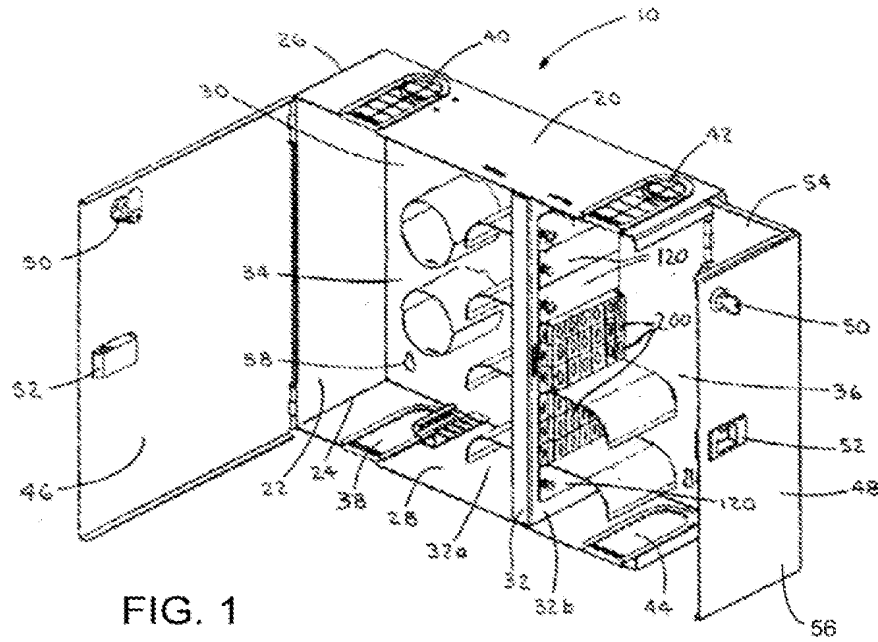
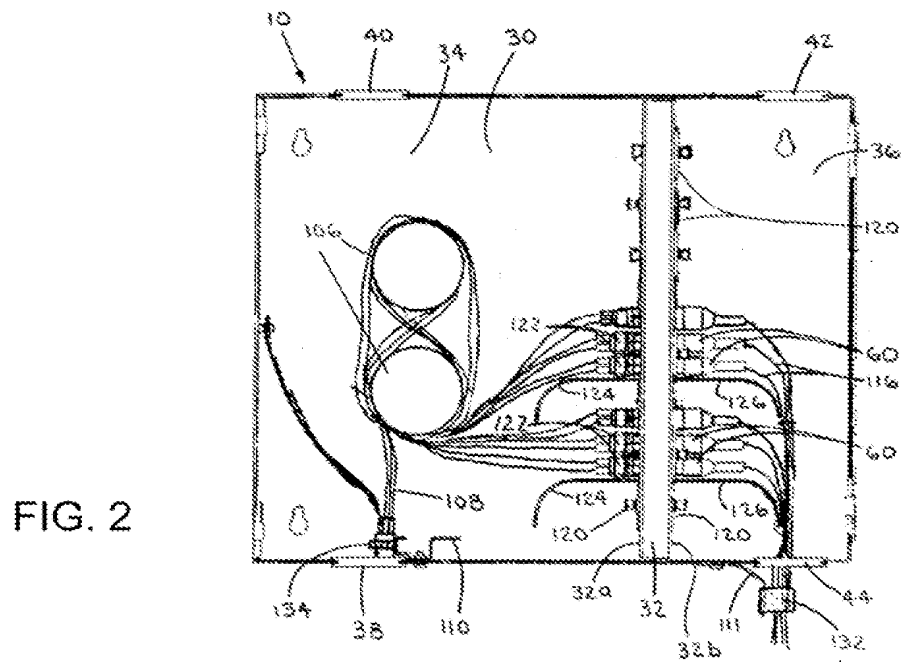
comprises a projection, and at least the other of:

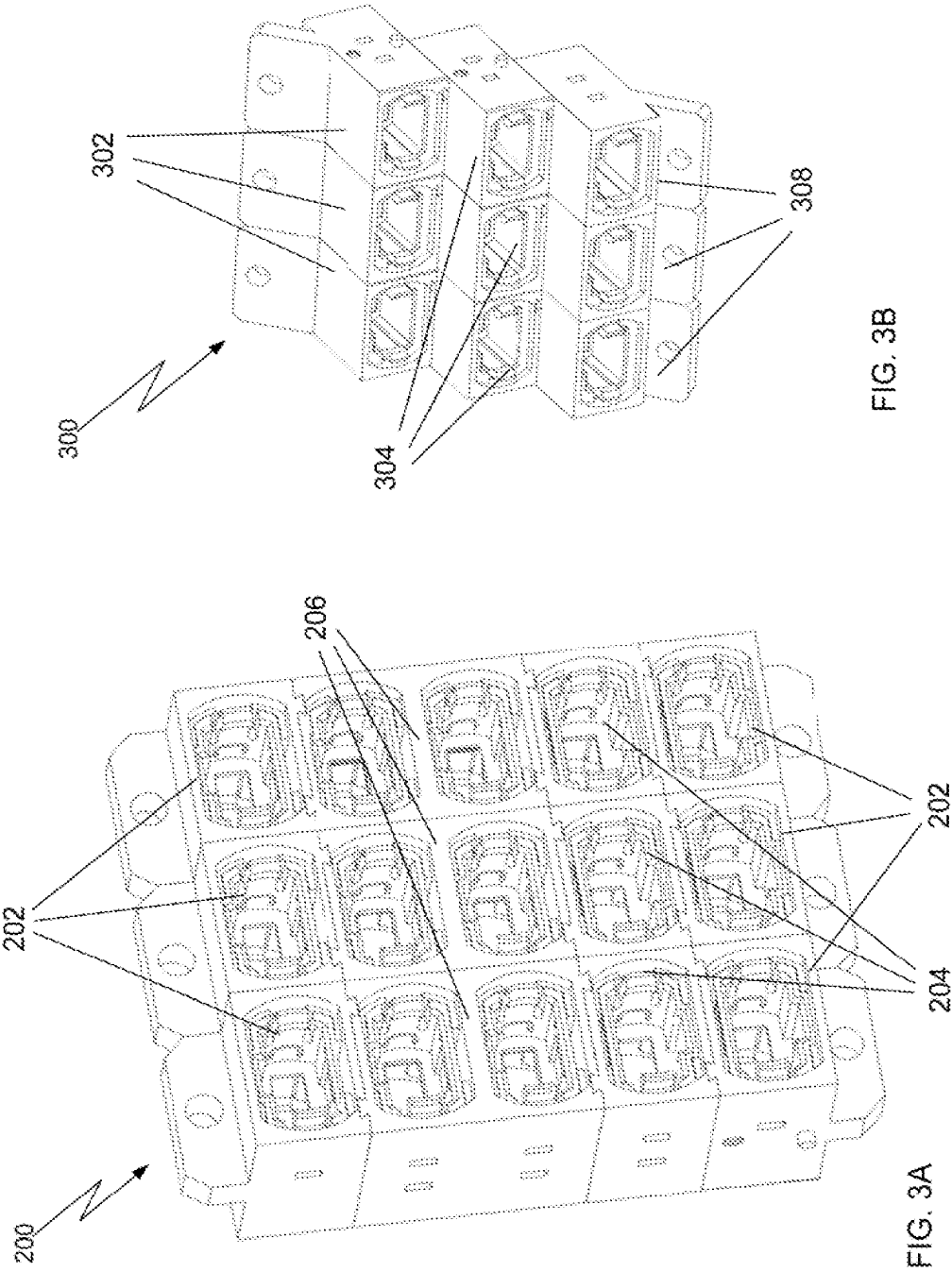
the internal surface within the clip slot, and

the first and second ends of the clip,

comprises a recess for receiving the projection therein for retaining the clip in the clip slot.

1/10





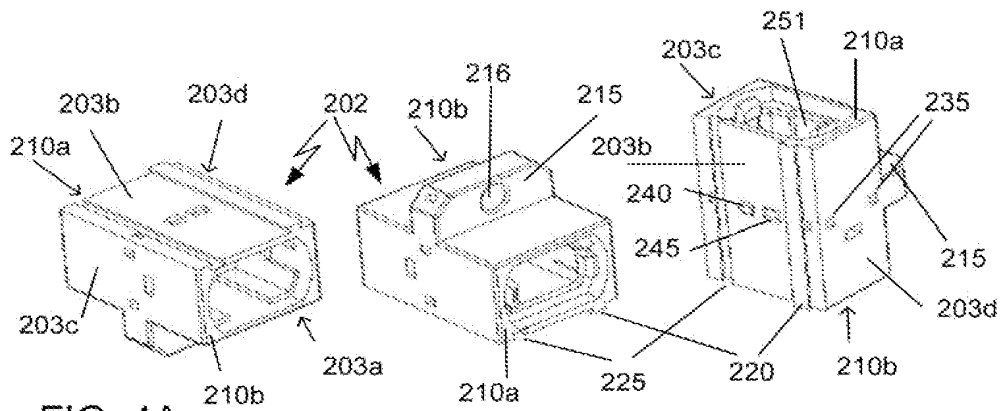


FIG. 4A

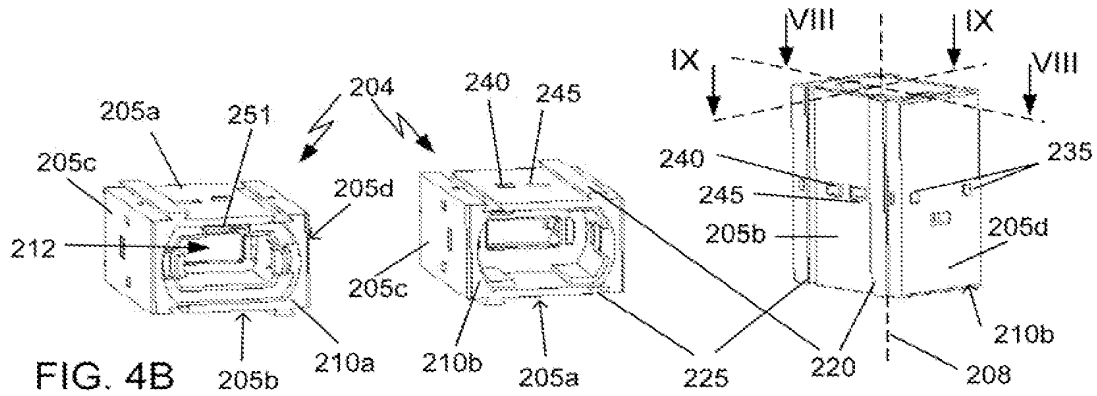


FIG. 4B

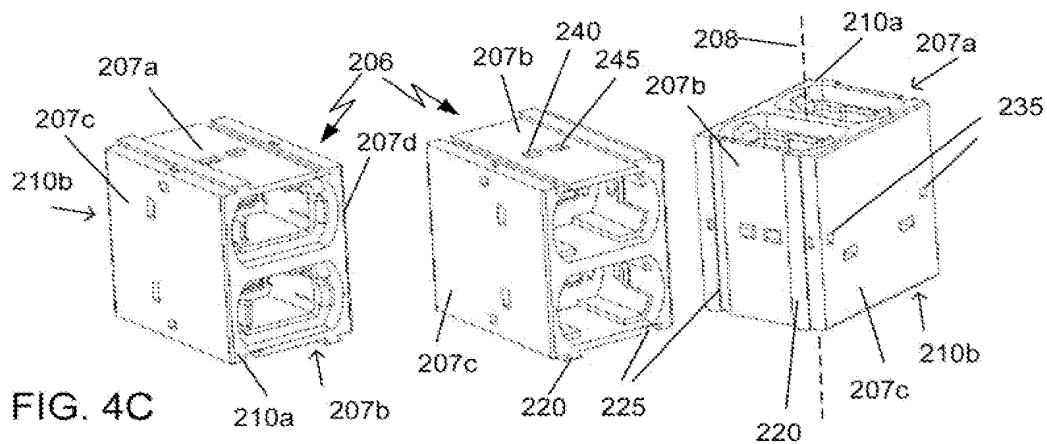
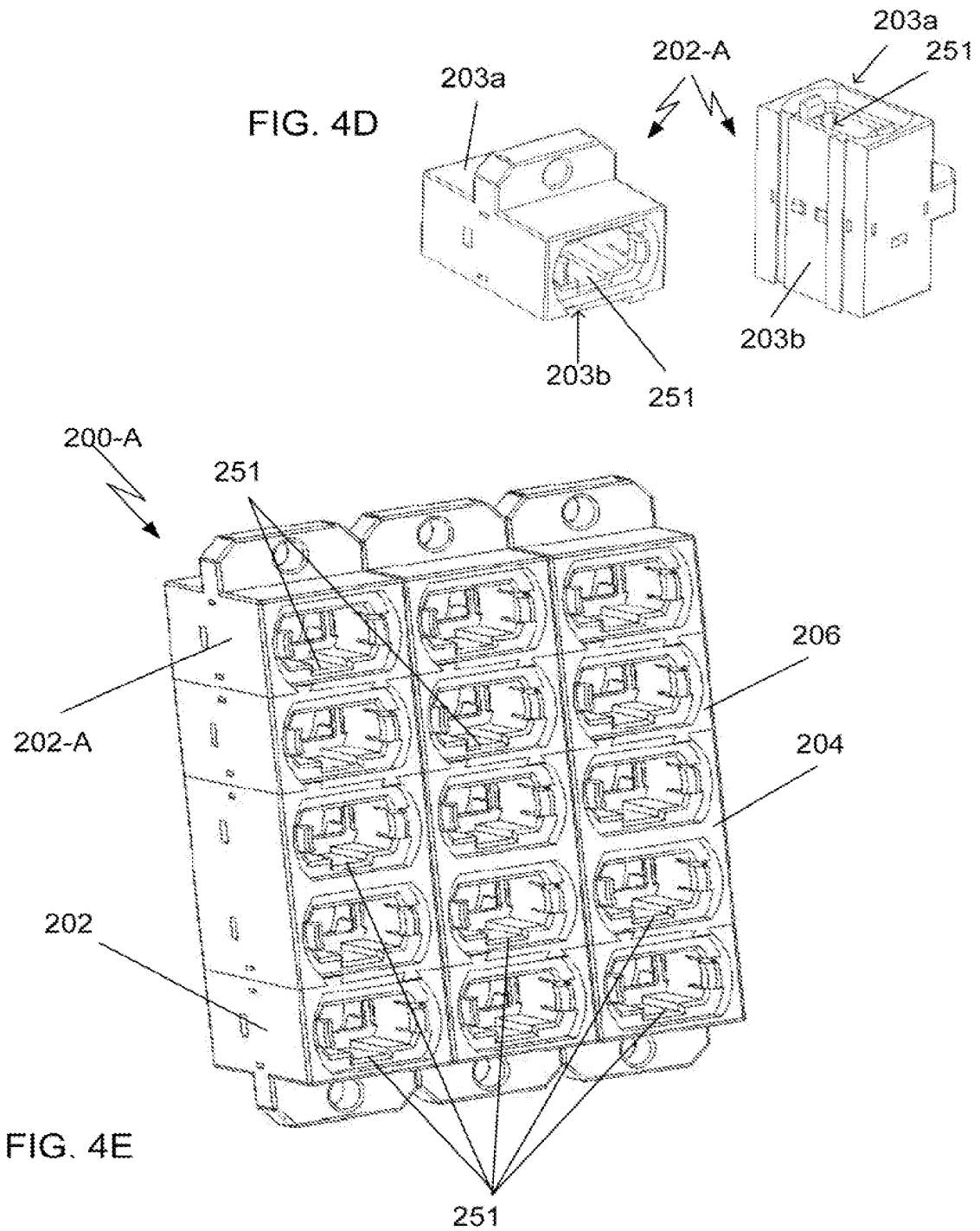
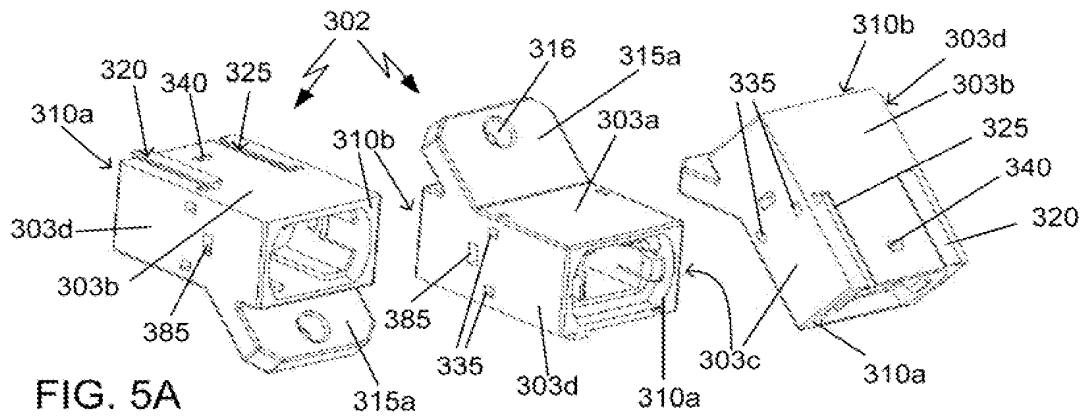
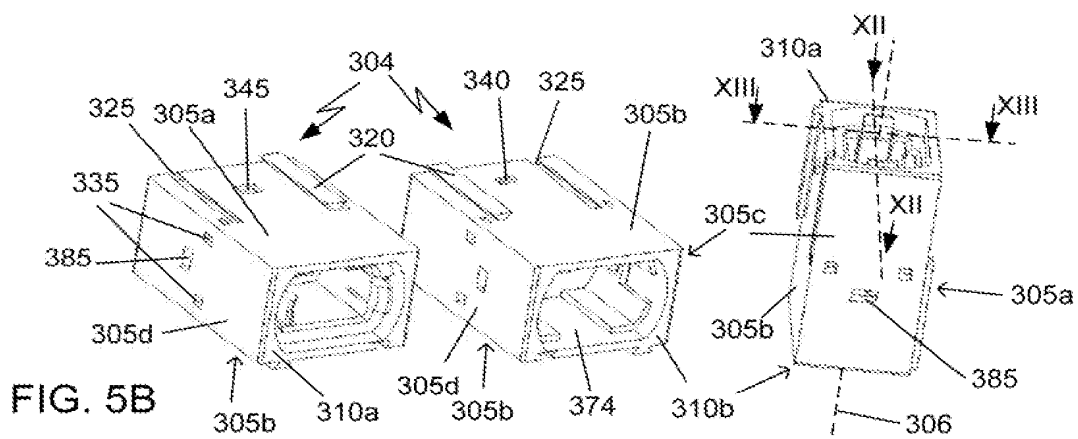
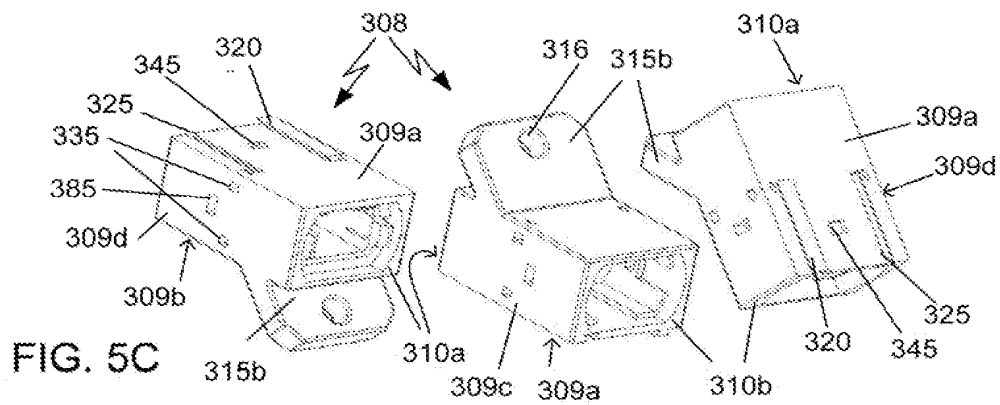


FIG. 4C

410



5/10



6/10

FIG. 6

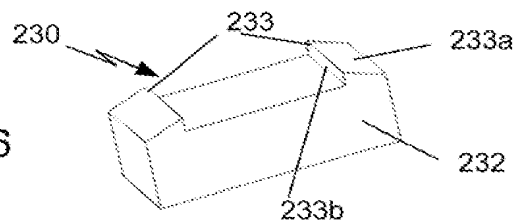
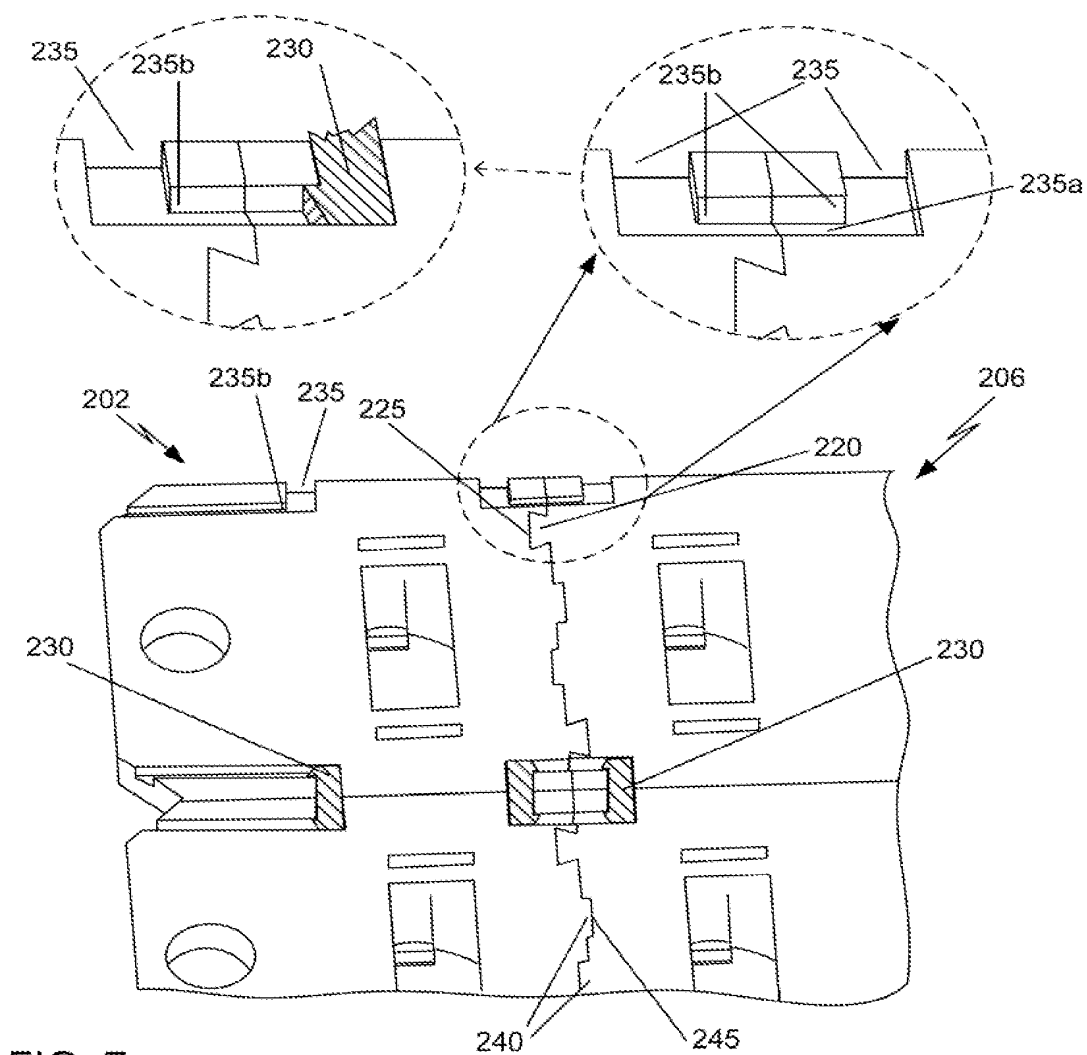


FIG. 7

7/10

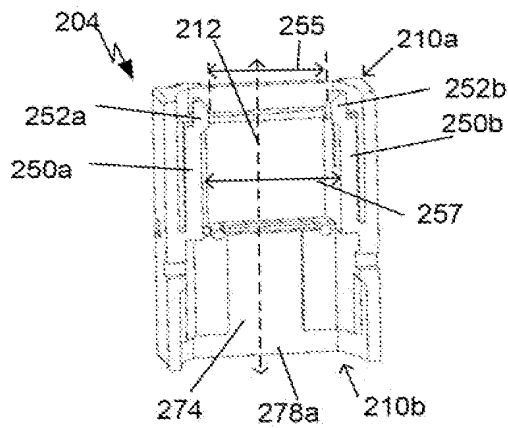


FIG. 8

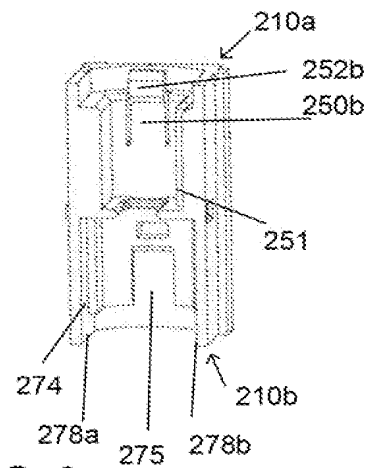


FIG. 9

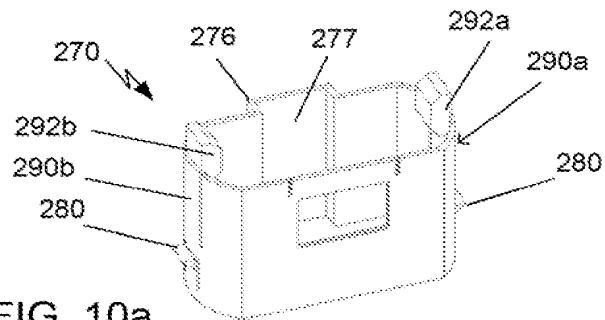


FIG. 10a

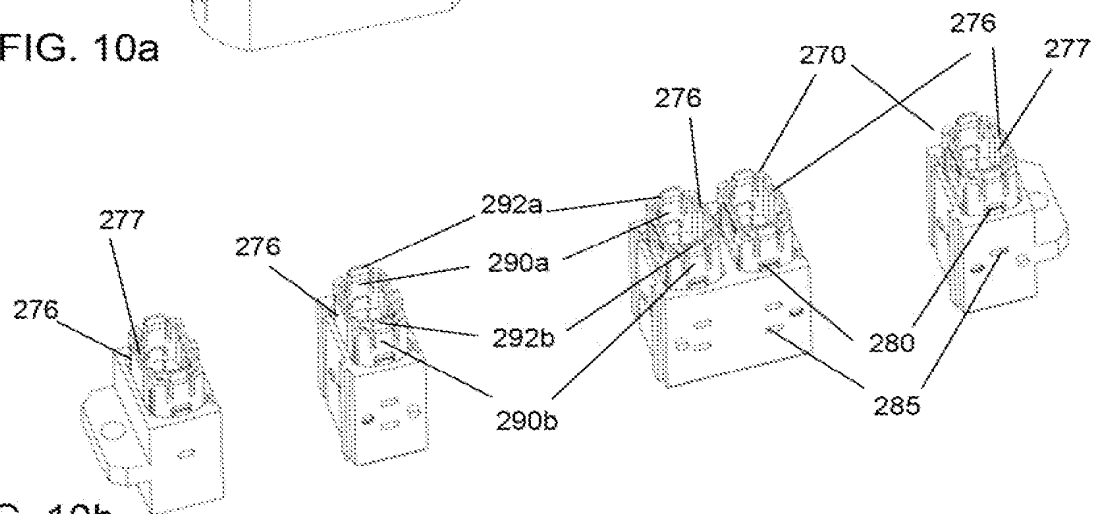
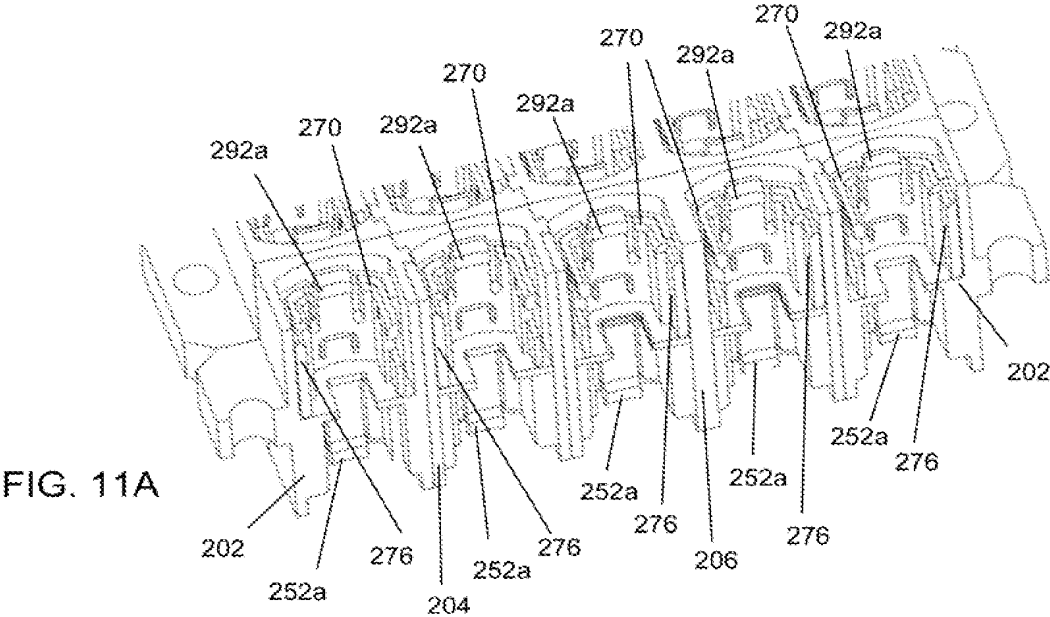
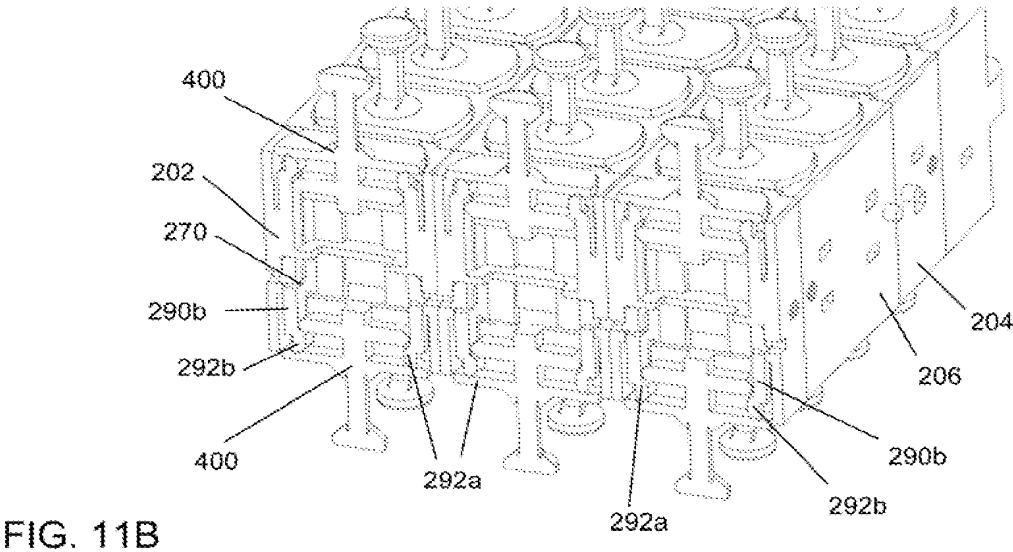


FIG. 10b



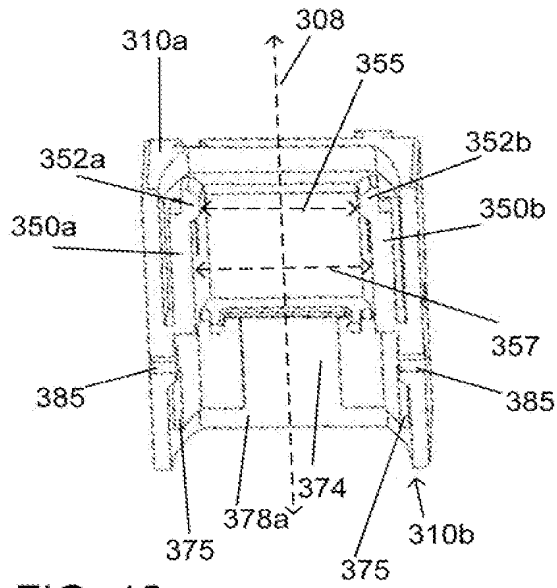


FIG. 12

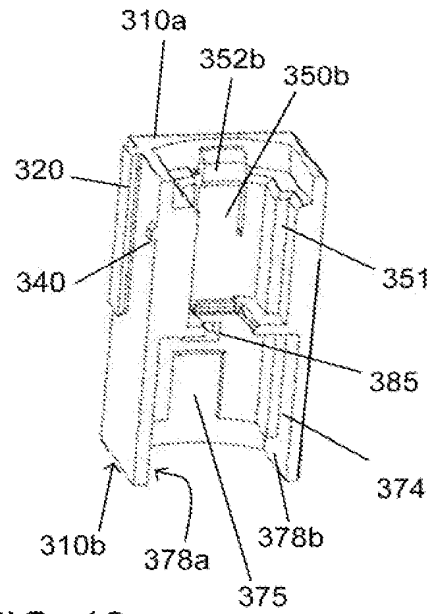


FIG. 13

10/10

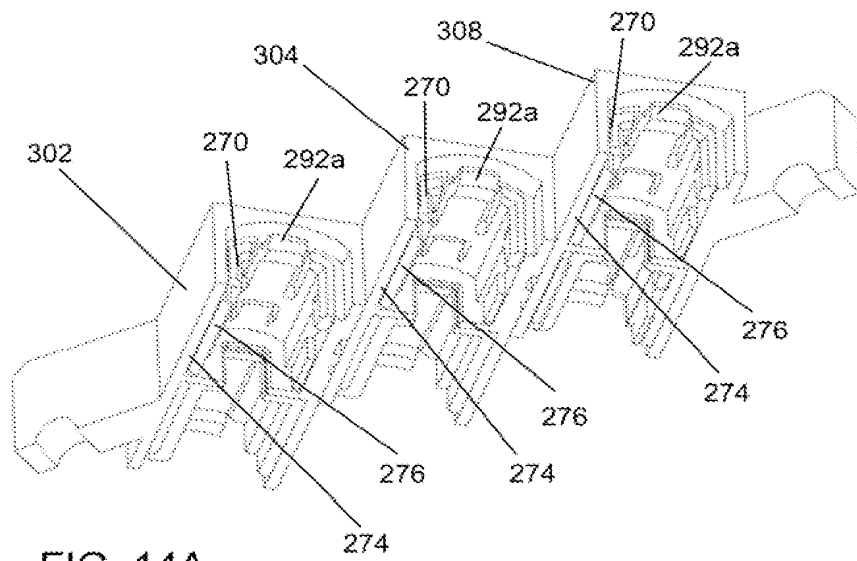


FIG. 14A

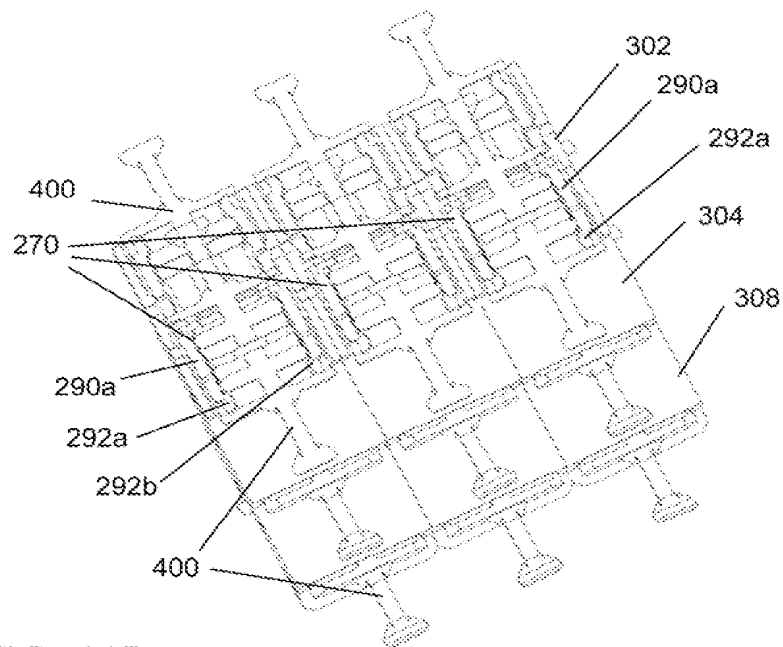


FIG. 14B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2014/012137

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/38 (2014.01)

USPC - 385/53

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)

IPC(8) - G02B 6/36, 6/38, 6/40, 6/44 (2014.01)

USPC - 385/34, 53, 54, 55, 59, 134, 135, 139; 439/284, 325, 326, 327, 328

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

CPC - G02B 6/38, 6/3825, 6/3826, 6/3829, 6/3831, 6/3897 (2014.02)

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

PatBase, Google Patents, Engineering Village

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 202600189 U (LIU et al) 12 December 2012 (12.12.2012) see machine translation	1-20
A	US 8,270,796 B2 (NHEP) 18 September 2012 (18.09.2012) entire document	1-20
A	US 6,471,412 B1 (SZLARYI et al) 29 October 2002 (29.10.2002) entire document	1-20
A	US 2005/0111796 A1 (GROIS et al) 26 May 2005 (26.05.2005) entire document	1-20

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 April 2014

Date of mailing of the international search report

14 MAY 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: ALISON L. MCCARTHY PEPPER HAMILTON LLP 125 HIGH STREET 19TH FLOOR, HIGH STREET TOWER BOSTON, MA 02110 USA	<h2 style="margin: 0;">PCT</h2> <p style="margin: 5px 0;">NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION</p> <p style="margin: 0;">(PCT Rule 44.1)</p>
Applicant's or agent's file reference 133077-03702	Date of mailing (day/month/year) 17 FEB 2017
International application No. PCT/US17/13286	International filing date (day/month/year) 13 January 2017 (13.01.2017)
Applicant SENKO ADVANCED COMPONENTS, INC.	

1.	☒	The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith. Filing of amendments and statement under Article 19: The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46): When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report. How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70 For more detailed instructions, see <i>PCT Applicant's Guide</i> , International Phase, paragraphs 9.004-9.011.
2.	☐	The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3.	☐	With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
	☐	the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
	☐	no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.
4.		Reminders The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3). Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.htm and the <i>PCT Applicant's Guide</i> , National Chapters. Within 19 months from the priority date, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the <i>PCT Applicant's Guide</i> , International Phase, paragraphs 8.006-8.032.
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-8300		Authorized officer Seungsook Ham Telephone No. 571-272-2405

Form PCT/ISA/220 (July 2014)

Received
 Pepper Hamilton LLP
 FEB 21 2017
 Boston Office

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-03702	FOR FURTHER ACTION		see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US17/13286	International filing date (day/month/year) 13 January 2017 (13.01.2017)	(Earliest) Priority Date (day/month/year) 15 January 2016 (15.01.2016)	
Applicant SENKO ADVANCED COMPONENTS, INC.			

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the Report

a. With regard to the language, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 Rule 43.5 bis(a)

c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (See Box No. II)

3. ☐ Unity of invention is lacking (See Box No. III)

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. _____
☐ as suggested by the applicant.
☐ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
b. ☒ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT		International application No. PCT/US17/13286						
A. CLASSIFICATION OF SUBJECT MATTER IPC: G02B 6/36(2006.01) CPC: 385/078.000 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) CPC : 385/078.000 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) Please See Continuation Sheet								
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 5px;">Category *</th> <th style="width: 60%; padding: 5px;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 30%; padding: 5px;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US 8,727,638 B2 (LEE et al) 20 May 2014 (20.05.2014), see entire documents.</td> <td style="vertical-align: top; padding: 5px;">1-10 and 13-16.</td> </tr> </tbody> </table>			Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 8,727,638 B2 (LEE et al) 20 May 2014 (20.05.2014), see entire documents.	1-10 and 13-16.
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.						
X	US 8,727,638 B2 (LEE et al) 20 May 2014 (20.05.2014), see entire documents.	1-10 and 13-16.						
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.								
<table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; vertical-align: top;"> 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 </td> </tr> </table>			Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	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				
Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	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 09 February 2017 (09.02.2017)		Date of mailing of the international search report <div style="font-size: 1.2em; font-weight: bold;">17 FEB 2017</div>						
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-8300		Authorized officer Seungsook Ham Telephone No. 571-272-2405						

Form PCT/ISA/210 (second sheet) (April 2007)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
ALISON L. MCCARTHY
PEPPER HAMILTON LLP
125 HIGH STREET
19TH FLOOR, HIGH STREET TOWER
BOSTON, MA 02110
USA

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) **17 FEB 2017**

Applicant's or agent's file reference

133077-03702

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US17/13286

International filing date (day/month/year)

13 January 2017 (13.01.2017)

Priority date (day/month/year)

15 January 2016 (15.01.2016)

International Patent Classification (IPC) or both national classification and IPC

IPC: **G02B 6/36(2006.01)**

CPC: 385/078.000

Applicant

SENKO ADVANCED COMPONENTS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Date of completion of this opinion

09 February 2017 (09.02.2017)

Authorized officer

Seungsook Ham

Facsimile No. (571) 273-8300

Telephone No. 571-272-2405

Form PCT/ISA/237 (cover sheet) (April 2007)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US17/13286

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of:

a. type of material

- ☐ a sequence listing
- ☐ table(s) related to the sequence listing

b. format of material

- ☐ on paper
- ☐ in electronic form

c. time of filing/furnishing

- ☐ contained in the international application as filed.
- ☐ filed together with the international application in electronic form.
- ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US17/13286

Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Claims 11 and 12 YES

Claims 1-10 and 13-16 NO

Inventive step (IS)

Claims 11 and 12 YES

Claims 1-10 and 13-16 NO

Industrial applicability (IA)

Claims 1-16 YES

Claims NONE NO

2. Citations and explanations:

Please See Continuation Sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US17/13286

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claims 1-16 are objected to under PCT Article 6 as lacking clarity because claims 1-16 are indefinite for the following reason(s): for failing to particularly point out and distinctly claim the subject matter which the inventor, the applicant regards as the invention.

1. The omitted elements are: a housing configured to receive the locking element and/or to receive the at least one compression element. All of the disclosed embodiments include a corresponding housing, e.g., such as housing 405 shown in Fig. 4A. Furthermore, there is no disclosure or suggestion that a housing is optional to the claimed connector assembly.

2. Claim 15 recites the limitation "the locking component" in the last line of the claim. There is insufficient antecedent basis for this limitation in the claim.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US17/13286

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

V. 2. Citations and Explanations:

Claims 1-10 and 13-16 lacks novelty under PCT Article 33(2) as being anticipated by Lee et al. US 8,727,638.

In re claim 1, Lee discloses, see Figs. 1-9, a connector assembly having an adjustable polarity, comprising:
a first ferrule (25) and a second ferrule (25) arranged in one of a first polarity and a second polarity;
a latch component/sub-assembly (3) configured to rotate from a first polarity position to a second polarity position;
a locking element/hook (12) configured to engage a locking recess (301/302) to prevent rotation of the latch component (3); and
at least one compression element corresponding to the portion of the locking element (12) that protrudes from the recess (301/302) configured to disengage the locking element (12) from the locking recess (301/302) when the at least one compression element corresponding to the portion of the locking element (12) that protrudes from the recess (301/302) is compressed by a finger, thereby allowing the latch component (3) to rotate.

wherein the connector assembly is capable of being connected to an adapter in a first polarity when the latch component (3) is located at the first polarity position and in a second polarity when the latch component (3) is located at the second polarity position. See columns 4-7 of Lee for further details.

In re claim 2, as seen in Fig. 1, the connector assembly is a duplex LC-type connector.

In re claim 3, the latch comprises at least one thumb latch (31) capable of securing the connector assembly to the adapter.

In re claim 4, as seen in Fig. 3, the at least one locking element (12) is arranged on the latch component (3).

In re claim 5, the at least one locking recess (301/302) is arranged on a housing shell (16/17).

In re claim 6, at least one locking element (12) is arranged on a locking component (16/17).

In re claim 7, the at least one locking recess (301/302) is arranged on the latch component (3).

In re claims 8 and 9, as seen in Fig. 2, the rear of latch component (3) comprises a ring portion disposed around a portion/housing (421) of the connector assembly.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US17/13286

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

In re claim 10, the ring portion is disposed about a first end (421) of a locking component (42), the locking component (42) configured to be engaged to a housing (16/17) at a second end of the locking component.

In re claim 13, the at least one compression element corresponding to the portion of the locking element (12) that protrudes from the recess (301/302) is formed on compression section (301/302) of the ring portion.

In re claim 14, the at least one compression element corresponding to the portion of the locking element (12) that protrudes from the recess (301/302) is formed on a locking component (16/17) arranged within the connector assembly.

In re claim 15, the at least one locking element (12) is arranged on the locking component (16/17).

In re claim 16, the at least one locking element (12) is configured to engage at least one locking recess (301/302) arranged on the latch component (3) when the compression element corresponding to the portion of the locking element (12) that protrudes from the recess (301/302) is not compressed, thereby preventing rotation of the latch component (3).

Claims 11 and 12 meets the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the claim limitations.

8. The following is a statement of reasons for the indication of allowable subject matter: The primary reason for indicating allowable subject matter is the inclusion of at least one locking projection arranged on an inner surface of the ring portion.

Claims 1-16 meets the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

PATENT COOPERATION TREATY

AUG - 7 2017

From the INTERNATIONAL SEARCHING AUTHORITY

To:
Pepper Hamilton LLP/Boston
Attn: Boston IP Docketing Department
125 High Street
19th Floor
Boston, MA 02110-2736
USA

PCT

Boston Office

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing
(day/month/year) 01 AUG 2017Applicant's or agent's file reference
133077-04102

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.
PCT/US17/40178International filing date
(day/month/year) 30 June 2017 (30.06.2017)Applicant
SENKO ADVANCED COMPONENTS, INC.

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70.

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004-9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within 19 months from the priority date, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (571) 273-8300

Authorized officer

Seungsook Ham

Telephone No. 571-272-4300

Form PCT/ISA/220 (July 2014)

DOCKETED

ON: 8/7/17

BY: [Signature]

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-04102	FOR FURTHER ACTION		see Form PCT/ISA/220 as well as, where applicable, item 5 below
International application No. PCT/US17/40178	International filing date (<i>day/month/year</i>) 30 June 2017 (30.06.2017)	(Earliest) Priority Date (<i>day/month/year</i>) 08 July 2016 (08.07.2016)	
Applicant SENKO ADVANCED COMPONENTS, INC.			

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the Report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 Rule 43.6 *bis(a)*

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1
- ☐ as suggested by the applicant.
- ☒ as selected by this Authority, because the applicant failed to suggest a figure.
- ☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (April 2007)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
Pepper Hamilton LLP/Boston
Attn: Boston IP Docketing Department
125 High Street
19th Floor
Boston, MA 02110-2736
USA

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) **01 AUG 2017**

Applicant's or agent's file reference

133077-04102

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US17/40178

International filing date (day/month/year)

30 June 2017 (30.06.2017)

Priority date (day/month/year)

08 July 2016 (08.07.2016)

International Patent Classification (IPC) or both national classification and IPC

IPC: **G02B 6/38(2006.01)**

CPC: **G02B 6/3821; G02B 6/3825; G02B 6/3893**

Applicant

SENKO ADVANCED COMPONENTS, INC.

1. This opinion contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| ☒ | Box No. I | Basis of the opinion |
| ☐ | Box No. II | Priority |
| ☐ | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| ☐ | Box No. IV | Lack of unity of invention |
| ☒ | Box No. V | Reasoned statement under Rule 43 <i>bis</i> .1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| ☐ | Box No. VI | Certain documents cited |
| ☐ | Box No. VII | Certain defects in the international application |
| ☐ | Box No. VIII | Certain observations on the international application |

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Facsimile No. (571) 273-8300

Date of completion of this opinion

20 July 2017 (20.07.2017)

Authorized officer

Seungsook Ham

Telephone No. 571-272-4300

Form PCT/ISA/237 (cover sheet) (April 2007)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US17/40178

Box No. 1 Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

a. type of material

- ☐ a sequence listing
- ☐ table(s) related to the sequence listing

b. format of material

- ☐ on paper
- ☐ in electronic form

c. time of filing/furnishing

- ☐ contained in the international application as filed.
- ☐ filed together with the international application in electronic form.
- ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

INTERNATIONAL SEARCH REPORT		International application No. PCT/US17/40178						
A. CLASSIFICATION OF SUBJECT MATTER IPC: G02B 6/38(2006.01) USPC: G02B 6/3821; G02B 6/3825; G02B 6/3893 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) U.S. : G02B 6/3821; G02B 6/3825; G02B 6/3893 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)								
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category *</th> <th style="width: 60%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 30%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;"> X <hr style="width: 50%; margin: 0;"/> Y </td> <td style="vertical-align: top;">US 2012/0099822 A1 (Kuffel et al.) 26 April 2012, see entire document.</td> <td style="text-align: center; vertical-align: top;"> 1-3, 5-10 <hr style="width: 50%; margin: 0;"/> 4 </td> </tr> </tbody> </table>			Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X <hr style="width: 50%; margin: 0;"/> Y	US 2012/0099822 A1 (Kuffel et al.) 26 April 2012, see entire document.	1-3, 5-10 <hr style="width: 50%; margin: 0;"/> 4
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.						
X <hr style="width: 50%; margin: 0;"/> Y	US 2012/0099822 A1 (Kuffel et al.) 26 April 2012, see entire document.	1-3, 5-10 <hr style="width: 50%; margin: 0;"/> 4						
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.								
<table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; vertical-align: top;"> "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 </td> </tr> </table>			* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family				
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family							
Date of the actual completion of the international search 20 July 2017 (20.07.2017)		Date of mailing of the international search report 01 AUG 2017						
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-8300		Authorized officer Seungsook Ham Telephone No. 571-272-4300						

Form PCT/ISA/210 (second sheet) (April 2007)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US17/49178

Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 4	YES
	Claims 1-3, 5-10	NO
Inventive step (IS)	Claims NONE	YES
	Claims 1-10	NO
Industrial applicability (IA)	Claims 1-10	YES
	Claims NONE	NO

2. Citations and explanations:

Please See Continuation Sheet

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US17/40178

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

V. 2. Citations and Explanations:

Claim 4 meet the criteria set out in PCT Article 33(2), because the prior art does not teach or fairly suggest the claimed invention.

Claims 1-10 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Claims 1 – 3 and 5 – 10 lack novelty under PCT Article 33(2) as being anticipated by Kuffel et al. (U.S. PG Pub. # 2012/0099822 A1).

In Re claim 1, '822 teaches an optical fiber connector (fig. 13) comprising: a ferrule (600); an inner housing (400) disposed around at least a portion of the ferrule, the housing comprising a first end for being inserted into an optical fiber adapter (FAP), and a second end (@ 500) disposed opposite the first end; at least one key (802, which is separate from outer housing per par. 0062) configured to move along the inner housing so as to change a polarity of said optical fiber connector with respect to the adapter; and an outer housing (500) disposed around at least a portion of the inner housing and configured to slide in a longitudinal direction towards the second end (along the z axis) so as to expose at least a portion of said at least one key (fig. 13), wherein the outer housing includes a flexible portion (831, 2002 or 500 itself (par. 0069) as all material possesses flexibility to some extent) configured to lock (@ 833 or @ 2004) to the second end of the inner housing so as to retain the outer housing in a pulled position at the second end of the inner housing.

In Re claim 2, '822 teaches wherein the flexible portion is configured to engage a mating portion (833 or 2004) at the second end of the inner housing (figs. 15 or 22).

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US17/40178

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

In Re claim 3, '822 teaches wherein the flexible portion comprises an opening (around 2002) and the mating portion comprises a protruding portion (2004) configured to engage the opening when the flexible portion is pushed towards the second end.

In Re claim 5, wherein the connector comprises at least one biasing member (820) for biasing the outer housing towards the first end of the inner housing (fig. 17).

In Re claim 6, wherein said connector is an MPO connector (par 0015).

In Re claim 7, wherein the flexible portion comprises a flat surface (2002, fig. 20).

In Re claim 8, wherein the at least one key includes a surface having a draft angle (@ tip of 802, figs. 15 and 16).

In Re claim 9, wherein the inner housing includes a corresponding surface having a corresponding draft angle and configured to retain the at least one key (814 or 818 of fig. 15 and 16).

In Re claim 10, wherein the draft angle is about three degrees (the term about has no metes or bounds and therefore any angle is about three degrees).

Claim 4 lack an inventive step under PCT Article 33(3), as being obvious over Kuffel et al. (U.S. PG Pub. # 2012/0099822 A1).

'822 teaches the connector of claim 3 but appears to be silent to wherein the opening has a circular shape. However, it would have been obvious to one of ordinary skill in the art before the effective filing date the claimed invention to make the opening to have a circular shape so as to ease alignment with protruding portion 2004 as it has been held by the court that the configuration of the claimed opening was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed opening was significant.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/057023

A. CLASSIFICATION OF SUBJECT MATTER

INV. G0286/38

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)

G02B H01R

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/089049 A1 (SEDOR THOMAS M [US]) 27 April 2006 (2006-04-27) figures 3-7, 10, 11, 15, 20, 21	1-5, 8-10, 13
A	paragraph [0042] ~ paragraph [0054]	6, 7, 11, 12
A	----- WO 01/79904 A (KRONE GMBH [DE]; KAHLE EBERHARD [DE]; THALEMANN DETLEV [DE]) 25 October 2001 (2001-10-25) figures 1-6 page 3, line 22 ~ page 5, line 7	8
X	----- EP 1 566 674 A (REICHLE & DE MASSARI FA [CH]) 24 August 2005 (2005-08-24) paragraph [0015] ~ paragraph [0018]; figure 1	1-3
	----- -/-	

☒ 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

E earlier document but published on or after the international filing date

1. document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

*² later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principles 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:

12 August 2008

Date of mailing of the international search report

21/08/2008

Name and mailing address of the ISAV

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2260 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Bourhis, J

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/057023

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 074 868 A (YAZAKI CORP [JP]) 7 February 2001 (2001-02-07) figures 1,3,4 paragraph [0025] - paragraph [0030] paragraph [0037] - paragraph [0046]	9,10,13
A	US 2004/136657 A1 (NGO HUNG VIET [US]) 15 July 2004 (2004-07-15) figures 3,4 paragraph [0036] - paragraph [0042]	1,7,9,12
X,P	DE 10 2006 019335 A1 (TELEGAERTNER GERAETEBAU GMBH [DE]) 25 October 2007 (2007-10-25) figures paragraph [0024] - paragraph [0026] idem	9
X,P	DE 20 2006 011910 U1 (WEIDMUELLER INTERFACE [DE]) 22 March 2007 (2007-03-22) figures 5-8,14,15a,21,22 paragraph [0026] - paragraph [0034] paragraph [0036] - paragraph [0038] paragraph [0046] - paragraph [0051] paragraph [0053] - paragraph [0054] paragraph [0059] - paragraph [0060]	1-3,5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/057023

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 2006089049	A1	27-04-2006	EP	1662287 A1	31-05-2006
			JP	2006126845 A	18-05-2006
WO 0179904	A	25-10-2001	AR	029060 A1	04-06-2003
			AT	398784 T	15-07-2008
			AU	6379701 A	30-10-2001
			AU	2001263797 B2	15-12-2005
			BR	0110109 A	11-02-2003
			CA	2403634 A1	18-09-2002
			CN	1425144 A	18-06-2003
			DE	10019104 A1	08-11-2001
			EG	22413 A	29-01-2003
			EP	1275022 A2	15-01-2003
			HK	1054591 A1	21-07-2006
			JP	2004501383 T	15-01-2004
			MX	PA02010282 A	25-04-2003
			NO	20024958 A	15-10-2002
			PL	358250 A1	09-08-2004
			US	2003190123 A1	09-10-2003
EP 1566674	A	24-08-2005	CN	1667441 A	14-09-2005
			JP	2005234567 A	02-09-2005
			SG	114734 A1	28-09-2005
EP 1074868	A	07-02-2001	DE	60036342 T2	29-05-2008
			JP	3731794 B2	05-01-2006
			JP	2001051151 A	23-02-2001
			US	6485194 B1	26-11-2002
US 2004136657	A1	15-07-2004	US	2005058404 A1	17-03-2005
			WO	2004065999 A2	05-08-2004
DE 102006019335	A1	25-10-2007	EP	1860473 A1	28-11-2007
DE 202006011910	U1	22-03-2007	EP	1786071 A2	16-05-2007
			JP	2007134332 A	31-05-2007
			US	2007105432 A1	10-05-2007

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2008/057023

International filing date (day/month/year)
14.03.2008

Priority date (day/month/year)
15.03.2007

International Patent Classification (IPC) or both national classification and IPC
INV. G02B6/38

Applicant
SENKO ADVANCED COMPONENTS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 65.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office - P.B. 5818 Patentlaag 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
Fax: +31 70 340 - 3016

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Bourhis, J

Telephone No. +31 70 340-4332



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2008/057023

Box No. 1 Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2008/057023

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>4,6-8,11,12</u>
	No: Claims	<u>1-3,5,9,10,13</u>
Inventive step (IS)	Yes: Claims	<u>6,7,11,12</u>
	No: Claims	<u>1-5,8-10,13</u>
Industrial applicability (IA)	Yes: Claims	<u>1-13</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rules 43bis.1 and 70.10)

and/or

2. Non-written disclosures (Rules 43bis.1 and 70.9)

see form 210

Re Item V.

1 Reference is made to the following document:

D1 : US 2006/089049 A1 (SEDOR THOMAS M [US]) 27 April 2006

D2: US 2004/136657 A1 (NGO HUNG VIET [US]) 15 July 2004

2 INDEPENDENT CLAIM 1

2.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

Document D1 discloses (the references in parentheses applying to this document) in figure 3 an apparatus for holding a first fiber optic connector and a second fiber optic connector comprising:

a housing (50) configured to secure a first fiber optic connector (70) and a second fiber optic connector (70) at a first end; and

a strain relief boot (62) connected to a second end of the housing (50),

wherein the housing (50) and the strain relief boot (62) are configured to form a passageway to receive a fiber optic cable (66) that is connected to the first fiber optic connector (70) and the second fiber optic connector (70).

3 INDEPENDENT CLAIM 9

3.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 9 is not new in the sense of Article 33(2) PCT. Document D1 discloses in figure 3 a duplex fiber optic connector comprising:

a first fiber optic cable connector (70);

a second fiber optic cable connector (70);

a back post (72) configured to secure the first fiber optic cable connector (70) and the second fiber optic cable connector (70) in a position adjacent one another; and

a strain relief boot (62) in connection with the back post (72) and configured to receive a fiber optic cable (66) that connects with the first and second fiber optic cable connectors (70).

4 DEPENDENT CLAIMS 2-5, 8, 10, 13

Dependent claims 2-5, 8, 10, 13 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT

in respect of novelty and/or inventive step (Article 33(2) and (3) PCT).

5 DEPENDENT CLAIMS 6, 7, 11, 12

The combination of the features of dependent claims 6, 7, 11, 12 are neither known from, nor rendered obvious by, the available prior art. The reasons are as follows:

The subject-matter of claim 6 differs from the apparatus known in D1 in that a heat shrink tube is configured to contain the fiber optic cable in the passageway. Hence claim 6 is novel.

The problem to be solved by the present invention may therefore be regarded as avoiding entanglement of the two optical fibers.

Although installing a shrink tube at the back of a connector plug is known, see for instance element (26) in figure 4 of D2, no hint was found in the prior art to have a heat shrink tube containing the whole two fibre optic cable in the passageway. Document D1 emphasizes in paragraph 54 the advantage of separately handling the two connectors when needed, which teaches away from the present solution of bringing the two connector cables in one single shrink tube.

Hence the subject-matter of claim 6 is inventive. The same reasoning applies to claim 11. Claims 7 and 12, depending on claims 6 and 11 respectively are also novel and inventive.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

ADAM RIZK
PEPPER HAMILTON LLP
ONE MELLON CENTER
500 GRANT STREET
PITTSBURGH, PA 15219

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing (day/month/year) 27 APR 2012	
Applicant's or agent's file reference 133077-00902	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US 11/58799	International filing date (day/month/year) 01 November 2011 (01.11.2011)
Applicant SENKO ADVANCED COMPONENTS, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:**

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer Lee W. Young PCT Helpdesk: 571-272-4300 Telephone No. PCT OSP: 571-272-7774
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Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-00902	FOR FURTHER ACTION <div style="text-align: right;">see Form PCT/ISA/220 as well as, where applicable, item 5 below.</div>	
International application No. PCT/US 11/58799	International filing date (<i>day/month/year</i>) 01 November 2011 (01.11.2011)	(Earliest) Priority Date (<i>day/month/year</i>) 05 October 2011 (05.10.2011)
Applicant SENKO ADVANCED COMPONENTS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found **unsearchable** (see Box No. II).

3. ☒ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 16
☒ as suggested by the applicant.
☐ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/58799

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

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

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

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-44 and 50, drawn to a latching connector.
Group II: Claims 45-49, drawn to a high-density panel.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The technical feature of Group I is a lever connected to the housing, which is not present in Group II.
The technical feature of Group II is a specified distance between a first and second mating connector, which is not present in Group I.

Accordingly, unity of invention is lacking under PCT Rule 13.1.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

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

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/58799

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01R 13/627 (2012.01)

USPC - 499/352

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)

USPC: 439/352

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 439/282, 350, 352, 353, 357, 358, 953 (text search - see terms below)

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

PubWEST(USPT,PGPB,EPAB,JPAB); Google

Search Terms: connector, latch, disengage, lever, extender, multi port, aspect ratio, high, 1.25 mm, 1.25 millimeters, hook, loop, extend, snap, selectively, fiber, LC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 6,478,472 B1 (ANDERSON et al.) 12 November 2002 (12.11.2002), entire document especially Abstract; Fig 1; col 3, lns 26-28; col 5, lns 19-25	1-2, 4-5, 22 ----- 3, 6-21, 23-44
X	US 6,854,894 B1 (YUNKER et al.) 15 February 2005 (15.02.2005), entire document especially Fig 5; col 2, lns 13-15; col 6, lns 17-22	45-49
X -- Y	US 2011/0131801 A1 (NELSON) 09 June 2011 (09.06.2011), entire document especially Figs 8-10; paras [0022], [0027]-[0031]	50 ----- 6-21, 23-44
Y	US 7,824,113 B2 (WONG et al.) 02 November 2010 (02.11.2010), entire document especially Fig 7	3
Y	US 6,041,155 A (ANDERSON et al.) 21 March 2000 (21.03.2000), entire document especially the Abstract; Fig 13	12, 19, 30, 37, 42
Y	US 2011/0044588 A1 (LARSON et al.) 24 February 2011 (24.02.2011), entire document especially para [0045]	13, 20, 31, 38
Y	US 5,937,130 A (AMBERG et al.) 10 August 1999 (10.08.1999), entire document especially col 2, lns 7-20; col 4, lns 19-21	14-15, 18, 21, 32-33, 39, 41
Y	US 6,551,117 A (POPLAWSKI et al.) 22 April 2003 (22.04.2003), entire document, especially Fig. 10	11, 17, 29, 36



Further documents are listed in the continuation of Box C.



* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

21 April 2012 (21.04.2012)

Date of mailing of the international search report

27 APR 2012

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/58799

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7,594,766 B1 (SASSER et al.) 29 September 2009 (29.09.2009), entire document	1-50
A	US 5,481,634 A (ANDERSON et al.) 02 January 1996 (02.01.1996), entire document	1-50
A	US 2011/0177710 A1 (TOBEY) 21 July 2011 (21.07.2011), entire document	1-50
A	US 2004/0161958 A1 (TOGAMI et al.) 19 August 2004 (19.08.2004), entire document	1-50

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-00701	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> FOR FURTHER ACTION </div> <div> see Form PCT/ISA/220 as well as, where applicable, item 5 below. </div> </div>	
International application No. PCT/US2012/039126	International filing date (<i>day/month/year</i>) 23 May 2012	(Earliest) Priority Date (<i>day/month/year</i>) 23 May 2011
Applicant SENKO ADVANCED COMPONENTS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 2

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/039126

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/38 (2012.01)

USPC - 385/56

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)

IPC(8) - G02B 6/36, 6/38, 6/40 (2012.01)

USPC - 385/55, 56, 60, 62

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)

PatBase, Google Patents, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2009/0028507 A1 (JONES et al) 29 January 2009 (29.01.2009) entire document	1-16
Y	US 5,971,626 A (KNODELL et al) 26 October 1999 (26.10.1999) entire document	1-16
A	US 6,206,581 B1 (DRISCOLL et al) 27 March 2001 (27.03.2001) entire document	1-16
A	US 7,695,199 B2 (TEO et al) 13 April 2010 (13.04.2010) entire document	1-16

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

06 August 2012

Date of mailing of the international search report

27 AUG 2012

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: JOHN BRANCOLINI
PEPPER HAMILTON LLP
500 GRANT STREET
SUITE 2000
PITTSBURGH, PA 15219

Date of mailing
(day/month/year)

27 AUG 2012

Applicant's or agent's file reference
133077-00701

FOR FURTHER ACTION

See paragraph 2 below

International application No.
PCT/US2012/039126

International filing date (day/month/year)
23 May 2012

Priority date (day/month/year)
23 May 2011

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G02B 6/38 (2012.01)
USPC - 385/56

Applicant SENKO ADVANCED COMPONENTS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Date of completion of this opinion

06 August 2012

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2012/039126

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - ☐ on paper
 - ☐ in electronic form
 - b. (time)
 - ☐ in the international application as filed
 - ☐ together with the international application in electronic form
 - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2012/039126

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-16	YES
	Claims	None	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-16	NO
Industrial applicability (IA)	Claims	1-16	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-16 lack an inventive step under PCT Article 33(3) as being obvious over Jones et al., hereinafter referred to as Jones, in view of Knodell et al., hereinafter referred to as Knodell.

Regarding claims 1, 8, 9, 10, Jones teaches a fiber optic adapter (abstract) comprising: a one piece housing (one-piece outer housing 52, para. 40, fig. 4) comprising a first alignment cylinder configured to receive a first optic fiber (sleeve bore 68 of the outer housing, para. 40, fig. 5; [see applicant's fig. 3a, integral alignment cylinder 130]), and at least one snap receiving recess (inner housing 54 is "snapped" into the outer housing 52 using exterior molded clips 64 or ramp-and-recess structures on the inner housing which are configured to engage corresponding interior molded receivers 66 or protrusions in the outer housing, para. 40, fig. 5); a dual connector latch (inner housing 52, para. 40, fig. 4) comprising: a second alignment cylinder configured to receive a second optic fiber (fig. 4 shows cylinder on inner housing 54 for receiving fiber optic, para. 40; [see applicant's fig. 2, alignment cylinder 122]), and at least one snap feature configured to engage within the snap receiving recess such that the connector latch locks within the housing (inner housing 54 is "snapped" into the outer housing 52 using exterior molded clips 64 or ramp-and-recess structures on the inner housing which are configured to engage corresponding interior molded receivers 66 or protrusions in the outer housing, para. 40, fig. 5); and an alignment sleeve (sleeve 56, para. 40) configured to be placed within the first alignment cylinder and the second alignment cylinder (sleeve 56 is captured by sleeve bore 62 and 68, para. 40, fig. 5); but lacks the explicit teaching wherein the alignment sleeve is positioned prior to the dual connector latch being locked into the housing. Knodell is in the field of fiber optic connectors and connector sleeve assembly (abstract) and teaches an alignment sleeve is positioned prior to a ferrule being locked into the housing (alignment sleeve 66 is slid over a ferrule portion 120 of connector 64, col. 4, lines 65-67; sleeve is inserted into second receptacle 76, col. 5, lines 1-24; col. 7, lines 1-9). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the assembly of Knodell in the adapter of Jones. The motivation would have been to more precisely align the ferrules of the connectors (Knodell, col. 7, lines 1-9).

Regarding claims 2, 11, Jones teaches the first alignment cylinder is integral to the housing (sleeve bore 68 of the outer housing, para. 40, fig. 5; [see applicant's fig. 3a, integral alignment cylinder 130]).

Regarding claims 3, 12, Jones teaches the at least one snap receiving recess is an indentation in a sidewall of the housing (inner housing 54 is "snapped" into the outer housing 52 using exterior molded clips 64 or ramp-and-recess structures on the inner housing which are configured to engage corresponding interior molded receivers 66 or protrusions in the outer housing, para. 40, fig. 5).

Regarding claims 4, 13, Jones teaches the at least one snap feature is a protrusion from the dual connector latch corresponding to the indentation in the sidewall of the housing (inner housing 54 is "snapped" into the outer housing 52 using exterior molded clips 64 or ramp-and-recess structures on the inner housing which are configured to engage corresponding interior molded receivers 66 or protrusions in the outer housing, para. 40, fig. 5).

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2012/039126

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding claims 5, 14 Jones teaches the housing is a single injection-molded (components of adapter 50 may comprise injection molded plastic, with no ultrasonic welding required for assembly, para. 40).

Regarding claim 6, 15, Jones teaches the dual connector latch is a single injection molded component (components of adapter 50 may comprise injection molded plastic, with no ultrasonic welding required for assembly, para. 40).

Regarding claim 7, 16, Jones teaches the dual connector latch further comprises: a first set of retaining clips for engaging a first optic fiber (inner housing 54 includes two pairs of axially-aligned receiving arms 60 that are each configured to receive and retain a corresponding portion of a connector when it is inserted into the outer housing 52, para. 40, fig. 4; [see applicant's fig. 2, retaining clips 124]); and a second set of retaining clips for engaging a second optic fiber (inner housing 54 includes two pairs of axially-aligned receiving arms 60 that are each configured to receive and retain a corresponding portion of a connector when it is inserted into the outer housing 52, para. 40, fig. 4; [see applicant's fig. 2, retaining clips 124]).

Claims 1-16 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-01102	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US13/54784	International filing date (<i>day/month/year</i>) 13 August 2013 (13.08.2013)	(Earliest) Priority Date (<i>day/month/year</i>) 16 August 2012 (16.08.2012)
Applicant Senko Advanced Components, Inc.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 3B
☐ as suggested by the applicant.
☒ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/54784

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/38, 6/36, 6/24 (2013.01)

USPC - 385/56, 65, 66

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)

IPC(8): G02B 6/38, 6/36, 6/24, 6/26 (2013.01)

USPC: 385/56, 65, 66, 67, 60, 78

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)

MicroPatent (US Granted, US Applications, EP-A, EP-B, WO, JP, DE-G, DE-A, DE-T, DE-U, GB-A, FR-A); Google; Google Scholar; ProQuest; Search Terms Used: optical fiber connector light conduit coupling movable insert housing shell ferrule holder passage bore sleeve rotate

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,935,789 B2 (GROSS, III R et al.) August 30, 2005; abstract; figure 3; column 2, lines 18-26 and 48-65; column 3, lines 4-30; column 4, lines 19-23	1-4, 21-23 --- 5-12
Y	US 7,371,082 B2 (ZIMMEL, S et al.) May 13, 2008; column 2, lines 31-33; column 4, lines 45-49; column 5, lines 12-23	5-12
Y	US 6,872,039 B2 (BAUS, R et al.) March 29, 2005; column 3, line 53; column 5, lines 8-15, 20-28, and 43-44	6-9
Y	US 4,872,736 A (MYERS, C et al.) October 10, 1989; column 5, lines 17-31 and 61-66; column 6, line 5	8-12
A	US 4,327,964 A (HAESLY, B et al.) May 4, 1982; entire document	1-20

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

30 December 2013 (30.12.2013)

Date of mailing of the international search report

16 JAN 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: Alison L. McCarthy
Pepper Hamilton LLP
Suite 5000
500 Grant Street
Pittsburgh, Pennsylvania 15219-2507
United States of America

Date of mailing
(day/month/year)

16 JAN 2014

Applicant's or agent's file reference
133077-01102

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US13/54784

International filing date (day/month/year)

13 August 2013 (13.08.2013)

Priority date (day/month/year)

16 August 2012 (16.08.2012)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - G02B 6/38, 6/36, 6/24 (2013.01)

USPC - 385/56, 65, 66

Applicant **Senko Advanced Components, Inc.**

I. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Date of completion of this opinion

30 December 2013 (30.12.2013)

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US13/54784

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

a. (means)

- ☐ on paper
☐ in electronic form

b. (time)

- ☐ in the international application as filed
☐ together with the international application in electronic form
☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US13/54784

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	5-20	YES
	Claims	1-4, 21-23	NO
Inventive step (IS)	Claims	13-20	YES
	Claims	1-12, 21-23	NO
Industrial applicability (IA)	Claims	1-23	YES
	Claims	NONE	NO

2. Citations and explanations:

Claims 1-4 and 21-23 lack novelty under PCT Article 33(2) as being anticipated by US 6935789 B2 to Gross, III R et al. (hereinafter "Gross").

As to claim 1, Gross discloses: an optical fiber connector (optical fiber connector; Abstract), comprising: a housing having a first end for receiving an optical fiber (right (first) end, as shown, for receiving an optical fiber; figure 3), a second end opposite the first end (left (second) end, as shown, opposite the first end; figure 3), and a longitudinal passage extending from the first end to the second end (a housing with through passages (longitudinal passages, as shown) completely through the housing; figures 1 and 3; column 2, lines 23-25); a ferrule assembly comprising a ferrule holder and ferrule (terminus 24 includes terminus body 90 (front portion of ferrule holder) that forms a terminus rear portion (rear portion of ferrule holder) and a ferrule 92; figure 3; column 2, lines 56-58), the ferrule assembly for being inserted into and disposed within the passage and longitudinally movable within the passage (moved rearward by a mating terminus 22 so the tips of the termini are halfway between front and rear ends 132, 134 of an alignment sleeve 34; Abstract; figure 3), the ferrule assembly being configured for retaining an optical fiber therein (optic fiber 116 that extends through a bore (retaining) in the ferrule; figure 3; column 3, lines 4-5) and at least one of the housing and the ferrule holder comprising a portion for engaging the other of the housing and the ferrule holder for retaining the ferrule assembly within the passage (a retainer 100 (portion for engaging) includes a holder 102 and a clip 104. The front end 106 of the spring presses against the holder 102, while the holder holds the clip in place and presses the clip forwardly so it presses against a shoulder 108 of the terminus body (ferrule holder), to push the terminus (ferrule assembly) forwardly; figure 3; column 2, lines 61-65).

As to claim 2, Gross discloses: the connector of claim 1. Gross further discloses further comprising: a resilient member for biasing the ferrule assembly towards the second end of the housing (a retainer 100 (portion for engaging) includes a holder 102 and a clip 104. The front end 106 of the spring (resilient member) presses against (biases) the holder 102, while the holder holds the clip in place and presses the clip forwardly (towards the second end) so it presses against a shoulder 108 of the terminus body (ferrule holder), to push the terminus (ferrule assembly) forwardly (towards the second end); figure 3; column 2, lines 61-65); and at least one of the housing and the ferrule holder comprising a portion for engaging the other of the housing and the ferrule holder for retaining the ferrule assembly within the passage in opposition to the bias of the resilient member (forward end 119 (portion for engaging) of terminus assembly (ferrule assembly) shown abutting (engaging) a stop shoulder of the plug of the housing; figure 3; column 3, lines 28-30).

As to claim 3, Gross discloses: the connector of claim 1. Gross further discloses wherein the portion for engaging comprises at least one integral projecting portion of the one of housing and the ferrule holder (forward end 119 (integral projecting portion of ferrule assembly for engaging) of terminus assembly (ferrule assembly; figure 3; column 3, lines 26-29), and the other of the housing and the ferrule holder comprises at least one integral recessed portion for receiving and engaging with corresponding projecting portions (forward end 119 (portion for engaging) of terminus assembly (ferrule assembly) shown abutting (engaging) a stop shoulder (recessed portion) of the plug of the housing; figure 3; column 3, lines 28-30).

As to claim 4, Gross discloses: the connector of claim 1. Gross further discloses wherein the housing comprises a one-piece unitary body (housing is a single piece; figure 3; column 2, line 54-55).

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

****-Continued from Box V: Citations and Explanations-****

As to claim 21, Gross discloses: A one-piece housing for an optical filter connector (housing 30 (one piece); a single piece as shown in figure 3; figure 3, column 2, lines 18-24, lines 54-55), the connector having a ferrule assembly for being movably disposed within the housing under bias of a resilient member (connector has a terminus assembly 20, 22 (ferrule assembly) for being movably disposed within the housing under bias of a resilient member (spring 84); Abstract; figure 3; column 2, lines 18-23), and the housing comprising: a one-piece unitary body having a first end and a second end opposite the first end (a single piece as shown in figure 3 having right (first) and left (second) ends; figure 3; column 2, lines 54-55); a longitudinal passage extending from the first end to the second end for receipt of the ferrule assembly therein (through 25 passages 32 that each extends in forward F and rearward R directions completely through the housing; figure 3, column 2, lines 24-26); and at least one of the body and the ferrule assembly comprising a portion for engaging the other of the housing and the ferrule assembly for retaining the ferrule assembly within the passage in opposition to the bias of the resilient member (shoulder 18 of housing retains shoulder 108 of ferrule assembly via holder 102 and clip 104 in opposition to the bias of the long spring 84 (resilient member); Abstract; figure 3; column 4, lines 19-23).

As to claim 22, Gross discloses the housing of claim 21. Gross further discloses: wherein the portion for engaging comprises at least one integral projecting portion of the one of the housing and the ferrule holder, and the other of the housing and the ferrule holder comprises at least one recessed portion for receiving and engaging with corresponding projecting portions (shoulder 108 projects from the terminus assembly (ferrule holder) and shoulder 118 defines a recessed portion for receiving and engaging with corresponding projecting portions via holder 102 and clip 104; figure 3; column 4, lines 19-23).

As to claim 23, Gross discloses the housing of claim 22. Gross further discloses: wherein the housing comprises the at least one recessed portion disposed within the passage and extending radially outwardly from the passage for receiving and retaining radial projections of a ferrule holder therein (housing has a recessed portion (shoulder 118) within the passage extending radially outward (shoulder 118) for receiving and retaining radial projections (holder 102 via clip 104 from the shoulder 108 (radial projections) of a terminus body 90 (ferrule holder) therein; figure 3; column 3, lines 26-29).

Claim 5 lacks an inventive step under PCT Article 33(3) as being obvious over Gross in view of US 7,371,082 B2 to Zimmer, et al. (hereinafter Zimmer).

As to claim 5, Gross discloses: the connector of claim 4. Gross further discloses wherein: the connector further comprises a resilient member for being disposed in the passage for biasing the ferrule assembly towards the second end of the housing (The front end 106 of the spring (resilient member, shown disposed in the passage) presses against the holder 102, while the holder holds the clip in place and presses the clip forwardly so it presses against a shoulder 108 of the terminus body, to push the terminus (ferrule assembly) forwardly (towards the second end); figure 3; column 2, lines 62-65); the ferrule holder has a first end for being disposed toward the first end of the housing (The terminus includes a terminus body 90 that forms a terminus rear portion, as shown; figure 3; column 2, lines 56-58), and a second end for retaining the ferrule adjacent the second end of the housing (and a ferrule 92 that projects (towards the second end, as shown) into the alignment sleeve 34; figure 3, column 2, lines 58-59). Gross does not disclose: the ferrule holder comprises at least first and second radial projections spaced apart from one another in a circumferential direction about the ferrule holder; and the passage comprises corresponding recessed portions extending radially outwardly from the passage for receiving and retaining the radial projections therein. Zimmer discloses the ferrule holder comprises at least first and second radial projections spaced apart from one another in a circumferential direction about the ferrule holder; (hub 122 (ferrule holder) includes an anti-rotation portion 128 (corners are first through fourth radial projections); figure 2; column 4, lines 45-48); and the passage comprises corresponding recessed portions extending radially outwardly from the passage for receiving and retaining the radial projections therein (anti-rotation seat 112 defines a seat (recessed portions) of a complementary (to the radial projections) geometry; figures 5 and 6; column 5, lines 46-49). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include the radial projections and complimentary recessed portions, as disclosed by Zimmer, to gain the advantage of limiting rotational motion of the ferrule holder, ferrule, and optical fiber.

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Supplemental Box

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Claims 6 and 7 lack an inventive step under PCT Article 33(3) as being obvious over Gross in view of Zimmer and further in view of US 6,872,039 B2 to Baus, et al. (hereinafter "Baus")

As to claim 6, Gross in view of Zimmer discloses: the connector of claim 5. Gross fails to disclose wherein: the passage, adjacent the second end of the housing, defines a first internal dimension, and the recessed portions define a second internal dimension greater than the first internal dimension. Zimmer further discloses: wherein: the passage, adjacent the second end of the housing, defines a first internal dimension, and the recessed portions define a second internal dimension greater than the first internal dimension (front bore 116 (passage, defines a first internal dimension (diameter)) of the front housing 110, where recessed portions of seat 112 have a larger diameter (second internal dimension) than the passage 116; figure 9; column 5, lines 15-23). It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the system of Gross to wherein: the passage, adjacent the second end of the housing, defines a first internal dimension, and the recessed portions define a second internal dimension greater than the first internal dimension, as disclosed by Zimmer, for the advantage of having a system properly sized to achieve the desired results. Gross does not disclose: the radial projections comprise flanges integral with the ferrule holder and extending radially outwardly adjacent the second end of the ferrule holder to define a first flange position, the flanges in the first flange position define a distance greater than the first internal dimension and corresponding substantially to the second internal dimension; the flanges are radially inwardly displaceable from the first flange position to a second flange position and have a resilience for returning to the first flange position from the second flange position, the flanges in the second flange position define a distance less than the first internal dimension for insertion of the ferrule holder into and along at least a portion of the passage; and the flanges are configured for resiliently returning from the second flange position towards the first flange position within the passage upon insertion into the passage and encountering the recessed portions within the passage. Baus discloses the radial projections comprise flanges integral with the ferrule holder and extending radially outwardly adjacent the second end of the ferrule holder to define a first flange position (the two plungers 132 (flanges) are disposed in one bore 30 (integral with the shaft (ferrule holder)). The plungers 132 are separated by a spring 54, biasing each plunger 132 in an outward direction (radially outward) adjacent second end defining a first flange position; figures 13 and 16; column 5, lines 10-12), the flanges in the first flange position define a distance greater than the first internal dimension (shaft and passage diameter; figures 13 and 16) and corresponding substantially to the second internal dimension (radial outward limit; figures 13 and 16); the flanges are radially inwardly displaceable from the first flange position to a second flange position and have a resilience for returning to the first flange position from the second flange position (The plunger (flange) sits upon a helical coil spring 54 (resilience); figures 2 and 21; column 3, line 53; can be freely depressed (second flange position) and extended (first flange position); column 5, lines 43-44), the flanges in the second flange position define a distance less than the first internal dimension for insertion of the ferrule holder into and along at least a portion of the passage (plunger (flange) depressed (second position) below shaft (passage) diameter; figure 21; and the flanges are configured for resiliently returning from the second flange position towards the first flange position within the passage upon insertion into the passage and encountering the recessed portions within the passage (The force of the 20 inner surface 62 of the aperture (passage) against the ramped engaging surface 48 of the plunger 32 (flange) causes the plunger 32 to be pushed inwardly against the bias of the spring 54 into the bore 30 until the abutment 50 is no longer exposed (second position). The pin 20 can then be installed completely by continuing to push 25 the pin 20 through the aperture (passage). Once the pin 20 is installed and the ramped engaging surface 48 clears the aperture(encounters the recessed portions) the plunger 32 (flange) pops back up (returns from the second flange position towards the first flange position) against the bias (resiliently) of the spring 54; figure 17; column 5, lines 20-28). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include the compressible and extendable resilient flanges, as disclosed by Baus, to gain the advantage of limiting rotational motion of the ferrule holder, ferrule, and optical fiber at a particular depth of insertion into the passage.

-Continued Within the Next Supplemental Box--

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-***-Continued from Previous Supplemental Box-***-

As to claim 7, Gross in view of Zimmel and further in view of Baus discloses: the connector of claim 6. Gross further discloses: wherein: the passage comprises a first cylindrical passage portion adjacent the first end of the housing and a second cylindrical passage portion adjacent the second end of the housing (passage 32 has a front portion 80 (first cylindrical passage portion) adjacent first end 120 of housing 30 and a rear portion 82 (second cylindrical passage portion) adjacent the second end of housing 30; figure 3; column 2, line 48 to column 3, line 29), the first cylindrical passage portion comprises a first cylindrical wall defining a first diameter (alignment sleeve 34 passage has a first cylindrical wall defining a first diameter; figures 3 and 6). Gross fails to disclose the second cylindrical passage portion comprises a second cylindrical wall defining a second diameter of the first internal dimension. Zimmel further discloses: the second cylindrical passage portion comprises a second cylindrical wall defining a second diameter of the first internal dimension (second cylindrical passage portion has a second cylindrical wall (adjacent to edges 194-197) defining a second diameter (extending from center to wall adjacent edges 194-197); figures 5 and 6), the first diameter being less than the second diameter (ferrule passage diameter is less than recess diameter; figures 5 and 6), and the passage comprises a first spring seat extending radially outwardly from the first cylindrical wall to the second cylindrical wall (front surface 146 of rear housing 140 is first spring seat extending radially outwardly from the first cylindrical wall of passage 147 (interior of rear housing 146) to the second cylindrical wall (inner wall of front housing 110; figure 4; column 5, lines 13-26); the ferrule holder comprises a first body portion for being disposed in the first cylindrical passage portion and a second body portion for being disposed within the second cylindrical passage portion (ferrule holder 122 has an anti-rotation portion 128 (second body portion for being disposed within the second cylindrical passage portion) and an elongated cylindrical rear portion 123 (first body portion for being disposed in the first cylindrical passage portion; figures 1-3; column 4, lines 45-48), the first body portion having a third diameter less than the first diameter (first body portion fits within first passage portion (third diameter less than first diameter); figures 5 and 6), the second body portion having a fourth diameter greater than the first and third diameter and less than the second diameter (anti-rotation portion 128 larger than rear portion 123 or rear portion passage and smaller than recesses; figures 2, 5, and 6), and the ferrule holder comprises a second spring seat extending radially outwardly from the first body portion to the second body portion (rear wall of anti-rotation portion 128 is a second spring seat extending radially outwardly from the first body portion to the second body portion; figures 2 and 4; column 5, lines 13-15); the resilient member comprises a spring for being disposed around the first body portion for engagement between the first spring seat and the second spring seat (The spring 130 (resilient member) surrounds (disposed around) the elongated cylindrical rear portion (first body portion) 123 of the hub 122. The spring 130 is captured between the anti-rotation portion 128 (second spring seat) and a surface 146 of the rear housing 140 (first spring seat); column 5, lines 12-23). It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the system of Gross to include the second cylindrical passage portion comprises a second cylindrical wall defining a second diameter of the first internal dimension, as disclosed by Zimmel, for the advantage of having a system with precisely defined dimensions allowing for greater control of the system. Gross fails to disclose the second body portion comprises a substantially cylindrical wall comprising the flanges (cylindrical wall of pin shaft comprising plungers (flanges); figures 13 and 16). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include the second cylindrical passage portion comprises a second cylindrical wall defining a second diameter of the first internal dimension, as disclosed by Baus, to gain the advantage of a resiliently biased ferrule holder with rotational restrictions.

-***-Continued Within the Next Supplemental Box-***-

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-***-Continued from Previous Supplemental Box-***-

Claims 8-9 lack an inventive step under PCT Article 33(3) as being obvious over Gross in view of Zimmer and Baus and further in view of US 4,872,736 A to Myers, C et al. (hereinafter "Myers").

As to claim 8, Gross in view of Zimmer and Baus discloses the connector of claim 7. Gross does not disclose: wherein: the first and second radial projections comprise first and second flanges spaced apart 180° from one another in a circumferential direction about the ferrule holder. Baus further discloses: wherein: the first and second radial projections comprise first and second flanges spaced apart 180° from one another in a circumferential direction about the ferrule holder (The plungers 132 (first and second flanges) are separated by a spring 54, biasing each plunger 132 (flange) in an outward direction (spaced apart 180° from one another in a circumferential direction about the pin shaft (ferrule holder); figures 13 and 16; column 5, lines 8-15). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include the first and second flanges spaced apart 180° from one another, as further disclosed by Baus, to obtain the advantage of retaining the ferrule holder in place. Zimmer further discloses: the ferrule holder is insertable into the passage in a first longitudinal direction to compress the spring between the first and second spring seats (The spring 130 surrounds the elongated cylindrical rear portion 123 of the hub 122. The spring 130 is captured between the anti-rotation portion 128 (second spring seat) and a surface 146 of the rear housing 140 (first spring seat) by rearward (first longitudinal) insertion; figures 2 and 4; column 5, lines 12-15), the spring being for biasing the ferrule holder in a second longitudinal direction opposite the first longitudinal direction (The spring 130 functions to bias the ferrule 124 in a forward (second longitudinal) direction through the front bore 116; figures 2 and 4; column 5, lines 15-17). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include forward spring biasing of the ferrule holder, as further disclosed by Zimmer, to obtain the advantage of resiliently retaining the ferrule holder in place. Gross fails to disclose the corresponding recessed portions comprise openings extending through the housing from the second cylindrical wall to an exterior of the housing. Myers discloses: the corresponding recessed portions comprise openings extending through the housing from the second cylindrical wall to an exterior of the housing (the release cover 80 (housing) includes windows 90-90 (openings in second cylindrical wall to an exterior of the housing), in each of two opposed sides of the cover. Each of the windows 90-90 is aligned with and is adapted to receive a latching nub 70 of an associated one of the cantilevered arms 66-66 (flanges); figures 1 and 3; column 5, lines 61-66), the openings being defined by a perimetrical wall and at least a first portion of the perimetrical wall is disposed towards the second end of the housing (interior walls of openings 90 are perimetrical walls and are disposed towards the second (cable-receiving) end of the housing); figures 1 and 3); the first and second flanges are configured to be radially displaceable from the first flange position to the second flange position upon insertion into the passage in the first direction (first and second flanges 70 on ferrule holder 30 radially displaceable from first flange position (extended) to the second flange position (radially compressed) upon insertion; figures 1-3); and the first and second flanges are configured for engaging the first perimetrical wall portions upon movement of the ferrule holder within the passage in the second longitudinal direction under bias of the spring (first and second flanges 70 on ferrule holder 30 engage perimetrical wall portions 92 upon movement of the ferrule holder within the passage in the second longitudinal direction under bias of the spring; figures 2 and 3). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include the perimetrically-walled opening for receiving flange ends, as disclosed by Myers, to gain the advantage of a longitudinal latch for retaining the ferrule assembly.

As to claim 9, Gross in view of Zimmer and Baus and further in view of Myers discloses: the connector of claim 8. Gross does not disclose: wherein the first and second flanges have a circumferential dimension and the corresponding recesses have a circumferential dimension, and the circumferential dimension of the flanges and the circumferential dimension of the corresponding recesses are configured with respect to one another for preventing rotation of the ferrule holder within the housing when the ferrule holder is inserted into the housing and the flanges are disposed in the recesses. Zimmer further discloses: wherein the first and second flanges have a circumferential dimension and the corresponding recesses have a circumferential dimension (Edges 194 and 197 (first and second flanges) have a circumferential dimension; figures 5 and 6), and the circumferential dimension of the flanges and the circumferential dimension of the corresponding recesses are configured with respect to one another for preventing rotation of the ferrule holder within the housing when the ferrule holder is inserted into the housing and the flanges are disposed in the recesses (allowing the antirotation portion of the hub to re-engage the anti-rotation seat (configured with respect to one another), thereby preventing further rotation within the housing when the ferrule holder is inserted into the housing and the flanges are disposed in the recesses; figures 5 and 6; column 2, lines 31-33). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include circumferentially complimentary flanges and recesses, as further disclosed by Zimmer, to provide a more secure anti-rotation system for the ferrule.

-***-Continued Within the Next Supplemental Box-***-

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-***-Continued from Previous Supplemental Box-***-

Claims 10-12 lack an inventive step under PCT Article 33(3) as being obvious over Gross in view of Zimmer and further in view of Myers.

As to claim 10, Gross in view of Zimmer discloses: the connector of claim 5. Gross does not disclose: wherein: the passage, adjacent the first end of the housing, defines a first internal dimension, and the recesses portions define a second internal dimension greater than the first internal dimension the first end of the ferrule holder comprises at least first and second axially extending arms spaced radially from one another, each of the arms having a first end integral with the ferrule holder and a second end disposed axially away from the first end, the radial projections extending outwardly adjacent the second end, and the axial arms having a first position wherein the projections define an external dimension greater than the first internal dimension and corresponding substantially to the second internal dimension; the axially extending arms are radially inwardly displaceable from the first position to a second position and have a resilience for returning to the first position from the second position, the projections in the second arm position define a distance less than the first internal dimension for insertion of the first end of the ferrule holder into and along at least a portion of the passage; and the axially extending arms are configured for resiliently returning from the second position towards the first position within the passage upon insertion into the passage and the projections encountering the recessed portions. Zimmer further discloses: wherein: the passage, adjacent the first end of the housing, defines a first internal dimension, and the recesses portions define a second internal dimension greater than the first internal dimension (front bore 116 (passage, defines a first internal dimension (diameter)) of the front housing 110, where recessed portions of seat 112 have a larger diameter (second internal dimension) than the passage 116; figure 8). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross in view of Zimmer to include a narrower passage dimension and a larger recess dimension, as further disclosed by Zimmer, to obtain the advantage of a more secure connection for the connector. Myers discloses: the first end of the ferrule holder comprises at least first and second axially extending arms spaced radially from one another (each cantilevered arm 66 (axially extending arms spaced radially apart); figure 2; column 6 line 5), each of the arms having a first end integral with the ferrule holder and a second end disposed axially away from the first end (on each of two opposite sides of the shell 30 (ferrule holder) two cantilevered arms 66-66 molded integrally with the shell (ferrule holder). Each cantilevered arm 66 is connected at an end 68 to the shell 30 adjacent to its connection end 34 and has a free end 69 (second end disposed axially away from the first end); figures 2-3; column 5, lines 17-21), the radial projections extending outwardly adjacent the second end (the free end 69 (second end) of each arm is provided with a latching nub 70 (radial projection); figure 2; column 5, lines 23-24), and the axial arms having a first position wherein the projections define an external dimension greater than the first internal dimension and corresponding substantially to the second internal dimension (Normally, each latching nub 70 is biased outwardly (first position) such that the latching nub projects beyond (greater than the first internal dimension and corresponding substantially to the second internal dimension) an outer surface of the shell; figures 2 and 3; column 5, lines 25-31); the axially extending arms are radially inwardly displaceable from the first position to a second position and have a resilience for returning to the first position from the second position (Each of the arms 66-66 (axial arms) is disposed within an opening 72 (second position) in the shell 30 (ferrule holder). Because each arm is cantilevered, it is capable of being turned about its end 68 (resilience) to cause the latching nub 70 to be moved within the shell 30 (ferrule holder); figures 2-3; column 5, lines 15-24), the projections in the second arm position define a distance less than the first internal dimension for insertion of the first end of the ferrule holder into and along at least a portion of the passage; figure 2; column 5, lines 15-31); and the axially extending arms are configured for resiliently returning from the second position towards the first position within the passage upon insertion into the passage and the projections encountering the recessed portions (cantilevered arms 66 (axially extending arms) are configured for resiliently returning from the second position (radially inward in the narrow passage) towards the first position (radially outward) within the passage upon insertion into the passage and the projections encountering the recessed portions (larger radial distance than first dimension; figure 2; column 5, lines 15-31). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include radially biased axially extending arms with radial projections, as disclosed by Myers, to obtain the advantage of a more secure connection for the connector.

-***-Continued Within the Next Supplemental Box-***-

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-***-Continued from Previous Supplemental Box-***-

As to claim 11, Gross in view of Zimmer and further in view of Myers discloses: the connector of claim 10. Gross further discloses: wherein: the passage comprises a first cylindrical passage portion adjacent the first end of the housing and a second cylindrical passage portion adjacent the second end of the housing (passage 32 has a front portion 80 (first cylindrical passage portion) adjacent first end 120 of housing 30 and a rear portion 82 (second cylindrical passage portion) adjacent the second end of housing 30; figure 3; column 2, line 48 to column 3, line 29), the first cylindrical passage portion comprises a first cylindrical wall defining a first diameter of the first internal dimension (alignment sleeve 34 passage has a first cylindrical wall defining a first diameter of the first internal dimension; figures 3 and 6). Gross does not disclose: the second cylindrical passage portion comprises a second cylindrical wall defining a second diameter greater than the first diameter, the first diameter being less than the second diameter, the first diameter being less than the second diameter, and the passage comprises a first spring seat extending radially outwardly from the first cylindrical wall to the second cylindrical wall; the ferrule holder comprises a first body portion for being disposed in the first cylindrical passage portion and a second body' portion for being disposed within the second cylindrical passage portion, the first body portion having a third diameter less than the first diameter, the second body portion having a fourth diameter greater than the first and third diameters and less than the second diameter; and the resilient member comprises a spring for being disposed around the first body portion for engagement between the first spring seat and the second spring seat. Zimmer further discloses: the second cylindrical passage portion comprises a second cylindrical wall defining a second diameter greater than the first diameter, and the ferrule holder comprises a second spring seat extending radially outwardly from the first body portion to the second body portion (second cylindrical passage portion has a second cylindrical wall (adjacent to edges 194-197) defining a second diameter (extending from center to wall adjacent edges 194-197; figures 5 and 6), the first diameter being less than the second diameter (ferrule passage diameter is less than recess diameter; figures 5 and 6), and the passage comprises a first spring seat extending radially outwardly from the first cylindrical wall to the second cylindrical wall (front surface 146 of rear housing 140 is first spring seat extending radially outwardly from the first cylindrical wall of passage 147 (interior of rear housing 146) to the second cylindrical wall (inner wall of front housing 110; figure 4; column 5, lines 13-26) the ferrule holder comprises a first body portion for being disposed in the first cylindrical passage portion and a second body' portion for being disposed within the second cylindrical passage portion (ferrule holder 122 has an anti-rotation portion 128 (second body portion for being disposed within the second cylindrical passage portion) and an elongated cylindrical rear portion 123 (first body portion for being disposed in the first cylindrical passage portion; figures 1-3; column 4, lines 45-48), the first body portion having a third diameter less than the first diameter (first body portion fits within first passage portion (third diameter less than first diameter); figures 5 and 6), the second body portion having a fourth diameter greater than the first and third diameters and less than the second diameter (anti-rotation portion 128 larger than rear portion 123 or rear portion passage and smaller than recesses; figures 2, 5, and 6), and the ferrule holder comprises a second spring seat extending radially outwardly from the first body portion to the second body portion (rear wall of anti-rotation portion 128 is a second spring seat extending radially outwardly from the first body portion to the second body portion; figures 2 and 4); and the resilient member comprises a spring for being disposed around the first body portion for engagement between the first spring seat and the second spring seat (The spring 130 (resilient member) surrounds (disposed around) the elongated cylindrical rear portion (first body portion) 123 of the hub 122. The spring 130 is captured between the anti-rotation portion 128 (second spring seat) and a surface 146 of the rear housing 140 (first spring seat); column 5, lines 12-23). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the connector of Gross to include the ferrule holder insertable into the passage in a first longitudinal direction to compress the spring between the first and second spring seats and the spring biasing the ferrule holder in a second longitudinal direction opposite the first longitudinal direction, as disclosed by Zimmer, to gain the advantage of a longitudinal latch for retaining the ferrule assembly.

-***-Continued Within the Next Supplemental Box-***-

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-Continued from Previous Supplemental Box--

As to claim 12, Gross in view of Zimmer and further in view of Myers discloses the connector of claim 11. Gross does not disclose the first end of the ferrule holder is insertable into the passage in a first longitudinal direction to compress the spring between the first and second spring seats. Zimmer further discloses: the first end of the ferrule holder is insertable into the passage in a first longitudinal direction to compress the spring between the first and second spring seats (The spring 130 surrounds the elongated cylindrical rear portion 123 of the hub 122. The spring 130 is captured between the anti-rotation portion 128 (second spring seat) and a surface 146 of the rear housing 140 (first spring seat) by rearward (first longitudinal) insertion; figures 2 and 4; column 5, lines 12-15), the spring being for biasing the ferrule holder in a second longitudinal direction opposite the first longitudinal direction (The spring 130 functions to bias the ferrule 124 in a forward (second longitudinal) direction through the front bore 116; figures 2 and 4). Gross further discloses an end surface of the first housing end, the end surface defining a ring-shaped surface (shoulder 118 (ring-shaped end surface); figure 3; and spring seat (ring-shaped end surface) at right end of figure 3; figure 3). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the invention of Gross to include: the spring-compressing insertion and the forward biasing, as further disclosed by Zimmer to gain the advantage of a more easily assembled connector. Gross fails to disclose wherein: the at least first and second axially extending arms comprise first, second, third and fourth axially extending arms disposed at about 90° from an adjacent arm in a circumferential direction about the ferrule holder. Myers further fairly suggests: wherein: the at least first and second axially extending arms comprise first, second, third and fourth axially extending arms disposed at about 90° from an adjacent arm in a circumferential direction about the ferrule holder (each cantilevered arm 66 (axially extending arms spaced radially apart) wherein the use of two spaced apart arms fairly suggests the use of four; figure 2; column 6 line 5); the corresponding recessed portions comprise one of: an annular enlargement of the first cylindrical passage portion adjacent the first end of the housing, the annular enlargement defining a ring-shaped surface disposed away from the first housing end towards the second end of the housing (window 90 is an annular enlargement of the first cylindrical passage portion adjacent the first end of the housing, the annular enlargement (walls of windows 90 collectively) defining a ring-shaped surface disposed away from the first housing end towards the second end of the housing; figure 2); and the first second, third and fourth axially extending arms are configured to be radially displaceable from the first position to the second position upon insertion into the passage in the first direction (first and second flanges 70 on ferrule holder 30 radially displaceable from first flange position (extended) to the second flange position (radially compressed) upon insertion, wherein first and second flanges 70 fairly suggest third and fourth flanges; figures 1-3); and the projections of the first, second, third and fourth axially extending arms are configured for engaging the ring-shaped surface upon movement of the ferrule holder within the passage in the second longitudinal direction under bias of the spring (projections 70 on first and second axially extending arms 66 on ferrule holder 30 engage ring-shaped surface (part of 90) upon movement of the ferrule holder within the passage in the second longitudinal direction under bias of the spring, wherein projections 70 on first and second axially extending arms 66 fairly suggest projections on third and fourth axially extending arms; figures 2 and 3). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the invention of Gross to include: wherein: the at least first and second axially extending arms comprise first, second, third and fourth axially extending arms disposed at about 90° from an adjacent arm in a circumferential direction about the ferrule holder, as disclosed by Myers, to gain the advantage of a more easily assembled connector.

Claim 13 meets the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest wherein one of the ferrule holder and the housing comprises an additional radial projection and: receiving the additional radial projection therein upon insertion of the ferrule holder into the passage to prevent rotational movement of the ferrule body within the passage. Gross discloses a ferrule holder (terminus 24 includes terminus body 90 (front portion of ferrule holder) that forms a terminus rear portion (rear portion of ferrule holder) and a ferrule 92; figure 3; column 2, lines 56-58), the ferrule holder and the housing comprises a longitudinal slot (a housing with through passages (longitudinal passages, as shown) completely through the housing; figures 1 and 3; column 2, lines 23-25). Since Gross and the references of record fail to disclose wherein one of the ferrule holder and the housing comprises an additional radial projection, it would not have been obvious to make this arrangement.

Claim 14 meets the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the second end of the housing, housing comprises a retainer for being inserted through at least a portion of the housing to block at least a portion of the passage to retain the ferrule holder in the passage after insertion of the ferrule holder into the passage through the second end of the housing. Haesly discloses the ferrule holder is insertable into the passage (a clip inserted through the housing which will retain the ferrule against all but a substantial pulling force; abstract; figure 2). Since Haesly and the references of record fail to disclose the second end of the housing, housing comprises a retainer for being inserted through at least a portion of the housing to block at least a portion of the passage to retain the ferrule holder in the passage after insertion of the ferrule holder into the passage through the second end of the housing, it would not have been obvious to make this arrangement.

Claims 15-20 meet the criteria set out in PCT Article 33(2)-(3), because of their dependency on claim 14.

Claims 1-23 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To: ALISON MCCARTHY
SUITE 5000
500 GRANT STREET
PITTSBURGH, PA 15219-2507

RECEIVED

MAY 13 2014

PEPPER HAMILTON LLP
Pittsburgh Office

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 133077-01502	Date of mailing (day/month/year) 14 MAY 2014
International application No. PCT/US2014/012137	International filing date (day/month/year) 17 January 2014
Applicant SENKO ADVANCED COMPONENTS, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.
Filing of amendments and statement under Article 19:
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):
 When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.
 Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70
 For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 – 9.011.
2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.
4. **Reminders**
 The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.
 Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).
 Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.
 In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.
 For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide, National Chapters*.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer <div style="text-align: right;">Blaine R. Copenheaver</div> <div style="text-align: right; font-size: 0.8em;">PCT Helpdesk: 571-272-4300</div> <div style="text-align: right; font-size: 0.8em;">Telephone No. PCT OSP: 571-272-7774</div>
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Form PCT/ISA/220 (July 2010)

DOCKETED
ON: 5/29/14
BY: 223

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-01502	FOR FURTHER ACTION <div style="float: right; font-size: small;"> see Form PCT/ISA/220 as well as, where applicable, item 5 below. </div>	
International application No. PCT/US2014/012137	International filing date (<i>day/month/year</i>) 17 January 2014	(Earliest) Priority Date (<i>day/month/year</i>) 10 May 2013
Applicant SENKO ADVANCED COMPONENTS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

☐ as suggested by the applicant.

☒ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2014/012137

Box No. IV **Text of the abstract (Continuation of item 5 of the first sheet)**

Adaptors for providing a connection between fiber-optic cables may be configured to be interlocked in both side-by-side and top-to-bottom orientations with adjacent adaptors to eliminate wasted spaced between adjacent rows and/or columns of adaptors in a junction panel. Fiber optic connector adaptors, that may include internal alignment sleeves or surfaces, are frequently utilized to facilitate the mating of one or more fiber optic connectors and the fiber optic cables associated therewith

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/012137

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - G02B 6/38 (2014.01) USPC - 385/53 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) IPC(8) - G02B 6/36, 6/38, 6/40, 6/44 (2014.01) USPC - 385/34, 53, 54, 55, 59, 134, 135, 139; 439/284, 325, 326, 327, 328 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - G02B 6/38, 6/3825, 6/3826, 6/3829, 6/3831, 6/3897 (2014.02) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase, Google Patents, Engineering Village		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 202600189 U (LIU et al) 12 December 2012 (12.12.2012) see machine translation	1-20
A	US 8,270,796 B2 (NHEP) 18 September 2012 (18.09.2012) entire document	1-20
A	US 6,471,412 B1 (SZLARYI et al) 29 October 2002 (29.10.2002) entire document	1-20
A	US 2005/0111796 A1 (GROIS et al) 26 May 2005 (26.05.2005) entire document	1-20
☐ Further documents are listed in the continuation of Box C. ☐		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 27 April 2014		Date of mailing of the international search report 14 MAY 2014
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: ALISON MCCARTHY
SUITE 5000
500 GRANT STREET
PITTSBURGH, PA 15219-2507

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing (day/month/year)	1 4 MAY 2014
-------------------------------------	---------------------

Applicant's or agent's file reference 133077-01502	FOR FURTHER ACTION See paragraph 2 below
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International application No. PCT/US2014/012137	International filing date (day/month/year) 17 January 2014	Priority date (day/month/year) 10 May 2013
---	--	--

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G02B 6/38 (2014.01)
USPC - 385/53

Applicant **SENKO ADVANCED COMPONENTS, INC.**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Date of completion of this opinion 27 April 2014	Authorized officer: Blaine R. Copenheaver <small>PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</small>
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Form PCT/ISA/237 (cover sheet) (July 2011)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2014/012137

Box No. 1 Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)

☐ on paper
☐ in electronic form

 - b. (time)

☐ in the international application as filed
☐ together with the international application in electronic form
☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2014/012137

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	None	YES
	Claims	1-20	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-20	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-20 lack novelty under PCT Article 33(2) as being anticipated by Liu et al.

Regarding claim 1, Liu et al disclose a fiber optic adaptor for providing a connection between at least two fiber optic connectors (adaptor assembly and connector assembly [title]), the adaptor comprising:

at least first and second cavities for receiving fiber optic connectors therein (at least a pair of ports used for insertion of the connectors are formed in the shell body; abstract)

and connecting members configured for directly interconnecting the adaptor with at least two additional adaptors in both first and second directions of a two-dimensional array to provide an interconnected two-directional array of adaptors with interconnections in each of the two directions (adaptors can be sequentially jointed side by side in the horizontal direction or sequentially jointed in the vertical direction in an overlaid mode; abstract; Fig. 1).

Regarding claim 2, Liu et al disclose the adaptor of claim 1, Liu et al further disclose wherein the adaptor has an exterior surface for being disposed adjacent and abutting an exterior surface of additional interconnected adaptors in each of the two-directions (adaptor 10 of the housing 1 has a substantially rectangular parallelepiped shape, and includes a first upstanding wall defining an interface 11 to 2, and The first vertical wall 11 opposite the second wall 12, a top wall 13 and bottom wall 14. The engagement means is configured to Connecting a plurality of adaptors 10 are adjacent to two adjacent first vertical wall of the adaptor 11 and the second wall 12, and / or adjacent the top wall 13 and bottom wall 14; [0062]).

Regarding claim 3, Liu et al disclose the adaptor of claim 2, Liu et al further disclose wherein: the connecting members comprise at least one of:

a slot in the external surface of the adaptor (each of the second engaging means 32 includes: receiving slot; [0069]; Fig. 11-13), and a projection extending from the external surface of the adaptor; and the at least one of the slot and the projection is configured to interlock with a corresponding other of a projection extending from an external surface of an additional adaptor, and a slot in an external surface of an additional adaptor (first opening 322 in communication with the receiving groove 321, the engaging portion 312 of another adaptor; [0069]).

Regarding claim 4, Liu et al disclose the adaptor of claim 2, Liu et al further disclose wherein the connecting members comprising clips (clamping structure 3; Fig. 3; [0063]) configured for engaging the adaptor and an additional adaptor to interconnect the adaptor with the additional adaptor.

Regarding claim 5, Liu et al disclose the adaptor of claim 1, Liu et al further disclose wherein: the adaptor has a first end comprising the first cavity, a second end comprising the second cavity and disposed opposite the first end (four interfaces 201, respectively, are formed at both ends of the pair of adaptor 200; [0004]), and defines a first longitudinal bore between the first and second ends, the first longitudinal bore defining a longitudinal axis (configured to accommodate the insertion of the respective connector 400; [0004]; Fig. 19-21); the adaptor defines an exterior surface disposed about the longitudinal bore, and the exterior surface defines at least a first pair of oppositely disposed sides defining a first direction orthogonal to the longitudinal axis (11'; Fig. 9, 10), and a second pair of oppositely disposed sides defining a second direction orthogonal to both the longitudinal axis and the first orthogonal direction (13'; Fig. 9, 10); and at least one side of each pair of opposite sides is configured for being disposed adjacent and abutting a side of an additional interconnected adaptor (plurality of adaptor 10 'side by side in the horizontal direction are sequentially joined together; Fig. 11, 12, 13; [0068]).

Regarding claim 6, Liu et al disclose the adaptor of claim 5, Liu et al further disclose wherein:

the adaptor is configured for being disposed in a panel (adaptor assembly 100 "to the mounting panel 101; Fig. 18, 19; [0080]); the panel defines a planar surface; and the adaptor is configured for being disposed in the panel with the longitudinal direction thereof at an angle of about 30 degrees to 90 degrees with respect to the planar surface (modular design of the adaptor can be used to ensure that clients need to select the appropriate number of adaptation is modular combinations; [0084]).

(Continued In Supplemental Boxes)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2014/012137

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V

Regarding claim 7, Liu et al disclose the adaptor of claim 5, Liu et al further disclose wherein: the adaptor is a rectangular cuboid (each of said adaptor housing has a substantially rectangular parallelepiped shape; [0009]) having a length extending from the first end to the second end; the first pair of oppositely disposed sides comprises a first side and a second side defining a height therebetween (a first upstanding wall defining an interface with the first vertical wall opposite the second wall; [0009]); the second pair of oppositely disposed sides comprises a third side and a fourth side defining a width therebetween (a top wall and a bottom wall, said plurality of device adapters are configured to connect two adjacent engagement with the adapter; [0009]); at least one of the first side and the second side is configured for being disposed adjacent to and interconnected with one of a first side and a second side of an additional interconnected adaptor; and at least one of the third side and the fourth side is configured for being disposed adjacent to and interconnected with one of a third side and a fourth side of an adjacent interconnected adaptor (the adapter assembly, said engagement means being configured to hold a plurality of adapters in the two adapter adjacent vertical walls of adjacent first and second wall and / or adjacent the top and bottom walls; [0010]).

Regarding claim 8, Liu et al disclose the adaptor of claim 7, Liu et al further disclose wherein: the connecting members are disposed on the at least one of the first side and the second side and on the at least one of the third side and the fourth side (the adapter assembly, said first vertical wall, second wall, a top wall and a bottom wall of each of includes a recess formed on the inner surface of the housing, the shape of the groove and the clamping; [0011]); the connecting members comprise at least one of: a slot in the external surface of the adaptor extending in a longitudinal direction of the adaptor (U-shaped and comprises: a first arm portion 313 'away from the first vertical wall 11' or the second wall; Fig. 19; [0079]); and a projecting rail (32'; Fig. 19) extending from the external surface of the adaptor and extending in a longitudinal direction of the adaptor; the at least one of the slot and the projecting rail is configured to interlock via a longitudinal sliding engagement with a corresponding other of: a projecting rail extending from an external surface of an additional adaptor, and a slot in an external surface of an additional adaptor (in two adjacent upper and lower adapter, the adapter on a bottom wall with the top wall next to each other near the adapter, reducing overall installation adapter assembly space; [0079]); and the at least one of the first side and the second side and the at least one of the third side and the fourth side comprises a stop for aligning adapters during sliding engagement (barrier 316 'to block the elongate first arm 313 projecting from the' empty and the second arm portion 314; [0080]).

Regarding claim 9, Liu et al disclose the adaptor of claim 8, Liu et al further disclose wherein: the first and second cavities are each configured for receiving a type of fiber optic connector selected from the group comprising MPO, LC, FC, SC, ST, and MTP type fiber optic connectors (utility model with the adapter 100 such as fiber optic connector 400 shown in Figure 20 (Example of LC fiber optic connector); [0061]); the adaptor comprises at least one additional bore and aligned with the first longitudinal bore in the first orthogonal direction, each at least one additional longitudinal bore comprises an additional set of first and second cavities for receiving and aligning a fiber optic connectors therein (when the optical fiber connector 400 is inserted into the adapter 200, the connected connector body 401 accommodated in the accommodating groove 201, the ferrule 301 is inserted into the connection portion 202 connected to the continued portion 202 for connection to another optical fiber ferrule; [0004]); and the first orthogonal direction defines a first orthogonal axis to the longitudinal axis, the second orthogonal direction defines a second orthogonal axis to the longitudinal axis, and the adaptor has 180 rotational symmetry about the longitudinal axis, the first orthogonal axis, the second orthogonal axis, or any combination thereof (modular design of the adapter can be used to ensure that clients need to select the appropriate number of adaptation is modular combinations; [0084]).

Regarding claim 10, Liu et al disclose the adaptor of claim 8, Liu et al further disclose wherein the adaptor is one of a tabbed adaptor for being fastened to a panel assembly and an add-on adaptor configured for being attached to at least one of a tabbed adaptor and an additional add-on adaptor (mounting holes 64 and 74 through the connecting member such as bolts to the adapter assembly 100' mounted on a mounting panel (not shown, see Figure 11); [0077]), wherein: a tabbed adaptor comprises: a tab (mounting ear 63; Fig. 14-17) extending from the first side and configured for being fastened to a panel assembly; and at least one connecting member disposed on each of the second, third and fourth sides, wherein the second side of the tabbed adaptor is configured to be interconnected with each of: a first side and a second side of an additional add-on adaptor, and a second side of a tabbed adaptor, and the third and fourth sides of the add-on adaptor are configured to be interconnected with each of: a third side and a fourth side of an additional add-on adaptor, and a third side and a fourth side of a tabbed adaptor (the clamping structure 3 the two clamping arms 30 of the first adapter receiving recess in second wall 121 of the same row 12 the first and second vertical wall 11 adapter recess 111, which can be more than one adapter 10 sequentially secured together side by side. Further, as shown, the holding structure of the two clamping arms 3, 4, 30 is accommodated in the same column of the bottom wall of the recess 141 and the upper portion of the lower portion of the adapter 14, a top wall of the adapter 131 grooves 13, which can be more than one adapter 10 sequentially stacked together; [0063]).

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Regarding claim 11, Liu et al disclose the adaptor of claim 10, Liu et al further disclose wherein: the at least one connecting member of each of the second side of the tabbed adaptor, and the first side and the second side of the add-on adaptor comprises a longitudinal rail spaced a first distance from one of the third side and the fourth side, and a longitudinal slot spaced a second distance from the other of the third side and the fourth side, wherein the first distance is the same as the second distance (U-shaped and comprises: a first arm portion 313 'away from the first vertical wall 11' or the second wall; Fig. 19; [0079]); each of the longitudinal rail and the longitudinal slot has cross-sectional configuration corresponding to the cross-sectional configuration of the other of the longitudinal rail and the longitudinal slot (in two adjacent upper and lower adaptor, the adaptor on a bottom wall with the top wall next to each other near the adaptor, reducing overall installation adapter assembly space; [0079]); and each longitudinal rail and longitudinal slot of the adaptor is configured to slidably engage with a corresponding other of a longitudinal slot and longitudinal rail of an additional adaptor for interlocking the adaptors (barrier 316 'to block the elongate first arm 313 projecting from the' empty and the second arm portion 314; [0080]).

Regarding claim 12, Liu et al disclose the adaptor of claim 11, Liu et al further disclose wherein the at least one connecting member of each of the third side and the fourth side of the tabbed adaptor and each of the third side and the fourth side of the add-on adaptor comprises at least one clip (clamping structure 3; Fig. 1-3; [0063]) configured for interlocking a tabbed adaptor or an add-on adaptor with an additional tabbed adaptor or add-on adaptor.

Regarding claim 13, Liu et al disclose the adaptor of claim 12, Liu et al further disclose wherein: the clip has a first end and a second end, and a longitudinal dimension extending from the first end to the second end (Fig. 6); each of the third side and the fourth side of a tabbed adaptor and each of the third side and the fourth side of an add-on adaptor comprises at least one clip slot configured for receiving one of the first end and the second end of the clip therein, and the at least one clip slot is positioned for being aligned with a clip slot of the third side or the fourth side of another tabbed adaptor or a clip slot of the third side or the fourth side of another add-on adaptor (clamping structure 3 the two clamping arms 30 of the first adaptor receiving recess in second wall 121 of the same row 12 the first and second vertical wall 11 adaptor recess 111, which can be more than one adaptor 10 sequentially secured together side by side. Further, as shown, the holding structure of the two clamping arms 3, 4, 30 is accommodated in the same column of the bottom wall of the recess 141 and the upper portion of the lower portion of the adaptor 14, a top wall of the adaptor 131 grooves 13, which can be more than one adaptor 10 sequentially stacked together; [0063]); each at least one clip slot defines an internal surface, and at least one of: the internal surface within the clip slot, and the first and second ends of the clip, comprises a projection, and at least the other of: the internal surface within the clip slot, and the first and second ends of the clip, comprises a recess for receiving the projection therein for retaining the clip in the clip slot (top wall 13 and bottom wall 14 includes a recess formed at each of the inside surface of their respective 111,121,131,141, 111,121,131,141 is substantially the same as the shape of the recess and the holding structure holding two shapes 3 with the arm 30 substantially to the two clamp-holding structure 3; [0063]; Fig. 4, 5).

Regarding claim 14, Liu et al disclose the adaptor of claim 13, Liu et al further disclose wherein: the adaptor is configured for being disposed in a panel (adaptor assembly 100 "to the mounting panel 101; Fig. 18, 19; [0080]); the panel defines a planar surface; and the adaptor is configured for being disposed in the panel with the longitudinal direction thereof at an angle of about 30 degrees to 90 degrees with respect to the planar surface (modular design of the adapter can be used to ensure that clients need to select the appropriate number of adaptation is modular combinations; [0084]).

Regarding claim 15, Liu et al disclose the adaptor of claim 14, Liu et al further disclose wherein each of the first and second cavities comprises an internally keyed configuration configured for one of: directly receiving a fiber optic connector therein in a first orientation (Connector body 401 accommodated in the accommodating groove 201; [0004]); and directly receiving an adaptor latch therein in each of a first orientation or a second orientation rotated 180° from the first; wherein the adaptor latch further comprises an internally keyed configuration for directly receiving a fiber optic connector therein in a first orientation (the ferrule 301 is inserted into the connection portion 202 connected to the Continued portion 202 for connection to another optical fiber ferrule; [0004]),

Regarding claim 16, the adaptor of claim 15, wherein: each of the first and second cavities (2; Fig. 5) is independently configured for one of: directly receiving a fiber optic connector therein, and comprises opposed retaining arms configured for releasably retaining a fiber optic connector within the cavity, the retaining arms being resiliently displaceable outwardly for passage of a fiber optic connector therebetween; and directly receiving an adaptor latch therein, and one of the adaptor latch and the cavity comprises at least one of a first recess and a first resiliently displaceable projection (the free end of the auxiliary clamping means 43 and the through hole 15 is provided with an elastic retaining projection; Fig. 6, 7; [0066]), and the other of the adaptor latch and the cavity comprises a corresponding other of a resiliently displaceable projection and a recess for engaging with the at least one of the first recess and first resiliently displaceable projection to releasably retain the adaptor latch within the cavity, and the adaptor latch comprises opposed retaining arms configured for releasably retaining a fiber optic connector within the cavity, the retaining arms being resiliently displaceable outwardly for passage of a fiber optic connector therebetween.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/012137

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding claim 17, Liu et al disclose a two-directional array of inter-connected fiber optic adaptors (Fig. 1) for providing connections between fiber optic connectors (at least a pair of ports used for insertion of the connectors are formed in the shell body; abstract), the adaptors comprising connection elements for releasably coupling each adaptor to immediately adjacent adaptors in both directions of the array (adapters can be sequentially jointed side by side in the horizontal direction or sequentially jointed in the vertical direction in an overlaid mode; abstract; Fig. 1).

Regarding claim 18, Liu et al disclose the adaptor of claim 17, Liu et al further disclose wherein: each adaptor comprises: at least first and second cavities for receiving fiber optic connectors therein (at least a pair of ports used for insertion of the connectors are formed in the shell body; abstract); an exterior surface disposed about the cavities; and the connection elements are configured for directly interconnecting each adaptor with the immediately adjacent adaptors with the exterior surface of each adaptor abutting an exterior surface of each immediately adjacent adaptor in both directions of the array (adapter 10 of the housing 1 has a substantially rectangular parallelepiped shape, and includes a first upstanding wall defining an interface 11 to 2, and The first vertical wall 11 opposite the second wall 12, a top wall 13 and bottom wall 14. The engagement means is configured to Connecting a plurality of adapters 10 are adjacent to two adjacent first vertical wall of the adapter 11 and the second wall 12, and / or adjacent the top wall 13 and bottom wall 14; [0062]).

Regarding claim 19, Liu et al disclose the adaptor of claim 18, Liu et al further disclose wherein the connecting elements comprise at least one of: clips configured for engaging immediately adjacent adaptors to interconnect immediately adjacent adaptors (clamping structure 3; Fig. 3; [0063]); and projections and slots configured for interlocking engagement, wherein the exterior surface of each adaptor comprises at least one of a slot and a projection configured for interlocking engagement with the other of the at least one slot and projection of another adaptor.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/012137

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding claim 20, Liu et al disclose the adaptor of claim 18, Liu et al further disclose wherein:
each adaptor has a first end comprising the first cavity, a second end comprising the second cavity and disposed opposite the first end (four interfaces 201, respectively, are formed at both ends of the pair of adapter 200; [0004]), and defines a first longitudinal bore between the first and second ends, the first longitudinal bore defining a longitudinal axis (configured to accommodate the insertion of the respective connector 400; [0004]; Fig. 19-21);
the exterior surface defines first and second oppositely disposed sides defining a first orthogonal direction orthogonal to the longitudinal axis and defining a height therebetween (11'; Fig. 9, 10);
third and fourth oppositely disposed sides defining a second orthogonal direction orthogonal to both the longitudinal axis and the first orthogonal direction and defining a width therebetween (13'; Fig. 9, 10); and
at least one side of each pair of opposite sides is configured for being disposed adjacent and abutting a side of immediately adjacent adaptors (plurality of adapter 10 'side by side in the horizontal direction are sequentially joined together; Fig. 11, 12, 13; [0068]);
each adaptor is one of a tabbed adaptor for being fastened to a panel assembly and an add-on adaptor configured for being attached to at least one of a tabbed adaptor and an additional add-on adaptor, wherein:
each tabbed adaptor comprises:
a tab (mounting ear 63; Fig. 14-17) extending from the first side and configured for being fastened to a panel assembly; and
at least one connecting element disposed on each of the second, third and fourth sides, wherein the second side of each tabbed adaptor is configured to be interconnected with each of: a first side and a second side of an add-on adaptor, and a second side of an additional tabbed adaptor, and the third and fourth sides of each tabbed adaptor are configured to be connected to each of: a third side and a fourth side of an additional tabbed adaptor, and a third side and a fourth side of an add-on adaptor (the clamping structure 3 the two clamping arms 30 of the first adapter receiving recess in second wall 121 of the same row 12 the first and second vertical wall 11 adapter recess 111, which can be more than one adapter 10 sequentially secured together side by side. Further, as shown, the holding structure of the two clamping arms 3, 4, 30 is accommodated in the same column of the bottom wall of the recess 141 and the upper portion of the lower portion of the adapter 14, a top wall of the adapter 131 grooves 13, which can be more than one adapter 10 sequentially stacked together; [0063]); and
each add-on adaptor comprises at least one connecting element disposed on each of the first, second, third and fourth sides, wherein the first and second sides of each add-on adaptor are configured to be interconnected with each of: a first side and a second side of an additional add-on adaptor, and a second side of a tabbed adaptor, and the third and fourth sides of each add-on adaptor are configured to be interconnected with each of: a third side and a fourth side of an additional add-on adaptor, and a third side and a fourth side of a tabbed adaptor (the clamping structure 3 the two clamping arms 30 of the first adapter receiving recess in second wall 121 of the same row 12 the first and second vertical wall 11 adapter recess 111, which can be more than one adapter 10 sequentially secured together side by side. Further, as shown, the holding structure of the two clamping arms 3, 4, 30 is accommodated in the same column of the bottom wall of the recess 141 and the upper portion of the lower portion of the adapter 14, a top wall of the adapter 131 grooves 13, which can be more than one adapter 10 sequentially stacked together; [0063]);
the at least one connecting element of each of the second side of the tabbed adaptors, and the first side and the second side of the add-on adaptors comprises a longitudinal rail spaced a first distance from one of the third side and the fourth side. and a longitudinal slot spaced a second distance from the other of the third side and the fourth side, wherein the first distance is the same as the second distance (U-shaped and comprises: a first arm portion 313 'away from the first vertical wall 11' or the second wall; Fig. 19; [0079]);
each of the longitudinal rails and the longitudinal slots has a cross-sectional configuration corresponding to the cross-sectional configuration of the others of the longitudinal rails and the longitudinal rails (in two adjacent upper and lower adapter, the adapter on a bottom wall with the top wall next to each other near the adapter, reducing overall installation adapter assembly space; [0079]); and
each longitudinal rail and longitudinal slot is configured to slidably engage with a corresponding other of the longitudinal slots and longitudinal rails of another adaptor for interlocking the adaptors (barrier 316 'to block the elongate first arm 313 projecting from the' empty and the second arm portion 314; [0080]);
the at least one connecting element of each of the third side and the fourth side of the tabbed adaptors and each of the third side and the fourth side of the add-on adaptors comprises at least one clip (clamping structure 3; Fig. 1-3; [0063]) configured for interlocking the tabbed adaptors or the add-on adaptors with an additional tabbed adaptor or add-on adaptor;
the clip has a first end and a second end, and a longitudinal dimension extending from the first end to the second end (Fig. 6);
each of the third side and the fourth side of the tabbed adaptors and each of the third side and the fourth side of the add-on adaptors comprises at least one clip slot configured for receiving one of the first end and the second end of the clip therein, and the at least one clip slot is positioned for being aligned with the clip slot of the third side or the fourth side of another tabbed adaptor or the clip slot of the third side or the fourth side of another add-on adaptor (clamping structure 3 the two clamping arms 30 of the first adapter receiving recess in second wall 121 of the same row 12 the first and second vertical wall 11 adapter recess 111, which can be more than one adapter 10 sequentially secured together side by side. Further, as shown, the holding structure of the two clamping arms 3, 4, 30 is accommodated in the same column of the bottom wall of the recess 141 and the upper portion of the lower portion of the adapter 14, a top wall of the adapter 131 grooves 13, which can be more than one adapter 10 sequentially stacked together; [0063]);
each at least one clip slot defines an internal surface, and at least one of: the internal surface within the clip slot, and the first and second ends of the clip, comprises a projection, and at least the other of: the internal surface within the clip slot, and the first and second ends of the clip, comprises a recess for receiving the projection therein for retaining the clip in the clip slot (top wall 13 and bottom wall 14 includes a recess formed at each of the inside surface of their respective 111,121,131,141, 111,121,131,141 is substantially the same as the shape of the recess and the holding structure holding two shapes 3 with the arm 30 substantially to the two clamp-holding structure 3; [0063]; Fig. 4, 5).

Claims 1-20 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To: Allison L. McCarthy
Pepper Hamilton LLP
Suite 5000
500 Grant Street
Pittsburgh, Pennsylvania 15219-2507
United States of America

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

OCT 14 2014

Date of mailing
(day/month/year)

09 OCT 2014

PEPPER HAMILTON LLP
Pittsburgh Office

Applicant's or agent's file reference

133077-02402

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.

PCT/US14/41500

International filing date
(day/month/year)

09 June 2014 (09.06.2014)

Applicant

SENKO ADVANCED COMPONENTS, INC.

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 - 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:**

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide, National Chapters*.

Within 19 months from the priority date, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide, International Phase, paragraphs 8.005-8.032*.

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3261

Authorized officer

Shane Thomas

PCT Helpdesk: 571-272-4390

Telephone No. PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2014)

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-02402	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US14/41500	International filing date (day/month/year) 09 June 2014 (09.06.2014)	(Earliest) Priority Date (day/month/year)
Applicant SENKO ADVANCED COMPONENTS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (see Box No. II).

3. ☐ Unity of invention is lacking (see Box No. III).

4. With regard to the title,

☐ the text is approved as submitted by the applicant

☒ the text has been established by this Authority to read as follows:

REDUCED-PROFILE CONNECTORS, ADAPTERS, AND CONNECTION ASSEMBLIES THEREOF

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the drawings to be published with the abstract is Figure No. 2A

☐ as suggested by the applicant.

☒ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/41500

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/36, 6/38, 6/40 (2014.01)

CPC - G02B 6/1228, 6/381, 6/3833

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)

IPC(8) Classification(s): G02B 6/36, 6/38, 6/40 (2014.01)

CPC Classification(s): G02B 6/1228, 6/381, 6/3833, 6/3825, 6/3885; USPC Classification(s): 385/72, 81, 55

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)

MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); IP Com, Google, Google Scholar, Proquest; search terms used: Ferrule fiber optic adapter clip hooks multi-fiber push-on/pull-off adapter mpo mt mechanical transfer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,682,228 B2 (RATHNAM, L. et al.) January 27, 2004; figures 1A-6C; column 1, lines 13-18 and 48-59; column 3, line 14- column 5, line 63; column 6, lines 33-39.	1-5, 7-16, 21-35 --- 6, 17-20
Y	US 8,651,749 B2 (DAINESE JUNIOR, P. Jr. et al.) February 18, 2014; figures 19-20; column 13, lines 17-29.	6
Y	US 2013/0121653 A1 (SHITAMA, S. et al.) May 16, 2013; figures 3-4; paragraphs [0025, 0027-0028].	17-18
Y	US 2009/0022457 A1 (DE JONG, M. et al.) January 22, 2009; figures 1, 5 and 7; paragraphs [0032 and 0040-0041].	19-20
A	US 2007/0098329 A1 (SHIMOJI, N. et al.) May 3, 2007; entire document.	1-20
A	US 2014/0133808 A1 (HILL, J. et al.) May 15, 2014; entire document.	1-20

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"G" document member of the same patent family

Date of the actual completion of the international search

29 August 2014 (29.08.2014)

Date of mailing of the international search report

09 OCT 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3291

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: Allison L. McCarthy
Pepper Hamilton LLP
Suite 5000
500 Grant Street
Pittsburgh, Pennsylvania 15219-2507
United States of America

Date of mailing
(day/month/year) **09 OCT 2014**

Applicant's or agent's file reference
133077-02402

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US14/41500

International filing date (day/month/year)

09 June 2014 (09.06.2014)

Priority date (day/month/year)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - G02B 6/36, 6/38, 6/40 (2014.01)

CPC - G02B 6/1228, 6/381, 6/3833

Applicant **SENKO ADVANCED COMPONENTS, INC.**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Date of completion of this opinion

29 August 2014 (29.08.2014)

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - ☐ on paper
 - ☐ in electronic form
 - b. (time)
 - ☐ in the international application as filed
 - ☐ together with the international application in electronic form
 - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US14/41500

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	6, 17-20	YES
	Claims	1-5, 7-16, 21-35	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-35	NO
Industrial applicability (IA)	Claims	1-35	YES
	Claims	NONE	NO

2. Citations and explanations:

Claims 1-5, 7-16, and 21-35 lack novelty under PCT Article 33(2) as being anticipated by US 6,682,228 B2 to Rathnam, L. et al. (hereinafter 'Rathnam').

As for claim 1, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: an adapter (connector 200 with connector housing 250 can be inserted into conventional adapter 150; figures 1C-2B and 5A; column 1, lines 13-18 and 48-59; column 3, lines 14-46); a ferrule having a connection side (ferrule 208 has an end which can be plugged into a transceiver (connection side); figures 1C, 2A-2B; 5A-5C; column 1, lines 48-59; column 3, lines 27-46; column 4, line 50-58; column 5, lines 38-55); and a reduced-profile clip fixedly arranged within the adapter (fingers 154 (reduced-profile clip) in adapter 150 flex outward when force is applied; (fixedly arranged within the adapter) figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55), the reduced-profile clip having hooks configured to engage a portion of the ferrule opposite the connection side to prevent movement of the ferrule within the adapter (fingers 154 (reduced-profile clip having hooks) in adapter 150 flex outward when force is applied to enter indentations 318 of body 202 while the ferrule 208 is slid outward from the indentation 318 (portion of the ferrule opposite the connection side) and can lock into place to prevent the connector 200 from disengaging from the receptacle 150 (prevent movement of the ferrule within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57; column 4, line 10; column 5, lines 38-55).

As for claim 2, Rathnam discloses the reduced-profile connection assembly of claim 1, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 3, Rathnam discloses the reduced-profile connection assembly of claim 1, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 4, Rathnam discloses the reduced-profile connection assembly of claim 1, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 5, Rathnam discloses the reduced-profile connection assembly of claim 1, further comprising a ferrule installation device configured to install the ferrule within the reduced-profile clip (ferrule 208 can be inserted by pushing it into body 202 (installation device) and can have the end pushed out of to protrude from body 202 and be inserted into adapter receptacle 150 (reduced-profile clip); figures 5A and 6A; column 5, lines 3-56).

Continued Within the Next Supplemental Box

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted.

Claims 23 and 35 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof.

Claim 21 is objected to for a typographic error "an adapter having at least on recess". For the purposes of this opinion "an adapter having at least on recess" is interpreted as "an adapter having at least one recess".

Claim 35 is objected to for a typographical error "the at least one spring" creating lack of antecedent basis issues. For the purposes of this opinion, "the at least one spring" is interpreted as "the at least one spacer" to restore antecedent basis and clarity.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41566

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

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As for claim 7, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: a ferrule having a connection end (ferrule 208 has an end which can be plugged into a transceiver (connection side); figures 1C, 2A-2B; 5A-5C; column 1, lines 48-59; column 3, lines 27-46; column 4, line 50-58; column 5, lines 38-55); a connector comprising: an inner housing having the ferrule fixedly arranged therein at a first end (body 202 (inner housing) can have ferrule 208 inserted into it by pushing the ferrule 208 into the body and have the ferrule held by lips 320 (first end) to prevent the ferrule from falling out the body (fixedly arranged therein); figures 5A and 6A; column 3, line 57 - column 4, line 10; column 5, lines 3-56) and flanges extending from a second end opposite the first end (ridges 312 (flanges) are opposite the ferrule end 208 with lips 320 and extend outward; figures 5A and 6A; column 3, line 57 - column 4, line 10; column 5, lines 3-56), and an ejector housing disposed around the inner housing (sleeve 204 (ejector housing) is slipped on body 202 (inner housing); figures 4A-6B; column 4, lines 22-49; column 5, lines 3-56) and configured to slide along the inner housing between a locked position and an unlocked position (sleeve 204 (ejector housing) is slipped on body 202 (inner housing) and when pushed toward receptacle 150 can lock into place and when pushed away from the receptacle to unlock (slide between a locked position and an unlocked position); figures 4A-6C; column 4, lines 22-49; column 5, lines 3-63); and an adapter having a clip fixedly arranged therein (connector 200 with connector housing 250 can be inserted into conventional adapter 150 and has fingers 154 (clip fixedly arranged therein); figures 1C-2B and 5A; column 1, lines 13-18 and 48-59; column 3, lines 14-46; column 5, lines 38-55), the clip having hooks configured to engage protrusions extending from an outer surface of the inner housing to prevent movement of the inner housing within the adapter (fingers 154 (reduced-profile clip having hooks) in adapter 150 flex outward when force is applied to enter indentations 318 of body 202 while the ferrule 208 is slid outward from the indentation 318 (protrusions extending from an outer surface of the inner housing) and can lock into place to prevent the connector 200 from disengaging from the receptacle 150 (prevent movement of the ferrule within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 - column 4, line 10; column 5, lines 38-55), wherein the ejector housing interfaces with the clip in the locked position to prevent disengagement of the hooks from the protrusions (sleeve 204 (ejector housing) when pushed toward receptacle 150 so the tabs 414 of sleeve 204 clear the ridges on the body 202 and lock fingers 154 (hooks) into the indentation 318 (protrusions) to prevent connector 200 from disengaging from receptacle 150 under normal use (prevent disengagement of the hooks from the protrusions); figures 6A-6C; column 4, lines 22-49; column 5, lines 3-63).

As for claim 8, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 9, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 5, lines 33-39).

As for claim 10, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 5, lines 33-39).

As for claim 11, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the inner housing comprises at least one ferrule latch configured to engage the ferrule at an end opposite the connection end (body 202 (inner housing) has protrusions 310 (ferrule latch) about the ferrule 208 (engage the ferrule) opposite the connection end; figures 3A-3C and 5A; column 3, line 57 - column 4, line 21; column 4, lines 59-65), thereby preventing movement of the ferrule within the inner housing in a direction toward the flanges (the protrusions 310 about the ferrule on each side walls 304 and 306 of body 202 (inner housing) only after the ferrule is fully inserted and the side walls retract to have the protrusions engage the ferrule and prevent the ferrule 208 from falling out of the body 202 (prevent movement in a direction toward the flanges); figures 3A-3C, 5A and 6A; column 3, line 57 - column 4, line 21; column 4, lines 59- column 5, line 36).

As for claim 12, Rathnam discloses the reduced-profile connection assembly of claim 11, wherein the ejector housing is configured to push the at least one ferrule latch into engagement with the ferrule (sleeve 204 (ejector housing) is pushed onto body 202 over the ridges 312 which will cause pressure on the side walls 304 and 306 and the protrusions 310, thus causing the protrusions 310 to push into the ferrule 208 (push the at least one ferrule latch into engagement with the ferrule); figures 3A-3C and 6A; column 3, line 57 - column 4, line 21; column 4, lines 59-65; column 5, lines 37-56).

As for claim 13, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein each of the flanges comprise a recess and a projection (ridges 312 (flanges) are a pair of ridges (projection) with a spot between the ridges as well as beyond the ridge where the surface is flat compared to the ridge (recess); figures 6A and 6B; column 3, line 57 - column 4, line 10; column 5, lines 21-56), wherein a distal portion of the ejector housing is configured to be seated in the recess when in the locked position (the sleeve 204 (ejector housing) is pushed so that the tabs 414 (distal portion) clear both ridges on the body 202 (seated in the recess) when in the locked position; figures 6A and 6B; column 3, line 57 - column 4, line 10; column 5, lines 21-56).

As for claim 14, Rathnam discloses the reduced-profile connection assembly of claim 13, wherein a distal portion of the ejector housing is configured to be seated in the recess when in the unlocked position (the sleeve 204 (ejector housing) is pushed so that the tabs 414 are between both ridges 312 on the body 202 (seated in the recess) when in the unlocked position; figures 6A and 6B; column 3, line 57 - column 4, line 10; column 5, lines 21-56), thereby preventing movement of the ejector housing in a proximal direction along the inner housing (the tabs 414 of sleeve 204 (ejector housing) are surrounded by ridges 312 which hold the tabs in place and prevent the sleeve from moving in either direction on body 202 (inner housing); figures 6A and 6B; column 3, line 57 - column 4, line 10; column 5, lines 21-56).

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 14/41500

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

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As for claim 15, Rathnam discloses the reduced-profile connection assembly of claim 13, wherein a proximal portion of the ejector housing is configured to engage the projection when in the locked position (per figures 4E and 4F tabs 414 are a pair of tabs on each end of the sleeve 204, so that either set of tabs could be used to engage the ridges 312 and the tabs 414 clear both ridges on the body 202 when in the locked position; figures 4E-4F, and 6B-6C; column 4, lines 33-43; column 5, lines 21-56), thereby preventing movement of the ejector housing in a distal direction along the inner housing (the tabs 414 of sleeve 204 (ejector housing) are surrounded by ridges 312 which hold the tabs in place and prevent the sleeve from moving in either direction on body 202 (inner housing); figures 6B-6C; column 4, lines 33-43; column 5, lines 21-56).

As for claim 16, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the connector comprises 2 parts (body 202 and sleeve 204; figures 6B-6C; column 5, lines 21-56).

As for claim 21, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: a ferrule (ferrule 208; figures 2A-2B; column 3, lines 27-46); a connector having the ferrule fixedly arranged therein (body 202 (connector) can have ferrule 208 inserted into it by pushing the ferrule 208 into the body 202 and have the ferrule held by lips 320 to prevent the ferrule from falling out the body (fixedly arranged therein); figures 5A and 6A; column 3, lines 27-46; column 3, line 57 - column 4, line 10; column 5, lines 3-56) and comprising at least one adapter latch having at least one adapter latch projection (adapter 150 has fingers 154 (adapter latch) flex outward when force is applied (at least one adapter latch projection); figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55); and an adapter having at least one recess (connector 200 with body 202 can be inserted into conventional adapter 150 and held there using indentations 318 (recesses); figures 1C, 5A and 6B-6C; column 1, lines 13-18 and 48-59; column 3, lines 14-46; column 5, lines 38-55), the at least one recess configured to engage the adapter latch projection when the connector is locked in the adapter to prevent movement of the connector within the adapter (body 202 has indentations 318 (recesses) which fingers 154 (adapter latch projection) flex to enter when locked to prevent the connector from disengaging from the adapter 150 (prevent movement of the connector within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 - column 4, line 10; column 5, lines 38-55).

As for claim 22, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 23, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 24, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 25, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the at least one adapter latch comprises two adapter latches arranged on opposite side portions of the connector (adapter 150 has fingers 154 (adapter latches) on the opposite sides of the body 202 of connector 200; figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55).

As for claim 26, Rathnam discloses the reduced-profile connection assembly of claim 25, wherein the at least one recess comprises two recesses arranged on opposite side walls of the adapter corresponding with the at least one adapter latch projection of the two adapter latches (body 202 has two indentations 318 (recesses) on the opposite sides walls of the body 202 of connector 200 which fingers 154 flex to enter when locked (corresponding with at least one adapter latch projection of the two adapter latches); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 - column 4, line 10; column 5, lines 38-55).

As for claim 27, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the connector comprises 1 part (body 202 may be molded as one part; figures 2A-2B; column 3, lines 27-56).

As for claim 28, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the connector has a length of about 10 millimeters to about 20 millimeters (the length of the bottom wall 302 of the connector is 14.45 mm; figure 3B; column 4, lines 11-21).

As for claim 29, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the connector has a length of about 13 millimeters (the length of the bottom wall 302 of the connector is 14.45 mm; figure 3B; column 4, lines 11-21).

As for claim 30, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: a ferrule (ferrule 208; figures 2A-2B; column 3, lines 27-46); a connector having the ferrule fixedly arranged therein (connector 200 can have ferrule 208 inserted into it by pushing the ferrule 208 into the body 202 and have the ferrule held by lips 320 to prevent the ferrule from falling out the body (fixedly arranged therein); figures 5A and 6A; column 3, lines 27-46; column 3, line 57 - column 4, line 10; column 5, lines 3-56) and comprising at least one adapter latch having at least one adapter latch projection (adapter 150 has fingers 154 (adapter latch) flex outward when force is applied (at least one adapter latch projection); figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55); and an adapter having a clip fixedly arranged therein (connector 200 with connector housing 250 can be inserted into conventional adapter 150 and held there; figures 1C, 5A and 6B-6C; column 1, lines 13-18 and 48-59; column 3, lines 14-46; column 5, lines 38-55), the clip having a recess configured to engage the adapter latch projection when the connector is locked in the adapter to prevent movement of the connector within the adapter (body 202 (clip) has indentations 318 (recesses) which fingers 154 (adapter latch projection) flex to enter when locked to prevent the connector 200 from disengaging from the receptacle 150 (prevent movement of the connector within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 - column 4, line 10; column 5, lines 38-55).

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Continued from Previous Supplemental Box

As for claim 31, Rathnam discloses the reduced-profile connection assembly of claim 30, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 32, Rathnam discloses the reduced-profile connection assembly of claim 30, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 33, Rathnam discloses the reduced-profile connection assembly of claim 30, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 34, Rathnam discloses the reduced-profile connection assembly of claim 30, further comprising at least one spring arranged within the connector (spring 206 engages the ferrule 208 within connector 200; figures 2A and 2B; column 3, lines 27-47), the at least one spring configured to engage an end of the ferrule opposite the connection end (the ferrule 208 is inserted by pushing it in along the y axis beyond the spring 206 (end of the ferrule opposite the connection end), and the spring 206 engages the ferrule 208; figures 2A-2B, 3A, and 5B; column 3, lines 27-47; column 4, line 59- column 5, line 21) to prevent movement of the ferrule within the connector in a direction away from the connection end (spring 206 engages the ferrule 208 within connector 200 so when the connector is plugged in a good optical interface is provided (prevent movement of the ferrule within the connector in a direction away from the connection end); figures 2A and 2B; column 3, lines 27-47).

As for claim 35, Rathnam discloses the reduced-profile connection assembly of claim 30, further comprising at least one spacer arranged within the connector (protrusions 310 (spacer) in body 202; figures 3A-3C and 5A; column 3, line 57 - column 4, line 21; column 4, lines 59-65), the at least one spacer configured to engage an end of the ferrule opposite the connection end (protrusions 310 (spacer) about the ferrule 208 (engage the ferrule) opposite the connection end; figures 3A-3C and 5A; column 3, line 57 - column 4, line 21; column 4, lines 59-65) to prevent movement of the ferrule within the connector in a direction away from the connection end (the protrusions 310 about the ferrule on each side walls 304 and 306 only after the ferrule 208 is fully inserted and the side walls retract to have the protrusions engage the ferrule and prevent the ferrule 208 from falling out of the body 202 (prevent movement in a direction away from the connection end); figures 3A-3C, 5A and 5A; column 3, line 57 - column 4, line 21; column 4, lines 59- column 5, line 36).

Claim 6 lacks an inventive step under PCT Article 33(3) as being obvious over Rathnam in view of US 8,651,749 B2 to Dainese, P. Jr. et al. (hereinafter 'Dainese').

As for claim 6, Rathnam discloses the reduced-profile connection assembly of claim 1, but Rathnam fails to disclose wherein the hooks extend about 2 millimeters outside of the adapter. However, Dainese discloses wherein the hooks extend about 2 millimeters outside of the adapter (plug ferrule 20 with plug guide arms 74 (hooks) can extend out a distance between 0.5 to 20 mm; figures 19-20; column 13, lines 17-29). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the hook extension of Dainese for the advantage of being able to adjust the distance necessary for the hooks to reach to use existing connectors, which is especially advantageous for Rathnam's use of an adapter which can require different size connections.

Claims 17 and 18 lack an inventive step under PCT Article 33(3) as being obvious over Rathnam in view of US 2013/0121653 A1 to Shitama, S. et al. (hereinafter 'Shitama').

As for claim 17, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector has a length of about 20 millimeters to about 30 millimeters. However, Shitama discloses wherein the connector has a length of about 20 millimeters to about 30 millimeters (metal plate 19 of splice protection 16 extends 26 mm along the entire length of an MPO/MT connector; figures 3-4; paragraphs [0025, 0027-0028]). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of Shitama for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

As for claim 18, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector has a length of about 26 millimeters. However, Shitama discloses wherein the connector has a length of about 26 millimeters (metal plate 19 of splice protection 16 extends 26 mm along the entire length of an MPO/MT connector; figures 3-4; paragraphs [0025, 0027-0028]). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of Shitama for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

Claims 19 and 20 lack an inventive step under PCT Article 33(3) as being obvious over Rathnam in view of US 2009/0022457 A1 to de Jong, M. et al. (hereinafter 'de Jong').

As for claim 19, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector extends outside of the adapter when in the locked position about 15 millimeters to about 30 millimeters. However, de Jong discloses wherein the connector extends outside of the adapter when in the locked position about 15 millimeters to about 30 millimeters (fiber optic connector 12 may have locked boots 16, 116 (extend out side of adapter when in the locked positions) with a length of about 10 to 100 mm or preferably 10 to 60 mm, or 10 to about 30 mm; figures 1, 5 and 7; paragraphs [0032 and 0040-0041]). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of de Jong for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

Continued Within the Next Supplemental Box

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Continued from Previous Supplemental Box.

As for claim 20, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector extends outside of the adapter when in the locked position about 24 millimeters. However, de Jong discloses wherein the connector extends outside of the adapter when in the locked position about 24 millimeters (fiber optic connector 12 may have locked boots 16, 116 (extend out side of adapter when in the locked positions) with a length of about 10 to 100 mm or preferably 10 to 60 mm, or 10 to about 30 mm; figures 1, 5 and 7; paragraphs 0032 and 0040-0041). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of de Jong for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

Claims 1-35 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/41500

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/36, 6/38, 6/40 (2014.01)

CPC - G02B 6/1228, 6/381, 6/3833

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)

IPC(8) Classification(s): G02B 6/36, 6/38, 6/40 (2014.01)

CPC Classification(s): G02B 6/1228, 6/381, 6/3833, 6/3825, 6/3885; USPC Classification(s): 385/72, 81, 55

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)

MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); IP Com, Google, Google Scholar, Proquest; search terms used: Ferrule fiber optic adapter clip hooks multi-fiber push-on/pull-off adapter mpo mt mechanical transfer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,682,228 B2 (RATHNAM, L. et al.) January 27, 2004; figures 1A-6C; column 1, lines 13-18 and 48-59; column 3, line 14- column 5, line 63; column 6, lines 33-39.	1-5, 7-16, 21-35 --- 6, 17-20
Y	US 8,651,749 B2 (DAINESE JUNIOR, P. Jr. et al.) February 18, 2014; figures 19-20; column 13, lines 17-29.	6
Y	US 2013/0121653 A1 (SHITAMA, S. et al.) May 16, 2013; figures 3-4; paragraphs [0025, 0027-0028].	17-18
Y	US 2009/0022457 A1 (DE JONG, M. et al.) January 22, 2009; figures 1, 5 and 7; paragraphs [0032 and 0040-0041].	19-20
A	US 2007/0098329 A1 (SHIMOJI, N. et al.) May 3, 2007; entire document.	1-20
A	US 2014/0133808 A1 (HILL, J. et al.) May 15, 2014; entire document.	1-20

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"G" document member of the same patent family

Date of the actual completion of the international search

29 August 2014 (29.08.2014)

Date of mailing of the international search report

09 OCT 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3291

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: Allison L. McCarthy
Pepper Hamilton LLP
Suite 5000
500 Grant Street
Pittsburgh, Pennsylvania 15219-2507
United States of America

Date of mailing
(day/month/year) **09 OCT 2014**

Applicant's or agent's file reference
133077-02402

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US14/41500

International filing date (day/month/year)

09 June 2014 (09.06.2014)

Priority date (day/month/year)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - G02B 6/36, 6/38, 6/40 (2014.01)

CPC - G02B 6/1228, 6/381, 6/3833

Applicant **SENKO ADVANCED COMPONENTS, INC.**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Date of completion of this opinion

29 August 2014 (29.08.2014)

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - ☐ on paper
 - ☐ in electronic form
 - b. (time)
 - ☐ in the international application as filed
 - ☐ together with the international application in electronic form
 - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US14/41500

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	6, 17-20	YES
	Claims	1-5, 7-16, 21-35	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-35	NO
Industrial applicability (IA)	Claims	1-35	YES
	Claims	NONE	NO

2. Citations and explanations:

Claims 1-5, 7-16, and 21-35 lack novelty under PCT Article 33(2) as being anticipated by US 6,682,228 B2 to Rathnam, L. et al. (hereinafter 'Rathnam').

As for claim 1, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: an adapter (connector 200 with connector housing 250 can be inserted into conventional adapter 150; figures 1C-2B and 5A; column 1, lines 13-18 and 48-59; column 3, lines 14-46); a ferrule having a connection side (ferrule 208 has an end which can be plugged into a transceiver (connection side); figures 1C, 2A-2B; 5A-5C; column 1, lines 48-59; column 3, lines 27-46; column 4, line 50-58; column 5, lines 38-55); and a reduced-profile clip fixedly arranged within the adapter (fingers 154 (reduced-profile clip) in adapter 150 flex outward when force is applied; (fixedly arranged within the adapter) figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55), the reduced-profile clip having hooks configured to engage a portion of the ferrule opposite the connection side to prevent movement of the ferrule within the adapter (fingers 154 (reduced-profile clip having hooks) in adapter 150 flex outward when force is applied to enter indentations 318 of body 202 while the ferrule 208 is slid outward from the indentation 318 (portion of the ferrule opposite the connection side) and can lock into place to prevent the connector 200 from disengaging from the receptacle 150 (prevent movement of the ferrule within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57; column 4, line 10; column 5, lines 38-55).

As for claim 2, Rathnam discloses the reduced-profile connection assembly of claim 1, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 3, Rathnam discloses the reduced-profile connection assembly of claim 1, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 4, Rathnam discloses the reduced-profile connection assembly of claim 1, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 5, Rathnam discloses the reduced-profile connection assembly of claim 1, further comprising a ferrule installation device configured to install the ferrule within the reduced-profile clip (ferrule 208 can be inserted by pushing it into body 202 (installation device) and can have the end pushed out of to protrude from body 202 and be inserted into adapter receptacle 150 (reduced-profile clip); figures 5A and 6A; column 5, lines 3-56).

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted.

Claims 23 and 35 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof.

Claim 21 is objected to for a typographic error "an adapter having at least on recess". For the purposes of this opinion "an adapter having at least on recess" is interpreted as "an adapter having at least one recess".

Claim 35 is objected to for a typographical error "the at least one spring" creating lack of antecedent basis issues. For the purposes of this opinion, "the at least one spring" is interpreted as "the at least one spacer" to restore antecedent basis and clarity.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US14/41566

Supplemental Box

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As for claim 7, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: a ferrule having a connection end (ferrule 208 has an end which can be plugged into a transceiver (connection side); figures 1C, 2A-2B; 5A-5C; column 1, lines 48-59; column 3, lines 27-46; column 4, line 50-58; column 5, lines 38-55); a connector comprising: an inner housing having the ferrule fixedly arranged therein at a first end (body 202 (inner housing) can have ferrule 208 inserted into it by pushing the ferrule 208 into the body and have the ferrule held by lips 320 (first end) to prevent the ferrule from falling out the body (fixedly arranged therein); figures 5A and 6A; column 3, line 57 – column 4, line 10; column 5, lines 3-56) and flanges extending from a second end opposite the first end (ridges 312 (flanges) are opposite the ferrule end 208 with lips 320 and extend outward; figures 5A and 6A; column 3, line 57 – column 4, line 10; column 5, lines 3-56), and an ejector housing disposed around the inner housing (sleeve 204 (ejector housing) is slipped on body 202 (inner housing); figures 4A-6B; column 4, lines 22-49; column 5, lines 3-56) and configured to slide along the inner housing between a locked position and an unlocked position (sleeve 204 (ejector housing) is slipped on body 202 (inner housing) and when pushed toward receptacle 150 can lock into place and when pushed away from the receptacle to unlock (slide between a locked position and an unlocked position); figures 4A-6C; column 4, lines 22-49; column 5, lines 3-63); and an adapter having a clip fixedly arranged therein (connector 200 with connector housing 250 can be inserted into conventional adapter 150 and has fingers 154 (clip fixedly arranged therein); figures 1C-2B and 5A; column 1, lines 13-18 and 48-59; column 3, lines 14-46; column 5, lines 38-55), the clip having hooks configured to engage protrusions extending from an outer surface of the inner housing to prevent movement of the inner housing within the adapter (fingers 154 (reduced-profile clip having hooks) in adapter 150 flex outward when force is applied to enter indentations 318 of body 202 while the ferrule 208 is slid outward from the indentation 318 (protrusions extending from an outer surface of the inner housing) and can lock into place to prevent the connector 200 from disengaging from the receptacle 150 (prevent movement of the ferrule within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 – column 4, line 10; column 5, lines 38-55), wherein the ejector housing interfaces with the clip in the locked position to prevent disengagement of the hooks from the protrusions (sleeve 204 (ejector housing) when pushed toward receptacle 150 so the tabs 414 of sleeve 204 clear the ridges on the body 202 and lock fingers 154 (hooks) into the indentation 318 (protrusions) to prevent connector 200 from disengaging from receptacle 150 under normal use (prevent disengagement of the hooks from the protrusions); figures 6A-6C; column 4, lines 22-49; column 5, lines 3-63).

As for claim 8, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 9, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 5, lines 33-39).

As for claim 10, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 5, lines 33-39).

As for claim 11, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the inner housing comprises at least one ferrule latch configured to engage the ferrule at an end opposite the connection end (body 202 (inner housing) has protrusions 310 (ferrule latch) about the ferrule 208 (engage the ferrule) opposite the connection end; figures 3A-3C and 5A; column 3, line 57 – column 4, line 21; column 4, lines 59-65), thereby preventing movement of the ferrule within the inner housing in a direction toward the flanges (the protrusions 310 about the ferrule on each side walls 304 and 306 of body 202 (inner housing) only after the ferrule is fully inserted and the side walls retract to have the protrusions engage the ferrule and prevent the ferrule 208 from falling out of the body 202 (prevent movement in a direction toward the flanges); figures 3A-3C, 5A and 6A; column 3, line 57 – column 4, line 21; column 4, lines 59- column 5, line 36).

As for claim 12, Rathnam discloses the reduced-profile connection assembly of claim 11, wherein the ejector housing is configured to push the at least one ferrule latch into engagement with the ferrule (sleeve 204 (ejector housing) is pushed onto body 202 over the ridges 312 which will cause pressure on the side walls 304 and 306 and the protrusions 310, thus causing the protrusions 310 to push into the ferrule 208 (push the at least one ferrule latch into engagement with the ferrule); figures 3A-3C and 6A; column 3, line 57 – column 4, line 21; column 4, lines 59-65; column 5, lines 37-56).

As for claim 13, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein each of the flanges comprise a recess and a projection (ridges 312 (flanges) are a pair of ridges (projection) with a spot between the ridges as well as beyond the ridge where the surface is flat compared to the ridge (recess); figures 6A and 6B; column 3, line 57 – column 4, line 10; column 5, lines 21-56), wherein a distal portion of the ejector housing is configured to be seated in the recess when in the locked position (the sleeve 204 (ejector housing) is pushed so that the tabs 414 (distal portion) clear both ridges on the body 202 (seated in the recess) when in the locked position; figures 6A and 6B; column 3, line 57 – column 4, line 10; column 5, lines 21-56).

As for claim 14, Rathnam discloses the reduced-profile connection assembly of claim 13, wherein a distal portion of the ejector housing is configured to be seated in the recess when in the unlocked position (the sleeve 204 (ejector housing) is pushed so that the tabs 414 are between both ridges 312 on the body 202 (seated in the recess) when in the unlocked position; figures 6A and 6B; column 3, line 57 – column 4, line 10; column 5, lines 21-56), thereby preventing movement of the ejector housing in a proximal direction along the inner housing (the tabs 414 of sleeve 204 (ejector housing) are surrounded by ridges 312 which hold the tabs in place and prevent the sleeve from moving in either direction on body 202 (inner housing); figures 6A and 6B; column 3, line 57 – column 4, line 10; column 5, lines 21-56).

Continued Within the Next Supplemental Box

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

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As for claim 15, Rathnam discloses the reduced-profile connection assembly of claim 13, wherein a proximal portion of the ejector housing is configured to engage the projection when in the locked position (per figures 4E and 4F tabs 414 are a pair of tabs on each end of the sleeve 204, so that either set of tabs could be used to engage the ridges 312 and the tabs 414 clear both ridges on the body 202 when in the locked position; figures 4E-4F, and 6B-6C; column 4, lines 33-43; column 5, lines 21-56), thereby preventing movement of the ejector housing in a distal direction along the inner housing (the tabs 414 of sleeve 204 (ejector housing) are surrounded by ridges 312 which hold the tabs in place and prevent the sleeve from moving in either direction on body 202 (inner housing); figures 6B-6C; column 4, lines 33-43; column 5, lines 21-56).

As for claim 16, Rathnam discloses the reduced-profile connection assembly of claim 7, wherein the connector comprises 2 parts (body 202 and sleeve 204; figures 6B-6C; column 5, lines 21-56).

As for claim 21, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: a ferrule (ferrule 208; figures 2A-2B; column 3, lines 27-46); a connector having the ferrule fixedly arranged therein (body 202 (connector) can have ferrule 208 inserted into it by pushing the ferrule 208 into the body 202 and have the ferrule held by lips 320 to prevent the ferrule from falling out the body (fixedly arranged therein); figures 5A and 6A; column 3, lines 27-46; column 3, line 57 - column 4, line 10; column 5, lines 3-56) and comprising at least one adapter latch having at least one adapter latch projection (adapter 150 has fingers 154 (adapter latch) flex outward when force is applied (at least one adapter latch projection); figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55); and an adapter having at least one recess (connector 200 with body 202 can be inserted into conventional adapter 150 and held there using indentations 318 (recesses); figures 1C, 5A and 6B-6C; column 1, lines 13-18 and 48-59; column 3, lines 14-46; column 5, lines 38-55), the at least one recess configured to engage the adapter latch projection when the connector is locked in the adapter to prevent movement of the connector within the adapter (body 202 has indentations 318 (recesses) which fingers 154 (adapter latch projection) flex to enter when locked to prevent the connector from disengaging from the adapter 150 (prevent movement of the connector within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 - column 4, line 10; column 5, lines 38-55).

As for claim 22, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 23, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 24, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 25, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the at least one adapter latch comprises two adapter latches arranged on opposite side portions of the connector (adapter 150 has fingers 154 (adapter latches) on the opposite sides of the body 202 of connector 200; figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55).

As for claim 26, Rathnam discloses the reduced-profile connection assembly of claim 25, wherein the at least one recess comprises two recesses arranged on opposite side walls of the adapter corresponding with the at least one adapter latch projection of the two adapter latches (body 202 has two indentations 318 (recesses) on the opposite sides walls of the body 202 of connector 200 which fingers 154 flex to enter when locked (corresponding with at least one adapter latch projection of the two adapter latches); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 - column 4, line 10; column 5, lines 38-55).

As for claim 27, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the connector comprises 1 part (body 202 may be molded as one part; figures 2A-2B; column 3, lines 27-56).

As for claim 28, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the connector has a length of about 10 millimeters to about 20 millimeters (the length of the bottom wall 302 of the connector is 14.45 mm; figure 3B; column 4, lines 11-21).

As for claim 29, Rathnam discloses the reduced-profile connection assembly of claim 21, wherein the connector has a length of about 13 millimeters (the length of the bottom wall 302 of the connector is 14.45 mm; figure 3B; column 4, lines 11-21).

As for claim 30, Rathnam discloses a reduced-profile connection assembly (a compact connector housing; figures 2A-2B; column 3, lines 14-46), comprising: a ferrule (ferrule 208; figures 2A-2B; column 3, lines 27-46); a connector having the ferrule fixedly arranged therein (connector 200 can have ferrule 208 inserted into it by pushing the ferrule 208 into the body 202 and have the ferrule held by lips 320 to prevent the ferrule from falling out the body (fixedly arranged therein); figures 5A and 6A; column 3, lines 27-46; column 3, line 57 - column 4, line 10; column 5, lines 3-56) and comprising at least one adapter latch having at least one adapter latch projection (adapter 150 has fingers 154 (adapter latch) flex outward when force is applied (at least one adapter latch projection); figures 1C and 5A; column 1, lines 48-59; column 5, lines 38-55); and an adapter having a clip fixedly arranged therein (connector 200 with connector housing 250 can be inserted into conventional adapter 150 and held there; figures 1C, 5A and 6B-6C; column 1, lines 13-18 and 48-59; column 3, lines 14-46; column 5, lines 38-55), the clip having a recess configured to engage the adapter latch projection when the connector is locked in the adapter to prevent movement of the connector within the adapter (body 202 (clip) has indentations 318 (recesses) which fingers 154 (adapter latch projection) flex to enter when locked to prevent the connector 200 from disengaging from the receptacle 150 (prevent movement of the connector within the adapter); figures 1C, 3A-3D and 5A-5D; column 1, lines 48-59; column 3, line 57 - column 4, line 10; column 5, lines 38-55).

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Continued from Previous Supplemental Box

As for claim 31, Rathnam discloses the reduced-profile connection assembly of claim 30, wherein the ferrule is a fiber optic ferrule (a compact connector housing for an optical fiber using a ferrule; figures 2A-2B; column 3, lines 14-46).

As for claim 32, Rathnam discloses the reduced-profile connection assembly of claim 30, wherein the ferrule is a mechanical transfer ferrule (ferrule 208 can be a conventional ferrule such as an MT ferrule; figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 33, Rathnam discloses the reduced-profile connection assembly of claim 30, wherein at least a portion of the adapter is configured as a multi-fiber push-on/pull-off adapter (ferrule 208 can be a conventional ferrule such as an MT ferrule configured to use MPO receptacles (multi-fiber push-on/pull off adapter); figures 2A-2B; column 3, lines 27-46; column 6, lines 33-39).

As for claim 34, Rathnam discloses the reduced-profile connection assembly of claim 30, further comprising at least one spring arranged within the connector (spring 206 engages the ferrule 208 within connector 200; figures 2A and 2B; column 3, lines 27-47), the at least one spring configured to engage an end of the ferrule opposite the connection end (the ferrule 208 is inserted by pushing it in along the y axis beyond the spring 206 (end of the ferrule opposite the connection end), and the spring 206 engages the ferrule 208; figures 2A-2B, 3A, and 5B; column 3, lines 27-47; column 4, line 59- column 5, line 21) to prevent movement of the ferrule within the connector in a direction away from the connection end (spring 206 engages the ferrule 208 within connector 200 so when the connector is plugged in a good optical interface is provided (prevent movement of the ferrule within the connector in a direction away from the connection end); figures 2A and 2B; column 3, lines 27-47).

As for claim 35, Rathnam discloses the reduced-profile connection assembly of claim 30, further comprising at least one spacer arranged within the connector (protrusions 310 (spacer) in body 202; figures 3A-3C and 5A; column 3, line 57 - column 4, line 21; column 4, lines 59-65), the at least one spacer configured to engage an end of the ferrule opposite the connection end (protrusions 310 (spacer) about the ferrule 208 (engage the ferrule) opposite the connection end; figures 3A-3C and 5A; column 3, line 57 - column 4, line 21; column 4, lines 59-65) to prevent movement of the ferrule within the connector in a direction away from the connection end (the protrusions 310 about the ferrule on each side walls 304 and 306 only after the ferrule 208 is fully inserted and the side walls retract to have the protrusions engage the ferrule and prevent the ferrule 208 from falling out of the body 202 (prevent movement in a direction away from the connection end); figures 3A-3C, 5A and 5A; column 3, line 57 - column 4, line 21; column 4, lines 59- column 5, line 36).

Claim 6 lacks an inventive step under PCT Article 33(3) as being obvious over Rathnam in view of US 8,651,749 B2 to Dainese, P. Jr. et al. (hereinafter 'Dainese').

As for claim 6, Rathnam discloses the reduced-profile connection assembly of claim 1, but Rathnam fails to disclose wherein the hooks extend about 2 millimeters outside of the adapter. However, Dainese discloses wherein the hooks extend about 2 millimeters outside of the adapter (plug ferrule 20 with plug guide arms 74 (hooks) can extend out a distance between 0.5 to 20 mm; figures 19-20; column 13, lines 17-29). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the hook extension of Dainese for the advantage of being able to adjust the distance necessary for the hooks to reach to use existing connectors, which is especially advantageous for Rathnam's use of an adapter which can require different size connections.

Claims 17 and 18 lack an inventive step under PCT Article 33(3) as being obvious over Rathnam in view of US 2013/0121653 A1 to Shitama, S. et al. (hereinafter 'Shitama').

As for claim 17, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector has a length of about 20 millimeters to about 30 millimeters. However, Shitama discloses wherein the connector has a length of about 20 millimeters to about 30 millimeters (metal plate 19 of splice protection 16 extends 26 mm along the entire length of an MPO/MT connector; figures 3-4; paragraphs [0025, 0027-0028]). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of Shitama for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

As for claim 18, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector has a length of about 26 millimeters. However, Shitama discloses wherein the connector has a length of about 26 millimeters (metal plate 19 of splice protection 16 extends 26 mm along the entire length of an MPO/MT connector; figures 3-4; paragraphs [0025, 0027-0028]). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of Shitama for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

Claims 19 and 20 lack an inventive step under PCT Article 33(3) as being obvious over Rathnam in view of US 2009/0022457 A1 to de Jong, M. et al. (hereinafter 'de Jong').

As for claim 19, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector extends outside of the adapter when in the locked position about 15 millimeters to about 30 millimeters. However, de Jong discloses wherein the connector extends outside of the adapter when in the locked position about 15 millimeters to about 30 millimeters (fiber optic connector 12 may have locked boots 16, 116 (extend out side of adapter when in the locked positions) with a length of about 10 to 100 mm or preferably 10 to 60 mm, or 10 to about 30 mm; figures 1, 5 and 7; paragraphs [0032 and 0040-0041]). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of de Jong for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

Continued Within the Next Supplemental Box

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/41500

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Continued from Previous Supplemental Box.

As for claim 20, Rathnam discloses the reduced-profile connection assembly of claim 7, but Rathnam fails to disclose wherein the connector extends outside of the adapter when in the locked position about 24 millimeters. However, de Jong discloses wherein the connector extends outside of the adapter when in the locked position about 24 millimeters (fiber optic connector 12 may have locked boots 16, 116 (extend out side of adapter when in the locked positions) with a length of about 10 to 100 mm or preferably 10 to 60 mm, or 10 to about 30 mm; figures 1, 5 and 7; paragraphs 0032 and 0040-0041). It would have been obvious to one having ordinary skill in the art at the time of invention to modify the connection assembly of Rathnam to have the connector of the length of de Jong for the advantage that Rathnam is an adapter and thus should be compatible with a variety of connector sizes.

Claims 1-35 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

ADVANCE E-MAIL

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
TRANSMITTAL OF COPY OF INTERNATIONAL
PRELIMINARY REPORT ON PATENTABILITY
(CHAPTER I OF THE PATENT COOPERATION
TREATY)
(PCT Rule 44bis.1(c))

To:

RECEIVED*By Donn R. Davis at 7:32 am, Sep 15, 2017*

MCCARTHY, Alison L.
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ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year)

14 September 2017 (14.09.2017)

Applicant's or agent's file reference

133077-3002

IMPORTANT NOTICE

International application No.

PCT/US2015/059458

International filing date (day/month/year)

06 November 2015 (06.11.2015)

Priority date (day/month/year)

03 March 2015 (03.03.2015)

Applicant

SENKO ADVANCED COMPONENTS, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

DOCKETED

by davisdr on 9/15/17

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

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Authorized officer

Mineko Mohri

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 133077-3002	FOR FURTHER ACTION	See item 4 below
International application No. PCT/US2015/059458	International filing date (<i>day/month/year</i>) 06 November 2015 (06.11.2015)	Priority date (<i>day/month/year</i>) 03 March 2015 (03.03.2015)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant SENKO ADVANCED COMPONENTS, INC.		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).																								
2.	This REPORT consists of a total of 10 sheets, including this cover sheet. In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	<p>This report contains indications relating to the following items:</p> <table style="width: 100%;"> <tr> <td style="width: 5%; text-align: center;">☒</td> <td style="width: 25%;">Box No. I</td> <td style="width: 70%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;">☒</td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;">☐</td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	☒	Box No. I	Basis of the report	☐	Box No. II	Priority	☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	☒	Box No. IV	Lack of unity of invention	☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	☐	Box No. VI	Certain documents cited	☐	Box No. VII	Certain defects in the international application	☐	Box No. VIII	Certain observations on the international application
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☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																							
☐	Box No. VI	Certain documents cited																							
☐	Box No. VII	Certain defects in the international application																							
☐	Box No. VIII	Certain observations on the international application																							
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).																								

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Date of issuance of this report 05 September 2017 (05.09.2017)</td> </tr> <tr> <td style="padding: 5px;">Authorized officer <div style="text-align: center; font-weight: bold; font-size: 1.2em;">Mineko Mohri</div></td> </tr> <tr> <td style="padding: 5px;">e-mail: pct.team8@wipo.int</td> </tr> </table>	Date of issuance of this report 05 September 2017 (05.09.2017)	Authorized officer <div style="text-align: center; font-weight: bold; font-size: 1.2em;">Mineko Mohri</div>	e-mail: pct.team8@wipo.int
Date of issuance of this report 05 September 2017 (05.09.2017)				
Authorized officer <div style="text-align: center; font-weight: bold; font-size: 1.2em;">Mineko Mohri</div>				
e-mail: pct.team8@wipo.int				

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: ALISON L. MCCARTHY
PEPPER HAMILTON LLP
125 HIGH STREET
19TH FLOOR, HIGH STREET TOWER
BOSTON, MA 02110

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

22 AUG 2016

Applicant's or agent's file reference
133077-3002

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US 15/59458

International filing date (day/month/year)

06 November 2015 (06.11.2015)

Priority date (day/month/year)

03 March 2015 (03.03.2015)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G02B 6/38, G02B 6/36, G02B 6/40, H01R 13/02 (2016.01)

CPC - G02B6/38, G02B6/36, G02B6/3825, G02B6/40, H01R13/02, G02B6/3885, G02B6/3831

Applicant **SENKO ADVANCES COMPONENTS, INC.**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300

Date of completion of this opinion

23 June 2016

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/59458

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/59458

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- ☐ paid additional fees.
- ☐ paid additional fees under protest and, where applicable, the protest fee.
- ☐ paid additional fees under protest but the applicable protest fee was not paid.
- ☒ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

☐ complied with.

☒ not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-15 directed to a multi-fiber optic connector with a removable key.

Group II: Claim 16 directed to a method of switching the polarity configuration between a multi-fiber optic connector and adapter using multiple movably displaceable keys.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

SPECIAL TECHNICAL FEATURES

The invention of Group II includes the special technical features of a method of switching the polarity configuration between a multi-fiber optic connector and adapter, wherein the connector comprises at least first and second movably displaceable keys along the housing between a first position and second position, and when the first key is in the first position, the second key is in the second position and providing a first polarity; wherein the method also includes slidingly displacing the first or second key from its first or second position to the alternate position to change the polarity, not required by the claims of Group I.

COMMON TECHNICAL FEATURES

The inventions of Groups I-II share the technical features of a multi-fiber fiber optic connector comprising: a ferrule having a plurality of optical fibers supported therein; a housing disposed around at least a portion of the ferrule, the housing comprising: a first end for being inserted into a fiber optic adapter, a second end disposed opposite the first end, and at least a first wall portion extending from the first end towards the second end and a second wall portion opposite the first wall portion and extending from the first end towards the second end, wherein each of the first wall portion and the second wall portion have an internal surface disposed towards the ferrule and an external surface disposed outwardly away from the ferrule, and the housing defining a longitudinal axis in a direction from the first end to the second end, a transverse axis orthogonal to the longitudinal axis, and a vertical centerline through the first and second wall portions; and a key configured to be removably attached to either: the first wall portion to define a first keyed configuration for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter, or the second wall portion to define a second keyed configuration for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter, wherein the second polarity is opposite to the first polarity, wherein the key comprises: a first end configured for engaging with the housing adjacent the first housing end to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion; and a second end disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing spaced longitudinally from the first end of the housing towards the second end of the housing to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion. Specifically, Groups I and II are related as an apparatus (Group I) and methods for using the apparatus (Group II). The apparatus is known in prior art as shown in US 2013/0322825 A1 to Cooke et al. (hereinafter 'Cooke'). Therefore, Groups I and II lack unity since the shared technical features do not represent a contribution over Cooke:

--- Continued in supplemental box ---

4. Consequently, this opinion has been established in respect of the following parts of the international application:

☐ all parts.

☒ the parts relating to claims Nos. 1-15

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/59458

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	2-12, 15	YES
	Claims	1, 13-14	NO
Inventive step (IS)	Claims	2-12	YES
	Claims	1, 13-15	NO
Industrial applicability (IA)	Claims	1-15	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1 and 13-14 lack novelty under PCT Article 33(2) as being anticipated by US 2013/0322825 A1 to Cooke et al. (hereinafter 'Cooke').

Regarding claim 1, Cooke discloses a multi-fiber fiber optic connector (20, Fig. 1A, 2; para[0025], 'a connector includes the structure (assembly) mounted upon the end of a multi-fiber fiber optic cable'; para[0028], 'an example connector 20') comprising:

a ferrule (30, Fig. 1A, 2; para[0029], 'a multi-fiber ferrule ("ferrule") 30') having a plurality of optical fibers supported therein (Fig. 1A, 2; para[0029] - see how the ferrule 30 is referred to as a multi-fiber ferrule 30);

a housing (46, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46') disposed around at least a portion of the ferrule (34, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46 positioned about ferrule 30 around the ferrule outside portion 34'), the housing comprising:

a first end (62, Fig. 1A - see front/first end 62; para[0032], 'inner housing 46 includes a front end 62') for being inserted into a fiber optic adapter (200, Fig. 7A, 9A - see adapter 200, and see how the first end 62 of the connector 20 is for being inserted into the adapter 200; para[0044], 'an adapter 200 configured to matingly engage MTP connector 20'),

a second end (64, Fig. 1A - see back/second end 64; para[0032], 'a back end 64') disposed opposite the first end (Fig. 1A - see how the first end 62 and the second back end 64 are opposite), and

at least a first wall portion (66T, Fig. 1A, 1C; para[0032], 'a top side 66T') extending from the first end towards the second end (Fig. 1A - see how the first/top wall portion 66T extends from the front/first end 62 to the second/back end 64) and a second wall portion (66B, Fig. 1B; para[0032], 'a bottom side 66B') opposite the first wall portion and extending from the first end towards the second end (Fig. 1A, 1B, 1C - see how the second wall portion 66B is opposite the first wall portion 66T and how it extends from the first end 62 to the second end 64), wherein each of the first wall portion and the second wall portion have an internal surface (Fig. 1A, 1B, 1C - see internal surface for first and second wall portions 66T and 66B) disposed towards the ferrule (Fig. 1C - see how the internal surfaces of the first and second wall portions 66T and 66B are disposed towards the ferrule 30) and an external surface (Fig. 1A, 1B, 1C - see external surface for first and second wall portions 66T and 66B) disposed outwardly away from the ferrule (Fig. 1C - see how the external surfaces of the first and second wall portions 66T and 66B are disposed outwardly away from the ferrule 30), and

the housing defining a longitudinal axis (A1, Fig. 1A; para[0032], 'the connector axis A1') in a direction from the first end to the second end (Fig. 1A - see how the longitudinal axis A1 is in the direction from the first end 62 to the second end 64), a transverse axis (Fig. 1A - see transverse axis that runs perpendicularly to the longitudinal axis through the connector 20) orthogonal to the longitudinal axis (Fig. 1A - see transverse axis that is orthogonal to the longitudinal axis A1), and a vertical centerline (Fig. 1C - see vertical centerline disposed directly in the center of ferrule 30) through the first and second wall portions (Fig. 1C - see vertical centerline that runs directly through the middle of ferrule 30 from the first wall portion 66T to the second wall portion 66B); and

a key (100, Fig. 2, 3A; para[0033], 'a polarity key 100') configured to be removably attached to either:

the first wall portion (66T, Fig. 4 - see how the key 100 is removably attachable to the first wall portion 66T in the top recess 70T; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T') to define a first keyed configuration (Fig. 4 - see first keyed configuration where key 100 is disposed in the top first wall portion 66T; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter (Fig. 9A - see how the connector 20 can only be inserted with the top side 66T facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), or

-*-Continued in Supplemental Box-*

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/59458

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

--- Continuation of Box No. IV Lack of unity of invention ---

Regarding claim 1, Cooke discloses a multi-fiber fiber optic connector (20, Fig. 1A, 2; para[0025], 'a connector includes the structure (assembly) mounted upon the end of a multi-fiber fiber optic cable'; para[0028], 'an example connector 20') comprising: a ferrule (30, Fig. 1A, 2; para[0029], 'a multi-fiber ferrule ("ferrule") 30') having a plurality of optical fibers supported therein (Fig. 1A, 2; para[0029] - see how the ferrule 30 is referred to as a multi-fiber ferrule 30'); a housing (46, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46') disposed around at least a portion of the ferrule (34, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46 positioned about ferrule 30 around the ferrule outside portion 34'), the housing comprising: a first end (62, Fig. 1A - see front/first end 62; para[0032], 'inner housing 46 includes a front end 62') for being inserted into a fiber optic adapter (200, Fig. 7A, 9A - see adapter 200, and see how the first end 62 of the connector 20 is for being inserted into the adapter 200; para[0044], 'an adapter 200 configured to matingly engage MTP connector 20'), a second end (64, Fig. 1A - see back/second end 64; para[0032], 'a back end 64') disposed opposite the first end (Fig. 1A - see how the first end 62 and the second back end 64 are opposite), and at least a first wall portion (66T, Fig. 1A, 1C; para[0032], 'a top side 66T') extending from the first end towards the second end (Fig. 1A - see how the first/top wall portion 66T extends from the front/first end 62 to the second/back end 64) and a second wall portion (66B, Fig. 1B; para[0032], 'a bottom side 66B') opposite the first wall portion and extending from the first end towards the second end (Fig. 1A, 1B, 1C - see how the second wall portion 66B is opposite the first wall portion 66T and how it extends from the first end 62 to the second end 64), wherein each of the first wall portion and the second wall portion have an internal surface (Fig. 1A, 1B, 1C - see internal surface for first and second wall portions 66T and 66B) disposed towards the ferrule (Fig. 1C - see how the internal surfaces of the first and second wall portions 66T and 66B are disposed towards the ferrule 30) and an external surface (Fig. 1A, 1B, 1C - see external surface for first and second wall portions 66T and 66B) disposed outwardly away from the ferrule (Fig. 1C - see how the external surfaces of the first and second wall portions 66T and 66B are disposed outwardly away from the ferrule 30), and the housing defining a longitudinal axis (A1, Fig. 1A; para[0032], 'the connector axis A1') in a direction from the first end to the second end (Fig. 1A - see how the longitudinal axis A1 is in the direction from the first end 62 to the second end 64), a transverse axis (Fig. 1A - see transverse axis that runs perpendicularly to the longitudinal axis through the connector 20) orthogonal to the longitudinal axis (Fig. 1A - see transverse axis that is orthogonal to the longitudinal axis A1), and a vertical centerline (Fig. 1C - see vertical centerline disposed directly in the center of ferrule 30) through the first and second wall portions (Fig. 1C - see vertical centerline that runs directly through the middle of ferrule 30 from the first wall portion 66T to the second wall portion 66B); and a key (100, Fig. 2, 3A; para[0033], 'a polarity key 100') configured to be removably attached to either: the first wall portion (66T, Fig. 4 - see how the key 100 is removably attachable to the first wall portion 66T in the top recess 70T; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T') to define a first keyed configuration (Fig. 4 - see first keyed configuration where key 100 is disposed in the top first wall portion 66T; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter (Fig. 9A - see how the connector 20 can only be inserted with the top side 66T facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), or the second wall portion (66B, Fig. 6 - see how the key 100 is removably attachable to the second wall portion 66B in the bottom recess 70B; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T or bottom recess 70B') to define a second keyed configuration (Fig. 6 - see second keyed configuration where key 100 is disposed in the bottom second wall portion 66B) for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter (Fig. 9B - see how the connector 20 can only be inserted with the bottom side 66B facing upward), wherein the second polarity is opposite to the first polarity (Fig. 4, 6, 9A, 9B - see how the first polarity orientation shown in Fig. 4 and 9A is opposite the second polarity orientation shown in Fig. 6 and 9B), wherein the key (100, Fig. 2, 3A) comprises: a first end (102, Fig. 3A - see first front end 102; para[0034], 'polarity key 100 has a front end 102, a back end 104') configured for engaging with the housing adjacent the first housing end (Fig. 1C, 2 - see how the first end 102 engages the housing 46 adjacent the first end 62 via the slot/recess 70T; para[0034], 'a polarity key 100 in the process of being inserted into top recess 70T') to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the movement is prevented in a lateral direction when the front end 102 of the key 100 is removably attached to the front end 62 of the housing 46 since the key 100 is partially disposed in the recess 70T, and see how the key 100 is then secured at the front end 102 via lip 72T, further limiting any movement); and a second end (104, Fig. 3A - see second back end 104; para[0034], 'polarity key 100 has a front end 102, a back end 104') disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing (Fig. 2, 3A - see how the second end 104 is disposed longitudinally away from the first end 62 and is removably attached to the housing 46 at a second location near the second end 64) spaced longitudinally from the first end of the housing towards the second end of the housing (Fig. 2 - see how the second end 104 is configured for engaging the housing 46 adjacent to the second housing end 64 longitudinally spaced from the first end 62 of housing 46) to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the second end 104 of the key 100 engages the housing 46 adjacent to the second end 64, and how it prevents movement in a direction longitudinally away from the housing 46 when removably attached to either the first or second wall portions 66T or 66B by using securing feature 124).

As the common technical features were known in the art at the time of the invention, these cannot be considered special technical feature that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US 15/59458

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-*-Box V.2 - Citations and Explanations--*-

the second wall portion (66B, Fig. 6 - see how the key 100 is removably attachable to the second wall portion 66B in the bottom recess 70B; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T or bottom recess 70B') to define a second keyed configuration (Fig. 6 - see second keyed configuration where key 100 is disposed in the bottom second wall portion 66B; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter (Fig. 9B - see how the connector 20 can only be inserted with the bottom side 66B facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), wherein the second polarity is opposite to the first polarity (Fig. 4, 6, 9A, 9B - see how the first polarity orientation shown in Fig. 4 and 9A is opposite the second polarity orientation shown in Fig. 6 and 9B),

wherein the key (100, Fig. 2, 3A) comprises:

a first end (102, Fig. 3A - see first front end 102; para[0034], 'polarity key 100 has a front end 102, a back end 104') configured for engaging with the housing adjacent the first housing end (Fig. 1C, 2 - see how the first end 102 engages the housing 46 adjacent the first end 62 via the slot/recess 70T; para[0034], 'a polarity key 100 in the process of being inserted into top recess 70T') to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the movement is prevented in a lateral direction when the front end 102 of the key 100 is removably attached to the front end 62 of the housing 46 since the key 100 is partially disposed in the recess 70T, and see how the key 100 is then secured at the front end 102 via lip 72T, further limiting any movement); and

a second end (104, Fig. 3A - see second back end 104; para[0034], 'polarity key 100 has a front end 102, a back end 104') disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing (Fig. 2, 3A - see how the second end 104 is disposed longitudinally away from the first end 62 and is removably attached to the housing 46 at a second location near the second end 64) spaced longitudinally from the first end of the housing towards the second end of the housing (Fig. 2 - see how the second end 104 is configured for engaging the housing 46 adjacent to the second housing end 64 longitudinally spaced from the first end 62 of housing 46) to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the second end 104 of the key 100 engages the housing 46 adjacent to the second end 64, and how it prevents movement in a direction longitudinally away from the housing 46 when removably attached to either the first or second wall portions 66T or 66B by using securing feature 124).

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US 15/59458

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-*-Supplemental Box - Box V.2 - Citations and Explanations--*

Regarding claim 13, Cooke discloses a housing (46, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46') for a fiber optic connector (20, Fig. 1A, 2; para[0025], 'a connector includes the structure (assembly) mounted upon the end of a multi-fiber fiber optic cable'; para[0028], 'an example connector 20'), the housing comprising:

a first end (62, Fig. 1A - see front/first end 62; para[0032], 'inner housing 46 includes a front end 62') for being inserted into a fiber optic adapter (200, Fig. 7A, 9A - see adapter 200, and see how the first end 62 of the connector 20 is for being inserted into the adapter 200; para[0044], 'an adapter 200 configured to matingly engage MTP connector 20'), and a second end (64, Fig. 1A - see back/second end 64; para[0032], 'a back end 64') disposed opposite the first end (Fig. 1A - see how the first end 62 and the second back end 64 are opposite), wherein the housing defines a longitudinal direction (A1, Fig. 1A; para[0032], 'the connector axis A1') from the first end to the second end (Fig. 1A - see how the longitudinal axis A1 is in the direction from the first end 62 to the second end 64), and a transverse direction (Fig. 1A - see transverse axis that runs perpendicularly to the longitudinal axis through the connector 20) orthogonal to the longitudinal direction (Fig. 1A - see transverse axis that is orthogonal to the longitudinal axis A1);

at least a first wall portion (66T, Fig. 1A, 1C; para[0032], 'a top side 66T') extending from the first end towards the second end (Fig. 1A - see how the first/top wall portion 66T extends from the front/first end 62 to the second/back end 64) and a second wall portion (66B, Fig. 1B; para[0032], 'a bottom side 66B') opposite the first wall portion and extending from the first end towards the second end (Fig. 1A, 1B, 1C - see how the second wall portion 66B is opposite the first wall portion 66T and how it extends from the first end 62 to the second end 64), wherein each of the first wall portion and the second wall portion have an external surface (Fig. 1A, 1B, 1C - see external surface for first and second wall portions 66T and 66B) disposed outwardly away from the ferrule (Fig. 1C - see how the external surfaces of the first and second wall portions 66T and 66B are disposed outwardly away from the ferrule 30); and

a key (100, Fig. 2, 3A; para[0033], 'a polarity key 100') configured to be removably attached to either:

the first wall portion (66T, Fig. 4 - see how the key 100 is removably attachable to the first wall portion 66T in the top recess 70T; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T') to define a first keyed configuration (Fig. 4 - see first keyed configuration where key 100 is disposed in the top first wall portion 66T; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a first orientation to define a first configuration with respect to the adapter (Fig. 9A - see how the connector 20 can only be inserted with the top side 66T facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), or

the second wall portion (66B, Fig. 6 - see how the key 100 is removably attachable to the second wall portion 66B in the bottom recess 70B; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T or bottom recess 70B') to define a second keyed configuration (Fig. 6 - see second keyed configuration where key 100 is disposed in the bottom second wall portion 66B; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a second orientation to define a second configuration with respect to the adapter (Fig. 9B - see how the connector 20 can only be inserted with the bottom side 66B facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'),

wherein the key comprises one of a snap-in fastener and a twist lock fastener (Fig. 2, 5A - see how the key 100 comprises a snap-in fastener feature 124; para[0041], 'so that polarity key 100 can be snap-inserted and snap-removed from either of the recesses') configured for engaging with either the first wall portion or the second wall portion (Fig. 2, 5A - see how the key 100 comprises a snap-in fastener feature 124 for engaging with latching features 74T and 74B on either the first wall portion 66T or the second wall portion 66B; para[0041], 'so that polarity key 100 can be snap-inserted and snap-removed from either of the recesses'); and

each of the first wall portion and the second wall portion comprises an opening (74T, 74B, Fig. 1A, 1B, 1C, 2 - see opening 74T and 74B on the first and second wall portions 66T and 66B) configured for receiving the snap-in fastener or the twist in fastener to releasably retain the key with either the first wall portion or the second wall portion (Fig. 4, 5A - see how the openings 74T/74B receive the snap-in features 124 and retain the key 100 within the first/second wall portions 66T/66B; para[0041] - see how the openings 74T/74B function with respect to the keys 100).

Regarding claim 14, Cooke discloses the housing of claim 13, and further teaches wherein:

the key has a planar base portion defining a top surface (Fig. 2 - see top planar base portion of key 100) for being disposed away from the first or second wall portion (Fig. 2 - see how the top planar base portion and top surface are disposed away from the first wall portion 66T) and a bottom surface for being disposed adjacent the first or second wall portion (Fig. 2 - see bottom surface of the key 100 that contacts/is disposed adjacent to the first wall portion 66T), and the key comprises a snap-in fastener (Fig. 2, 5A - see how the key 100 comprises a snap-in fastener feature 124/the block disposed adjacent to end 104; para[0041], 'so that polarity key 100 can be snap-inserted and snap-removed from either of the recesses') extending from the bottom surface transverse to the planar base portion (Fig. 3A, 5A - see how the snap-in feature extends from the bottom surface perpendicularly to the planar base portion), and

each of the first and second wall portions (66T, 66B, Fig. 1A, 1B, 1C) comprises an opening (74T, 74B, Fig. 1A, 1B, 1C, 2 - see opening 74T and 74B on the first and second wall portions 66T and 66B) configured for receiving the snap-in fastener and releasably retaining the snap-in fastener therein (Fig. 4, 5A - see how the openings 74T/74B receive the snap-in features 124 and retain the key 100 within the first/second wall portions 66T/66B; para[0041] - see how the openings 74T/74B function with respect to the keys 100).

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US 15/59458

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-*-Supplemental Box - Box V.2 - Citations and Explanations--*

Claim 15 lacks an inventive step under PCT Article 33(3) as being obvious over Cooke in view of US 5,521,997 A to Rovenolt et al. (hereinafter 'Rovenolt').

Regarding claim 15, Cooke discloses the housing of claim 13, and further teaches wherein:

the key has a planar base portion defining a top surface (Fig. 2 - see top planar base portion of key 100) for being disposed away from the first or second wall portion (Fig. 2 - see how the top planar base portion and top surface are disposed away from the first wall portion 66T) and a bottom surface for being disposed adjacent the first or second wall portion (Fig. 2 - see bottom surface of the key 100 that contacts/is disposed adjacent to the first wall portion 66T), and Cooke further teaches an opening (74T, 74B, Fig. 1A, 1B, 1C, 2 - see opening 74T and 74B on the first and second wall portions 66T and 66B) configured for receiving the snap-in fastener and releasably retaining the snap-in fastener therein (Fig. 4, 5A - see how the openings 74T/74B receive the snap-in features 124 and retain the key 100 within the first/second wall portions 66T/66B; para[0041] - see how the openings 74T/74B function with respect to the keys 100),

but Cooke does not specifically teach wherein the key comprises a twist-lock element extending from the bottom surface transverse to the planar base portion, and each of the first and second wall portions comprises an opening configured for receiving the twist-lock element and releasably retaining the twist-lock element therein.

However, Rovenolt discloses a connector (10, Fig. 1; col 3, ln 1-3, 'connector 10') housing having a key (40, Fig. 1; col 3, ln 1-3, 'a polarization key 40'), a first wall portion (80, Fig. 1, 3 - see first wall portion 80; col 3, ln 10-12, 'a top half 80') and a second wall portion (90, Fig. 1, 4 - see second wall portion 90; col 3, ln 10-12, 'a bottom half 90'); wherein the key comprises a twist-lock element (290, Fig. 1, 6; col 4, ln 62-65, 'the key 40 rotates to the A, B, or M polarizations, the locking tab 290 passes below the secondary boss members 210 preventing disassociation of the key 40 from the connector 10') extending from the bottom surface transverse to the planar base portion (Fig. 6 - see how the twist-lock element 290 extends from the bottom surface and is transverse to the planar base portion of key 40), and each of the first and second wall portions (80, 90, Fig. 1, 3, 4) comprises an opening (30, Fig. 1; col 3, ln 3-5, 'opening 30') configured for receiving the twist-lock element (Fig. 1 - see how the slot 30 is for receiving key 40) and releasably retaining the twist-lock element therein (Fig. 3, 4, 5 - see how the opening 30 is designed for receiving the twist-lock element 290 and for retaining the key 40; col 4, ln 62-65, 'the key 40 rotates to the A, B, or M polarizations, the locking tab 290 passes below the secondary boss members 210 preventing disassociation of the key 40 from the connector 10'). Accordingly, it would have been obvious to one of ordinary skill in the art to have modified the key and wall portions of Cooke's connector by employing the twist-lock key and wall portions, in order to have allowed for a more secured key element, capable of being quickly and easily attached and removed without the need for additional tools.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/59458

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-*-Supplemental Box - Box V.2 - Citations and Explanations.*-

Claims 2-12 meet the criteria as set forth by PCT Articles 33(2) and 33(3) as having novelty and an inventive step because the prior art fails to teach or fairly suggest the claimed subject matter.

The prior art is exemplified by (1) Cooke, (2) US 8,636,424 B2 to Kuffel et al. (hereinafter 'Kuffel'), and (3) Rovenolt.

Regarding claim 2, Cooke discloses the connector of claim 1, and further teaches wherein:

each of the first wall portion (66T, Fig. 1A, 1C) and the second wall portion (66B, Fig. 1B, 1C) comprise a longitudinal slot (70T, 70B, Fig. 1A, 1B, 1C; para[0032], 'top and bottom recesses 70T and 70B') extending from the first housing end towards the second housing end (Fig. 1A, 1B, 1C - see how the longitudinal slots 70T and 70B extend from the first end 62 to the second end 64 of housing 46) and disposed centrally on the wall portion at the vertical centerline (Fig. 1A, 1B, 1C - see how the slots 70T and 70B are disposed on the vertical centerlines), each slot having a depth extending from the external surface towards the internal surface along the vertical centerline (H, Fig. 1A, 1B, 1C - see how both slots 70T and 70B have a depth extending from the top external surface toward the internal surface/towards ferrule 30; para[0034], 'a height H'), and defining a width transverse to the depth (W, Fig. 1A, 1B, 1C - see width of slots 70T and 70B that are transverse to the depth; para[0034], 'a width W'); and

the key (100, Fig. 2, 3A) comprises a key body (Fig. 3 - see key body) extending from the first key end to the second key end (Fig. 3A - see how the key 100 has a body extending from the first end 102 to the second end 104);

but Cooke does not specifically teach wherein each slot has a first width at the external surface and a second width spaced from the external surface in the depth direction, wherein the second width is greater than the first width; and the key body comprising a longitudinal guide rail projecting away from the key body and extending from the first key end towards the second key end, the guide rail having a first width adjacent the key body and a second width away from the key body, wherein the first and second widths of the guide rail correspond to the first and second widths of the slots for longitudinal insertion and movement of the guide rail within the slots.

In similar art, Kuffel discloses a connector (300, Fig. 13, 16; col 7, in 43-46, 'a connector 300') comprising an inner housing (400, Fig. 14, 16; col 7, in 61-63, 'the inner housing assembly 400') and outer housing (500, Fig. 14, 16; col 7, in 47-51, 'the outer housing 500'); the outer housing comprising a slot (806, Fig. 16; col 7, in 61-63, 'two symmetric recessed features 806') extending from the front end to the back end (Fig. 16 - see how the slots 806 extend from the front end of the housing 400 to the back end), the slot having a depth extending from the top surface to the bottom surface (Fig. 16 - see how the depth extends from the top surface towards the bottom surface), and defining a width transverse to the depth (Fig. 16 - see how the slot 806 has two widths for the top and bottom portion, that are transverse to the depth), wherein each slot has a first width at the external surface (Fig. 16 - see first width of the slot 806 disposed at the top external surface) and a second width spaced from the external surface in the depth direction (Fig. 16 - see second wider width of retainers 818 of slot 806 that is spaced deeper in the depth direction), wherein the second width is greater than the first width (Fig. 16 - see how the second/deeper width is wider than the first surface width for the slot 806); and the inner housing comprising a key (802, Fig. 16; col 7, in 52-55, 'the polarity key 802'), wherein the key comprises a first width for the main body (Fig. 13, 16 - see how the key 802 comprises a first/top width for being received by the upper width portion of the slot 806), and a second width for being received within the slot's wider width section (Fig. 13, 16 - see how the second bottom width of the key 802, located where protrusions 816 are disposed, is for being received within the retainers 816 of the slot 806).

Further, Rovenolt discloses a connector (10, Fig. 1; col 3, in 1-3, 'connector 10') housing having a key (40, Fig. 1; col 3, in 1-3, 'a polarization key 40'), and a slot (30, Fig. 1; col 3, in 3-5, 'opening 30') for receiving the key (Fig. 1 - see how the slot 30 is for receiving key 40), wherein the slot extends vertically through the entire top housing portion (Fig. 1, 3, 4 - see how slot 30 extends through the entire top housing portion 80); and wherein the slot comprises a first width (Fig. 3 - see top/first width of the slot 30) located near the top surface (Fig. 3 - see first width of the top portion of the slot 30, located near the top surface of housing portion 80), and a wider second width (Fig. 4 - see bottom/second wider width) disposed on the internal surface of the top housing portion (Fig. 3, 4 - see how the bottom side of the slot 30 has a wider width than the top/first width).

However, the prior art does not disclose/teach individually nor fairly suggest in combination wherein each slot has a first width at the external surface and a second width spaced from the external surface in the depth direction, wherein the second width is greater than the first width; and the key body comprising a longitudinal guide rail projecting away from the key body and extending from the first key end towards the second key end, the guide rail having a first width adjacent the key body and a second width away from the key body, wherein the first and second widths of the guide rail correspond to the first and second widths of the slots for longitudinal insertion and movement of the guide rail within the slots.

Regarding claims 3-12, the prior art does not teach or fairly suggest the connector as claimed since they are dependent upon claim 2.

Claims 1-15 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

To: ALISON L. MCCARTHY
PEPPER HAMILTON LLP
125 HIGH STREET
19TH FLOOR, HIGH STREET TOWER
BOSTON, MA 02110

Date of mailing
(day/month/year)

22 AUG 2016

Applicant's or agent's file reference

133077-3002

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.

PCT/US 15/59458

International filing date
(day/month/year)

06 November 2015 (06.11.2015)

Applicant **SENKO ADVANCES COMPONENTS, INC.**

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 92 70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within 19 months from the priority date, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300

Authorized officer

Lee W. Young

PCT Helpdesk: 571-272-4300
Telephone No. PCT CSP: 571-273-7774

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 133077-3002	FOR FURTHER ACTION <div style="float: right; font-size: small;">see Form PCT/ISA/220 as well as, where applicable, item 5 below.</div>	
International application No. PCT/US 15/59456	International filing date (day/month/year) 06 November 2015 (06.11.2015)	(Earliest) Priority Date (day/month/year) 03 March 2015 (03.03.2015)
Applicant SENKO ADVANCES COMPONENTS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

I. Basis of the report

a. With regard to the language, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed,
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (see Box No. II).

3. ☒ Unity of invention is lacking (see Box No. III).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 1
☐ as suggested by the applicant.
☒ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/59458

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

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-15 directed to a multi-fiber optic connector with a removable key.

Group II: Claim 16 directed to a method of switching the polarity configuration between a multi-fiber optic connector and adapter using multiple movably displaceable keys.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

--- Continued in supplemental box ---

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos. 1-15.

Remark on Protest

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

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/59456

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/38, G02B 6/36, G02B 6/40, H01R 13/02 (2016.01)

CPC - G02B6/38, G02B6/36, G02B6/3825, G02B6/40, H01R13/02, G02B6/3885, G02B6/3831

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)

IPC (8) G02B 6/38, G02B 6/36, G02B 6/40, H01R 13/02 (2016.01)

CPC: G02B6/38, G02B6/36, G02B6/3825, G02B6/40, H01R13/02, G02B6/3885, G02B6/3831

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC (8) G02B 6/38, G02B 6/36, G02B 6/40, H01R 13/02, H01R 13/24 (2016.01) CPC: G02B6/38, G02B6/36, G02B6/3825, G02B6/3874, G02B6/40, H01R13/02, H01R13/24, G02B6/3889, G02B6/3885, G02B6/3831 (keyword limited; terms below)

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

PatBase; Google Patents; Google Scholar; Google Web;

Search terms used: Fiber optics multiple polarity key removable slidable connector cable first second polarity snap-in twist fastener key two connector adapter

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/0322825 A1 (Cooke et al.) 05 December 2013 (05.12.2013), entire document, especially Fig. 1A, 1B, 1C, 2, 3A, 4, 5A, 6, 7A, 8A, 9B; para[0025]; para[0028]; para[0029]; para[0032]; para[0044]; para[0033]; para[0034];	1, 13-14
Y		15
A		2-12
Y	US 5,621,997 A (Rovenolt et al.) 26 May 1996 (26.05.1996), entire document, especially Fig. 1, 3, 4, 6; col 3, ln 1-3; col 3, ln 3-5; col 4, ln 62-65; col 3, ln 10-12;	15
A		2-12
A	US 8,636,424 B2 (Kuffel et al.) 28 January 2014 (28.01.2014), entire document, especially Fig. 13, 14, 16; col 7, ln 43-46; col 7, ln 61-63; col 7, ln 47-51; col 7, ln 52-55;	2-12
A	US 4,979,792 A (Weber et al.) 25 December 1990 (25.12.1990), entire document	1-15
A	US 5,335,301 A (Newman et al.) 02 August 1994 (02.08.1994), entire document	1-15
A	US 5,289,554 A (Cubukciyan et al.) 22 February 1994 (22.02.1994), entire document	1-15
A	US 5,265,181 A (Chang) 23 November 1993 (23.11.1993), entire document	1-15

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

23 June 2016

Date of mailing of the international search report

22 AUG 2016

Name and mailing address of the ISA/US

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 PCT OSP: 571-272-7774

--- Continuation of Box No. III Observations where unity of invention is lacking ---

SPECIAL TECHNICAL FEATURES

The invention of Group II includes the special technical features of a method of switching the polarity configuration between a multi-fiber optic connector and adapter, wherein the connector comprises at least first and second movably displaceable keys along the housing between a first position and second position, and when the first key is in the first position, the second key is in the second position and providing a first polarity; wherein the method also includes slidably displacing the first or second key from its first or second position to the alternate position to change the polarity, not required by the claims of Group I.

COMMON TECHNICAL FEATURES

The inventions of Groups I-II share the technical features of a multi-fiber fiber optic connector comprising: a ferrule having a plurality of optical fibers supported therein; a housing disposed around at least a portion of the ferrule, the housing comprising: a first end for being inserted into a fiber optic adapter, a second end disposed opposite the first end, and at least a first wall portion extending from the first end towards the second end and a second wall portion opposite the first wall portion and extending from the first end towards the second end, wherein each of the first wall portion and the second wall portion have an internal surface disposed towards the ferrule and an external surface disposed outwardly away from the ferrule, and the housing defining a longitudinal axis in a direction from the first end to the second end, a transverse axis orthogonal to the longitudinal axis, and a vertical centerline through the first and second wall portions; and a key configured to be removably attached to either: the first wall portion to define a first keyed configuration for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter, or the second wall portion to define a second keyed configuration for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter, wherein the second polarity is opposite to the first polarity, wherein the key comprises: a first end configured for engaging with the housing adjacent the first housing end to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion; and a second end disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing spaced longitudinally from the first end of the housing towards the second end of the housing to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion. Specifically, Groups I and II are related as an apparatus (Group I) and methods for using the apparatus (Group II). The apparatus is known in prior art as shown in US 2013/0322825 A1 to Cooke et al. (hereinafter "Cooke"). Therefore, Groups I and II lack unity since the shared technical features do not represent a contribution over Cooke.

--- Continued in next supplemental box ---

--- Continuation supplemental box for Box No. III Observations where unity of invention is lacking ---

Regarding claim 1, Cooke discloses a multi-fiber fiber optic connector (20, Fig. 1A, 2; para[0029], 'a connector includes the structure (assembly) mounted upon the end of a multi-fiber fiber optic cable'; para[0028], 'an example connector 20') comprising: a ferrule (30, Fig. 1A, 2; para[0029]), 'a multi-fiber ferrule ("ferrule") 30' having a plurality of optical fibers supported therein (Fig. 1A, 2; para[0029] - see how the ferrule 30 is referred to as a multi-fiber ferrule 30'); a housing (46, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46') disposed around at least a portion of the ferrule (34, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46 positioned about ferrule 30 around the ferrule outside portion 34'), the housing comprising: a first end (62, Fig. 1A - see front/first end 62; para[0032], 'inner housing 46 includes a front end 62') for being inserted into a fiber optic adapter (200, Fig. 7A, 9A - see adapter 200, and see how the first end 62 of the connector 20 is for being inserted into the adapter 200; para[0044], 'an adapter 200 configured to matingly engage MTP connector 20'), a second end (64, Fig. 1A - see back/second end 64; para[0032], 'a back end 64') disposed opposite the first end (Fig. 1A - see how the first end 62 and the second back end 64 are opposite), and at least a first wall portion (66T, Fig. 1A, 1C; para[0032], 'a top side 66T') extending from the first end towards the second end (Fig. 1A - see how the first/top wall portion 66T extends from the front/first end 62 to the second/back end 64) and a second wall portion (66B, Fig. 1B; para[0032], 'a bottom side 66B') opposite the first wall portion and extending from the first end towards the second end (Fig. 1A, 1B, 1C - see how the second wall portion 66B is opposite the first wall portion 66T and how it extends from the first end 62 to the second end 64), wherein each of the first wall portion and the second wall portion have an internal surface (Fig. 1A, 1B, 1C - see internal surface for first and second wall portions 66T and 66B) disposed towards the ferrule (Fig. 1C - see how the internal surfaces of the first and second wall portions 66T and 66B are disposed towards the ferrule 30) and an external surface (Fig. 1A, 1B, 1C - see external surface for first and second wall portions 66T and 66B) disposed outwardly away from the ferrule (Fig. 1C - see how the external surfaces of the first and second wall portions 66T and 66B are disposed outwardly away from the ferrule 30), and the housing defining a longitudinal axis (A1, Fig. 1A; para[0032], 'the connector axis A1') in a direction from the first end to the second end (Fig. 1A - see how the longitudinal axis A1 is in the direction from the first end 62 to the second end 64); a transverse axis (Fig. 1A - see transverse axis that runs perpendicularly to the longitudinal axis through the connector 20) orthogonal to the longitudinal axis (Fig. 1A - see transverse axis that is orthogonal to the longitudinal axis A1), and a vertical centerline (Fig. 1C - see vertical centerline disposed directly in the center of ferrule 30) through the first and second wall portions (Fig. 1C - see vertical centerline that runs directly through the middle of ferrule 30 from the first wall portion 66T to the second wall portion 66B); and a key (100, Fig. 2, 3A; para[0033], 'a polarity key 100') configured to be removably attached to either: the first wall portion (66T, Fig. 4 - see how the key 100 is removably attachable to the first wall portion 66T in the top recess 70T; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T') to define a first keyed configuration (Fig. 4 - see first keyed configuration where key 100 is disposed in the top first wall portion 66T; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter (Fig. 9A - see how the connector 20 can only be inserted with the top side 66T facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), or the second wall portion (66B, Fig. 6 - see how the key 100 is removably attachable to the second wall portion 66B in the bottom recess 70B; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T or bottom recess 70B') to define a second keyed configuration (Fig. 6 - see second keyed configuration where key 100 is disposed in the bottom second wall portion 66B) for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter (Fig. 9B - see how the connector 20 can only be inserted with the bottom side 66B facing upward), wherein the second polarity is opposite to the first polarity (Fig. 4, 6, 9A, 9B - see how the first polarity orientation shown in Fig. 4 and 9A is opposite the second polarity orientation shown in Fig. 6 and 9B), wherein the key (100, Fig. 2, 3A) comprises: a first end (102, Fig. 3A - see first front end 102; para[0034], 'polarity key 100 has a front end 102, a back end 104') configured for engaging with the housing adjacent the first housing end (Fig. 1C, 2 - see how the first end 102 engages the housing 46 adjacent the first end 62 via the slot/recess 70T; para[0034], 'a polarity key 100 in the process of being inserted into top recess 70T') to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the movement is prevented in a lateral direction when the front end 102 of the key 100 is removably attached to the front end 62 of the housing 46 since the key 100 is partially disposed in the recess 70T, and see how the key 100 is then secured at the front end 102 via lip 72T, further limiting any movement); and a second end (104, Fig. 3A - see second back end 104; para[0034], 'polarity key 100 has a front end 102, a back end 104') disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing (Fig. 2, 3A - see how the second end 104 is disposed longitudinally away from the first end 62 and is removably attached to the housing 46 at a second location near the second end 64) spaced longitudinally from the first end of the housing towards the second end of the housing (Fig. 2 - see how the second end 104 is configured for engaging the housing 46 adjacent to the second housing end 64 longitudinally spaced from the first end 62 of housing 46) to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the second end 104 of the key 100 engages the housing 46 adjacent to the second end 64, and how it prevents movement in a direction longitudinally away from the housing 46 when removably attached to either the first or second wall portions 66T or 66B by using securing feature 124).

As the common technical features were known in the art at the time of the invention, these cannot be considered special technical feature that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: ALISON L. MCCARTHY
PEPPER HAMILTON LLP
125 HIGH STREET
19TH FLOOR, HIGH STREET TOWER
BOSTON, MA 02110

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

22 AUG 2016

Applicant's or agent's file reference
133077-3002

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US 15/59458

International filing date (day/month/year)

06 November 2015 (06.11.2015)

Priority date (day/month/year)

03 March 2015 (03.03.2015)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - G02B 6/38, G02B 6/36, G02B 6/40, H01R 13/02 (2016.01)

CPC - G02B6/38, G02B6/36, G02B6/3825, G02B6/40, H01R13/02, G02B6/3885, G02B6/3831

Applicant SENKO ADVANCES COMPONENTS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P. O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Date of completion of this opinion

23 June 2016

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 15/59458

Box No. 1 Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).
3. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 15/59458

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- ☐ paid additional fees.
 - ☐ paid additional fees under protest and, where applicable, the protest fee.
 - ☐ paid additional fees under protest but the applicable protest fee was not paid.
 - ☒ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

☐ complied with.

☒ not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-15 directed to a multi-fiber optic connector with a removable key.

Group II: Claim 16 directed to a method of switching the polarity configuration between a multi-fiber optic connector and adapter using multiple movably displaceable keys.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

SPECIAL TECHNICAL FEATURES

The invention of Group II includes the special technical features of a method of switching the polarity configuration between a multi-fiber optic connector and adapter, wherein the connector comprises at least first and second movably displaceable keys along the housing between a first position and second position, and when the first key is in the first position, the second key is in the second position and providing a first polarity; wherein the method also includes slidingly displacing the first or second key from its first or second position to the alternate position to change the polarity, not required by the claims of Group I.

COMMON TECHNICAL FEATURES

The inventions of Groups I-II share the technical features of a multi-fiber fiber optic connector comprising: a ferrule having a plurality of optical fibers supported therein; a housing disposed around at least a portion of the ferrule, the housing comprising: a first end for being inserted into a fiber optic adapter, a second end disposed opposite the first end, and at least a first wall portion extending from the first end towards the second end and a second wall portion opposite the first wall portion and extending from the first end towards the second end, wherein each of the first wall portion and the second wall portion have an internal surface disposed towards the ferrule and an external surface disposed outwardly away from the ferrule, and the housing defining a longitudinal axis in a direction from the first end to the second end, a transverse axis orthogonal to the longitudinal axis, and a vertical centerline through the first and second wall portions; and a key configured to be removably attached to either: the first wall portion to define a first keyed configuration for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter, or the second wall portion to define a second keyed configuration for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter, wherein the second polarity is opposite to the first polarity, wherein the key comprises: a first end configured for engaging with the housing adjacent the first housing end to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion; and a second end disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing spaced longitudinally from the first end of the housing towards the second end of the housing to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion. Specifically, Groups I and II are related as an apparatus (Group I) and methods for using the apparatus (Group II). The apparatus is known in prior art as shown in US 2013/0322825 A1 to Cooke et al. (hereinafter 'Cooke'). Therefore, Groups I and II lack unity since the shared technical features do not represent a contribution over Cooke.

--- Continued in supplemental box ---

4. Consequently, this opinion has been established in respect of the following parts of the international application:

☐ all parts.

☒ the parts relating to claims Nos. 1-15

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US 15/59458

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement			
1. Statement				
Novelty (N)	Claims	2-12, 15		YES
	Claims	1, 13-14		NO
Inventive step (IS)	Claims	2-12		YES
	Claims	1, 13-15		NO
Industrial applicability (IA)	Claims	1-15		YES
	Claims	None		NO
2. Citations and explanations:				
<p>Claims 1 and 13-14 lack novelty under PCT Article 33(2) as being anticipated by US 2013/0322825 A1 to Cooke et al. (hereinafter 'Cooke').</p> <p>Regarding claim 1, Cooke discloses a multi-fiber fiber optic connector (20, Fig. 1A, 2; para[0025], 'a connector includes the structure (assembly) mounted upon the end of a multi-fiber fiber optic cable'; para[0028], 'an example connector 20') comprising:</p> <p style="padding-left: 20px;">a ferrule (30, Fig. 1A, 2; para[0029], 'a multi-fiber ferrule ("ferrule") 30') having a plurality of optical fibers supported therein (Fig. 1A, 2; para[0029] - see how the ferrule 30 is referred to as a multi-fiber ferrule 30);</p> <p style="padding-left: 20px;">a housing (46, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46') disposed around at least a portion of the ferrule (34, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46 positioned about ferrule 30 around the ferrule outside portion 34'), the housing comprising:</p> <p style="padding-left: 20px;">a first end (62, Fig. 1A - see front/first end 62; para[0032], 'inner housing 46 includes a front end 62') for being inserted into a fiber optic adapter (200, Fig. 7A, 9A - see adapter 200, and see how the first end 62 of the connector 20 is for being inserted into the adapter 200; para[0044], 'an adapter 200 configured to matingly engage MTP connector 20'),</p> <p style="padding-left: 20px;">a second end (64, Fig. 1A - see back/second end 64; para[0032], 'a back end 64') disposed opposite the first end (Fig. 1A - see how the first end 62 and the second back end 64 are opposite), and</p> <p style="padding-left: 20px;">at least a first wall portion (66T, Fig. 1A, 1C; para[0032], 'a top side 66T') extending from the first end towards the second end (Fig. 1A - see how the first/top wall portion 66T extends from the front/first end 62 to the second/back end 64) and a second wall portion (66B, Fig. 1B; para[0032], 'a bottom side 66B') opposite the first wall portion and extending from the first end towards the second end (Fig. 1A, 1B, 1C - see how the second wall portion 66B is opposite the first wall portion 66T and how it extends from the first end 62 to the second end 64), wherein each of the first wall portion and the second wall portion have an internal surface (Fig. 1A, 1B, 1C - see internal surface for first and second wall portions 66T and 66B) disposed towards the ferrule (Fig. 1C - see how the internal surfaces of the first and second wall portions 66T and 66B are disposed towards the ferrule 30) and an external surface (Fig. 1A, 1B, 1C - see external surface for first and second wall portions 66T and 66B) disposed outwardly away from the ferrule (Fig. 1C - see how the external surfaces of the first and second wall portions 66T and 66B are disposed outwardly away from the ferrule 30), and</p> <p style="padding-left: 20px;">the housing defining a longitudinal axis (A1, Fig. 1A; para[0032], 'the connector axis A1') in a direction from the first end to the second end (Fig. 1A - see how the longitudinal axis A1 is in the direction from the first end 62 to the second end 64), a transverse axis (Fig. 1A - see transverse axis that runs perpendicularly to the longitudinal axis through the connector 20) orthogonal to the longitudinal axis (Fig. 1A - see transverse axis that is orthogonal to the longitudinal axis A1), and a vertical centerline (Fig. 1C - see vertical centerline disposed directly in the center of ferrule 30) through the first and second wall portions (Fig. 1C - see vertical centerline that runs directly through the middle of ferrule 30 from the first wall portion 66T to the second wall portion 66B); and</p> <p style="padding-left: 20px;">a key (100, Fig. 2, 3A; para[0033], 'a polarity key 100') configured to be removably attached to either:</p> <p style="padding-left: 20px;">the first wall portion (66T, Fig. 4 - see how the key 100 is removably attachable to the first wall portion 66T in the top recess 70T; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T') to define a first keyed configuration (Fig. 4 - see first keyed configuration where key 100 is disposed in the top first wall portion 66T; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter (Fig. 9A - see how the connector 20 can only be inserted with the top side 66T facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), or</p>				
<p>*-Continued in Supplemental Box.*-</p>				

Supplemental Box

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--- Continuation of Box No. IV Lack of unity of invention ---

Regarding claim 1, Cooke discloses a multi-fiber fiber optic connector (20, Fig. 1A, 2; para[0025], 'a connector includes the structure (assembly) mounted upon the end of a multi-fiber fiber optic cable'; para[0026], 'an example connector 20' comprising: a ferrule (30, Fig. 1A, 2; para[0029], 'a multi-fiber ferrule ("ferrule") 30') having a plurality of optical fibers supported therein (Fig. 1A, 2; para[0029] - see how the ferrule 30 is referred to as a multi-fiber ferrule 30'); a housing (46, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46') disposed around at least a portion of the ferrule (34, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46 positioned about ferrule 30 around the ferrule outside portion 34'), the housing comprising: a first end (62, Fig. 1A - see front/first end 62; para[0032], 'inner housing 46 includes a front end 62') for being inserted into a fiber optic adapter (200, Fig. 7A, 9A - see adapter 200, and see how the first end 62 of the connector 20 is for being inserted into the adapter 200; para[0044], 'an adapter 200 configured to matingly engage MTP connector 20'), a second end (64, Fig. 1A - see back/second end 64; para[0032], 'a back end 64') disposed opposite the first end (Fig. 1A - see how the first end 62 and the second back end 64 are opposite), and at least a first wall portion (66T, Fig. 1A, 1C; para[0032], 'a top side 66T') extending from the first end towards the second end (Fig. 1A - see how the first/top wall portion 66T extends from the front/first end 62 to the second/back end 64) and a second wall portion (66B, Fig. 1B; para[0032], 'a bottom side 66B') opposite the first wall portion and extending from the first end towards the second end (Fig. 1A, 1B, 1C - see how the second wall portion 66B is opposite the first wall portion 66T and how it extends from the first end 62 to the second end 64), wherein each of the first wall portion and the second wall portion have an internal surface (Fig. 1A, 1B, 1C - see internal surface for first and second wall portions 66T and 66B) disposed towards the ferrule (Fig. 1C - see how the internal surfaces of the first and second wall portions 66T and 66B are disposed towards the ferrule 30) and an external surface (Fig. 1A, 1B, 1C - see external surface for first and second wall portions 66T and 66B) disposed outwardly away from the ferrule (Fig. 1C - see how the external surfaces of the first and second wall portions 66T and 66B are disposed outwardly away from the ferrule 30), and the housing defining a longitudinal axis (A1, Fig. 1A; para[0032], 'the connector axis A1') in a direction from the first end to the second end (Fig. 1A - see how the longitudinal axis A1 is in the direction from the first end 62 to the second end 64), a transverse axis (Fig. 1A - see transverse axis that runs perpendicularly to the longitudinal axis through the connector 20) orthogonal to the longitudinal axis (Fig. 1A - see transverse axis that is orthogonal to the longitudinal axis A1), and a vertical centerline (Fig. 1C - see vertical centerline disposed directly in the center of ferrule 30) through the first and second wall portions (Fig. 1C - see vertical centerline that runs directly through the middle of ferrule 30 from the first wall portion 66T to the second wall portion 66B); and a key (100, Fig. 2, 3A; para[0033], 'a polarity key 100') configured to be removably attached to either: the first wall portion (66T, Fig. 4 - see how the key 100 is removably attachable to the first wall portion 66T in the top recess 70T; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T') to define a first keyed configuration (Fig. 4 - see first keyed configuration where key 100 is disposed in the top first wall portion 66T; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a first orientation to define a first polarity with respect to the adapter (Fig. 9A - see how the connector 20 can only be inserted with the top side 66T facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), or the second wall portion (66B, Fig. 6 - see how the key 100 is removably attachable to the second wall portion 66B in the bottom recess 70B; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T or bottom recess 70B') to define a second keyed configuration (Fig. 6 - see second keyed configuration where key 100 is disposed in the bottom second wall portion 66B) for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter (Fig. 9B - see how the connector 20 can only be inserted with the bottom side 66B facing upward), wherein the second polarity is opposite to the first polarity (Fig. 4, 6, 9A, 9B - see how the first polarity orientation shown in Fig. 4 and 9A is opposite the second polarity orientation shown in Fig. 6 and 9B), wherein the key (100, Fig. 2, 3A) comprises: a first end (102, Fig. 3A - see first front end 102; para[0034], 'polarity key 100 has a front end 102, a back end 104') configured for engaging with the housing adjacent the first housing end (Fig. 1C, 2 - see how the first end 102 engages the housing 46 adjacent the first end 62 via the slot/recess 70T; para[0034], 'a polarity key 100 in the process of being inserted into top recess 70T') to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the movement is prevented in a lateral direction when the front end 102 of the key 100 is removably attached to the front end 62 of the housing 46 since the key 100 is partially disposed in the recess 70T, and see how the key 100 is then secured at the front end 102 via lip 72T, further limiting any movement); and a second end (104, Fig. 3A - see second back end 104; para[0034], 'polarity key 100 has a front end 102, a back end 104') disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing (Fig. 2, 3A - see how the second end 104 is disposed longitudinally away from the first end 62 and is removably attached to the housing 46 at a second location near the second end 64) spaced longitudinally from the first end of the housing towards the second end of the housing (Fig. 2 - see how the second end 104 is configured for engaging the housing 46 adjacent to the second housing end 64 longitudinally spaced from the first end 62 of housing 46) to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the second end 104 of the key 100 engages the housing 46 adjacent to the second end 64, and how it prevents movement in a direction longitudinally away from the housing 46 when removably attached to either the first or second wall portions 66T or 66B by using securing feature 124).

As the common technical features were known in the art at the time of the invention, these cannot be considered special technical feature that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.

Supplemental Box

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-*-Box V.2 - Citations and Explanations-*-

the second wall portion (66B, Fig. 6 - see how the key 100 is removably attachable to the second wall portion 66B in the bottom recess 70B; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T or bottom recess 70B') to define a second keyed configuration (Fig. 6 - see second keyed configuration where key 100 is disposed in the bottom second wall portion 66B; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a second orientation to define a second polarity with respect to the adapter (Fig. 9B - see how the connector 20 can only be inserted with the bottom side 66B facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), wherein the second polarity is opposite to the first polarity (Fig. 4, 6, 9A, 9B - see how the first polarity orientation shown in Fig. 4 and 9A is opposite the second polarity orientation shown in Fig. 6 and 9B),

wherein the key (100, Fig. 2, 3A) comprises:

a first end (102, Fig. 3A - see first front end 102; para[0034], 'polarity key 100 has a front end 102, a back end 104') configured for engaging with the housing adjacent the first housing end (Fig. 1C, 2 - see how the first end 102 engages the housing 46 adjacent the first end 62 via the slot/recess 70T; para[0034], 'a polarity key 100 in the process of being inserted into top recess 70T') to prevent movement of the first key end with respect to the housing in at least a direction laterally away from the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the movement is prevented in a lateral direction when the front end 102 of the key 100 is removably attached to the front end 62 of the housing 46 since the key 100 is partially disposed in the recess 70T, and see how the key 100 is then secured at the front end 102 via lip 72T, further limiting any movement); and

a second end (104, Fig. 3A - see second back end 104; para[0034], 'polarity key 100 has a front end 102, a back end 104') disposed longitudinally away from the first end and configured for being removably attached to the housing at a second location of the housing (Fig. 2, 3A - see how the second end 104 is disposed longitudinally away from the first end 62 and is removably attached to the housing 46 at a second location near the second end 64) spaced longitudinally from the first end of the housing towards the second end of the housing (Fig. 2 - see how the second end 104 is configured for engaging the housing 46 adjacent to the second housing end 64 longitudinally spaced from the first end 62 of housing 46) to prevent movement of the key with respect to the housing in at least a longitudinal direction along the housing when removably attached to either the first wall portion or the second wall portion (Fig. 2, 4, 5A - see how the second end 104 of the key 100 engages the housing 46 adjacent to the second end 64, and how it prevents movement in a direction longitudinally away from the housing 46 when removably attached to either the first or second wall portions 66T or 66B by using securing feature 124).

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-Supplemental Box - Box V.2 - Citations and Explanations-^

Regarding claim 13, Cooke discloses a housing (46, Fig. 1A, 1C, 2; para[0029], 'an inner housing 46') for a fiber optic connector (20, Fig. 1A, 2; para[0025], 'a connector includes the structure (assembly) mounted upon the end of a multi-fiber fiber optic cable'; para[0026], 'an example connector 20'), the housing comprising:

a first end (62, Fig. 1A - see front/first end 62; para[0032], 'inner housing 46 includes a front end 62') for being inserted into a fiber optic adapter (200, Fig. 7A, 9A - see adapter 200, and see how the first end 62 of the connector 20 is for being inserted into the adapter 200; para[0044], 'an adapter 200 configured to matingly engage MTP connector 20'), and a second end (64, Fig. 1A - see back/second end 64; para[0032], 'a back end 64') disposed opposite the first end (Fig. 1A - see how the first end 62 and the second back end 64 are opposite), wherein the housing defines a longitudinal direction (A1, Fig. 1A; para[0032], 'the connector axis A1') from the first end to the second end (Fig. 1A - see how the longitudinal axis A1 is in the direction from the first end 62 to the second end 64), and a transverse direction (Fig. 1A - see transverse axis that runs perpendicularly to the longitudinal axis through the connector 20) orthogonal to the longitudinal direction (Fig. 1A - see transverse axis that is orthogonal to the longitudinal axis A1);

at least a first wall portion (66T, Fig. 1A, 1C; para[0032], 'a top side 66T') extending from the first end towards the second end (Fig. 1A - see how the first/top wall portion 66T extends from the front/first end 62 to the second/back end 64) and a second wall portion (66B, Fig. 1B; para[0032], 'a bottom side 66B') opposite the first wall portion and extending from the first end towards the second end (Fig. 1A, 1B, 1C - see how the second wall portion 66B is opposite the first wall portion 66T and how it extends from the first end 62 to the second end 64), wherein each of the first wall portion and the second wall portion have an external surface (Fig. 1A, 1B, 1C - see external surface for first and second wall portions 66T and 66B) disposed outwardly away from the ferrule (Fig. 1C - see how the external surfaces of the first and second wall portions 66T and 66B are disposed outwardly away from the ferrule 30); and

a key (100, Fig. 2, 3A; para[0033], 'a polarity key 100') configured to be removably attached to either:

the first wall portion (66T, Fig. 4 - see how the key 100 is removably attachable to the first wall portion 66T in the top recess 70T; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T') to define a first keyed configuration (Fig. 4 - see first keyed configuration where key 100 is disposed in the top first wall portion 66T; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a first orientation to define a first configuration with respect to the adapter (Fig. 9A - see how the connector 20 can only be inserted with the top side 66T facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'), or

the second wall portion (66B, Fig. 6 - see how the key 100 is removably attachable to the second wall portion 66B in the bottom recess 70B; para[0035], 'polarity key 100 is configured to be removably secured within top recess 70T or bottom recess 70B') to define a second keyed configuration (Fig. 6 - see second keyed configuration where key 100 is disposed in the bottom second wall portion 66B; para[0042], 'with reference to FIGS. 4 and 6, MTP connector 20 includes first and second polarity keying configurations, depending in which recess polarity key 100 resides') for insertion of the first end into the adapter in only a second orientation to define a second configuration with respect to the adapter (Fig. 9B - see how the connector 20 can only be inserted with the bottom side 66B facing upward; para[0045], 'because MTP connector 20 has a switchable polarity key 100, a field technician can manage the polarity of the connection between the MTP connector and adapter 200'),

wherein the key comprises one of a snap-in fastener and a twist lock fastener (Fig. 2, 5A - see how the key 100 comprises a snap-in fastener feature 124; para[0041], 'so that polarity key 100 can be snap-inserted and snap-removed from either of the recesses') configured for engaging with either the first wall portion or the second wall portion (Fig. 2, 5A - see how the key 100 comprises a snap-in fastener feature 124 for engaging with latching features 74T and 74B on either the first wall portion 66T or the second wall portion 66B; para[0041], 'so that polarity key 100 can be snap-inserted and snap-removed from either of the recesses'); and

each of the first wall portion and the second wall portion comprises an opening (74T, 74B, Fig. 1A, 1B, 1C, 2 - see opening 74T and 74B on the first and second wall portions 66T and 66B) configured for receiving the snap-in fastener or the twist in fastener to releasably retain the key with either the first wall portion or the second wall portion (Fig. 4, 5A - see how the openings 74T/74B receive the snap-in features 124 and retain the key 100 within the first/second wall portions 66T/66B; para[0041] - see how the openings 74T/74B function with respect to the keys 100).

Regarding claim 14, Cooke discloses the housing of claim 13, and further teaches wherein:

the key has a planar base portion defining a top surface (Fig. 2 - see top planar base portion of key 100) for being disposed away from the first or second wall portion (Fig. 2 - see how the top planar base portion and top surface are disposed away from the first wall portion 66T) and a bottom surface for being disposed adjacent the first or second wall portion (Fig. 2 - see bottom surface of the key 100 that contacts/is disposed adjacent to the first wall portion 66T), and the key comprises a snap-in fastener (Fig. 2, 5A - see how the key 100 comprises a snap-in fastener feature 124/the block disposed adjacent to end 104; para[0041], 'so that polarity key 100 can be snap-inserted and snap-removed from either of the recesses') extending from the bottom surface transverse to the planar base portion (Fig. 3A, 5A - see how the snap-in feature extends from the bottom surface perpendicularly to the planar base portion), and

each of the first and second wall portions (66T, 66B, Fig. 1A, 1B, 1C) comprises an opening (74T, 74B, Fig. 1A, 1B, 1C, 2 - see opening 74T and 74B on the first and second wall portions 66T and 66B) configured for receiving the snap in fastener and releasably retaining the snap-in fastener therein (Fig. 4, 5A - see how the openings 74T/74B receive the snap-in features 124 and retain the key 100 within the first/second wall portions 66T/66B; para[0041] - see how the openings 74T/74B function with respect to the keys 100).

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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 15/59456

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Claim 15 lacks an inventive step under PCT Article 33(3) as being obvious over Cooke in view of US 5,521,997 A to Rovenolt et al. (hereinafter 'Rovenolt').

Regarding claim 15, Cooke discloses the housing of claim 13, and further teaches wherein:

the key has a planar base portion defining a top surface (Fig. 2 - see top planar base portion of key 100) for being disposed away from the first or second wall portion (Fig. 2 - see how the top planar base portion and top surface are disposed away from the first wall portion 66T) and a bottom surface for being disposed adjacent the first or second wall portion (Fig. 2 - see bottom surface of the key 100 that contacts/is disposed adjacent to the first wall portion 66T), and Cooke further teaches an opening (74T, 74B; Fig. 1A, 1B, 1C, 2 - see opening 74T and 74B on the first and second wall portions 66T and 66B) configured for receiving the snap-in fastener and releasably retaining the snap-in fastener therein (Fig. 4, 5A - see how the openings 74T/74B receive the snap-in features 124 and retain the key 100 within the first/second wall portions 66T/66B; para[0041] - see how the openings 74T/74B function with respect to the keys 100),

but Cooke does not specifically teach wherein the key comprises a twist-lock element extending from the bottom surface transverse to the planar base portion, and each of the first and second wall portions comprises an opening configured for receiving the twist-lock element and releasably retaining the twist-lock element therein.

However, Rovenolt discloses a connector (10, Fig. 1; col 3, ln 1-3, 'connector 10') housing having a key (40, Fig. 1; col 3, ln 1-3, 'a polarization key 40'), a first wall portion (80, Fig. 1, 3 - see first wall portion 80; col 3, ln 10-12, 'a top half 80') and a second wall portion (90, Fig. 1, 4 - see second wall portion 90; col 3, ln 10-12, 'a bottom half 90'); wherein the key comprises a twist-lock element (290, Fig. 1, 6; col 4, ln 62-65, 'the key 40 rotates to the A, B, or M polarizations, the locking tab 290 passes below the secondary boss members 210 preventing disassociation of the key 40 from the connector 10') extending from the bottom surface transverse to the planar base portion (Fig. 6 - see how the twist-lock element 290 extends from the bottom surface and is transverse to the planar base portion of key 40), and each of the first and second wall portions (80, 90, Fig. 1, 3, 4) comprises an opening (30, Fig. 1; col 3, ln 3-5, 'opening 30') configured for receiving the twist-lock element (Fig. 1 - see how the slot 30 is for receiving key 40) and releasably retaining the twist-lock element therein (Fig. 3, 4, 5 - see how the opening 30 is designed for receiving the twist-lock element 290 and for retaining the key 40; col 4, ln 62-65, 'the key 40 rotates to the A, B, or M polarizations, the locking tab 290 passes below the secondary boss members 210 preventing disassociation of the key 40 from the connector 10'). Accordingly, it would have been obvious to one of ordinary skill in the art to have modified the key and wall portions of Cooke's connector by employing the twist-lock key and wall portions, in order to have allowed for a more secured key element, capable of being quickly and easily attached and removed without the need for additional tools.

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- "Supplemental Box - Box V.2 - Citations and Explanations" -

Claims 2-12 meet the criteria as set forth by PCT Articles 33(2) and 33(3) as having novelty and an inventive step because the prior art fails to teach or fairly suggest the claimed subject matter.

The prior art is exemplified by (1) Cooke, (2) US 8,636,424 B2 to Kuffel et al. (hereinafter "Kuffel"), and (3) Rovenolt.

Regarding claim 2, Cooke discloses the connector of claim 1, and further teaches wherein:

each of the first wall portion (56T, Fig. 1A, 1C) and the second wall portion (56B, Fig. 1B, 1C) comprise a longitudinal slot (70T, 70B, Fig. 1A, 1B, 1C; para[0032], "top and bottom recesses 70T and 70B") extending from the first housing end towards the second housing end (Fig. 1A, 1B, 1C - see how the longitudinal slots 70T and 70B extend from the first end 62 to the second end 64 of housing 46) and disposed centrally on the wall portion at the vertical centerline (Fig. 1A, 1B, 1C - see how the slots 70T and 70B are disposed on the vertical centerlines), each slot having a depth extending from the external surface towards the internal surface along the vertical centerline (H, Fig. 1A, 1B, 1C - see how both slots 70T and 70B have a depth extending from the top external surface toward the internal surface/towards ferrule 30; para[0034], "a height H"), and defining a width transverse to the depth (W, Fig. 1A, 1B, 1C - see width of slots 70T and 70B that are transverse to the depth; para[0034], "a width W"); and

the key (100, Fig. 2, 3A) comprises a key body (Fig. 3 - see key body) extending from the first key end to the second key end (Fig. 3A - see how the key 100 has a body extending from the first end 102 to the second end 104);

but Cooke does not specifically teach wherein each slot has a first width at the external surface and a second width spaced from the external surface in the depth direction, wherein the second width is greater than the first width; and the key body comprising a longitudinal guide rail projecting away from the key body and extending from the first key end towards the second key end, the guide rail having a first width adjacent the key body and a second width away from the key body, wherein the first and second widths of the guide rail correspond to the first and second widths of the slots for longitudinal insertion and movement of the guide rail within the slots.

In similar art, Kuffel discloses a connector (300, Fig. 13, 16; col 7, in 43-46, "a connector 300") comprising an inner housing (400, Fig. 14, 16; col 7, in 51-63, "the inner housing assembly 400") and outer housing (500, Fig. 14, 16; col 7, in 47-51, "the outer housing 500"); the outer housing comprising a slot (806, Fig. 16; col 7, in 61-63, "two symmetric recessed features 806") extending from the front end to the back end (Fig. 16 - see how the slots 806 extend from the front end of the housing 400 to the back end), the slot having a depth extending from the top surface to the bottom surface (Fig. 16 - see how the depth extends from the top surface towards the bottom surface), and defining a width transverse to the depth (Fig. 16 - see how the slot 806 has two widths for the top and bottom portion, that are transverse to the depth), wherein each slot has a first width at the external surface (Fig. 16 - see first width of the slot 806 disposed at the top external surface) and a second width spaced from the external surface in the depth direction (Fig. 16 - see second wider width of retainers 818 of slot 806 that is spaced deeper in the depth direction), wherein the second width is greater than the first width (Fig. 16 - see how the second/deeper width is wider than the first surface width for the slot 806); and the inner housing comprising a key (802, Fig. 16; col 7, in 52-55, "the polarity key 802"), wherein the key comprises a first width for the main body (Fig. 13, 16 - see how the key 802 comprises a first/top width for being received by the upper width portion of the slot 806), and a second width for being received within the slot's wider width section (Fig. 13, 16 - see how the second bottom width of the key 802, located where protrusions 816 are disposed, is for being received within the retainers 816 of the slot 806).

Further, Rovenolt discloses a connector (10, Fig. 1; col 3, in 1-3, "connector 10") housing having a key (40, Fig. 1; col 3, in 1-3, "a polarization key 40"), and a slot (30, Fig. 1; col 3, in 3-5, "opening 30") for receiving the key (Fig. 1 - see how the slot 30 is for receiving key 40), wherein the slot extends vertically through the entire top housing portion (Fig. 1, 3, 4 - see how slot 30 extends through the entire top housing portion 80); and wherein the slot comprises a first width (Fig. 3 - see top/first width of the slot 30) located near the top surface (Fig. 3 - see first width of the top portion of the slot 30, located near the top surface of housing portion 80), and a wider second width (Fig. 4 - see bottom/second wider width) disposed on the internal surface of the top housing portion (Fig. 3, 4 - see how the bottom side of the slot 30 has a wider width than the top/first width).

However, the prior art does not disclose/teach individually nor fairly suggest in combination wherein each slot has a first width at the external surface and a second width spaced from the external surface in the depth direction, wherein the second width is greater than the first width; and the key body comprising a longitudinal guide rail projecting away from the key body and extending from the first key end towards the second key end, the guide rail having a first width adjacent the key body and a second width away from the key body, wherein the first and second widths of the guide rail correspond to the first and second widths of the slots for longitudinal insertion and movement of the guide rail within the slots.

Regarding claims 3-12, the prior art does not teach or fairly suggest the connector as claimed since they are dependent upon claim 2.

Claims 1-15 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: SAM YIP
IDEA INTELLECTUAL LIMITED
SUITE 1203, 12/F, BONHAM TRADE CENTRE,
50 BONHAM
STRAND, SHEUNG WAN
HONG KONG

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing
(day/month/year)

13 APR 2018

Applicant's or agent's file reference

P1183PC00(S09300US01)

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.

PCT/US2018/016049

International filing date
(day/month/year)

30 January 2018

Applicant

SENKO ADVANCED COMPONENTS, INC.

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide, National Chapters*.

Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide, International Phase, paragraphs 8.006-8.032*.

Name and mailing address of the ISA/US

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Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450
Facsimile No. 571-273-8300

Authorized officer

Blaine R. Copenheaver

Telephone No. PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2017)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P1183PC00(S09300US01)	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> FOR FURTHER ACTION </div> <div> see Form PCT/ISA/220 as well as, where applicable, item 5 below. </div> </div>	
International application No. PCT/US2018/016049	International filing date <i>(day/month/year)</i> 30 January 2018	(Earliest) Priority Date <i>(day/month/year)</i> 30 January 2017
Applicant SENKO ADVANCED COMPONENTS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 2
- ☒ as suggested by the applicant.
☐ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/016049

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/38; G02B 6/00; G02B 6/24; G02B 6/26; G02B 6/27; G02B 6/36; G02B 6/42 (2018.01)
CPC - G02B 6/38; G02B 6/00; G02B 6/24; G02B 6/26; G02B 6/27; G02B 6/36; G02B 6/3825; G02B 6/3831; G02B 6/387; G02B 6/3879; G02B 6/3893; G02B 6/42; G02B 6/4284; H01R 13/627; H01R 13/6271; H01R 13/6272; H01R 13/6275 (2018.02)

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)
See Search History document

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/0322825 A1 (COOKE et al) 05 December 2013 (05.12.2013) entire document	1, 9
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Y		12
Y	US 2016/0116685 A1 (SENKO ADVANCED COMPONENTS, INC.) 28 April 2016 (28.04.2016) entire document	12
A	US 2015/0212282 A1 (JYH Eng Technology Co., Ltd.) 30 July 2015 (30.07.2015) entire document	1-25
A	US 2016/0349458 A1 (Murray et al) 01 December 2016 (01.12.2016) entire document	1-25
A	US 2009/0220200 A1 (SHEAU TUNG WONG et al) 03 September 2009 (03.09.2009) entire document	1-25

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

☐ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

18 March 2018

Date of mailing of the international search report

13 APR 2018

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450
Facsimile No. 571-273-8300

Authorized officer

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300
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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: SAM YIP
IDEA INTELLECTUAL LIMITED
SUITE 1203, 12/F, BONHAM TRADE CENTRE,
50 BONHAM
STRAND, SHEUNG WAN
HONG KONG

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

13 APR 2018

Applicant's or agent's file reference
P1183PC00 (S09300US01)

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2018/016049

International filing date (day/month/year)

30 January 2018

Priority date (day/month/year)

30 January 2017

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - G02B 6/38; G02B 6/00; G02B 6/24; G02B 6/26; G02B 6/27; G02B 6/36; G02B 6/42 (2018.01)

CPC - G02B 6/38; G02B 6/00; G02B 6/24; G02B 6/26; G02B 6/27; G02B 6/36; G02B 6/3825; G02B 6/3831; G02B 6/387; G02B 6/3879; G02B 6/3893; G02B 6/42; G02B 6/4284; H01R 13/627; H01R 13/6271; H01R 13/6272; H01R 13/6275 (2018.02)

Applicant **SENKO ADVANCED COMPONENTS, INC.**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US
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Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450
Facsimile No. 571-273-8300

Date of completion of this opinion

18 March 2018

Authorized officer

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2018/016049

Box No. 1 Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
- a. ☐ forming part of the international application as filed:
- ☐ in the form of an Annex C/ST.25 text file.
- ☐ on paper or in the form of an image file.
- b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
- c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
- ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
- ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2018/016049

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement			
1. Statement				
Novelty (N)	Claims	2-8, 10-25		YES
	Claims	1, 9		NO
Inventive step (IS)	Claims	2-8, 10, 11, 13-25		YES
	Claims	1, 9, 12		NO
Industrial applicability (IA)	Claims	1-25		YES
	Claims	None		NO
2. Citations and explanations:				
<p>Claims 1 and 9 lack novelty under PCT Article 33(2) as being anticipated by Cooke et al. (hereinafter Cooke).</p> <p>Regarding Claim 1, Cooke discloses a reversible polarity fiber optic connector (multi-fiber fiber-optic connector with switchable polarity key; title) comprising: at least first and second optical ferrules (multi-fiber ferrule 30, which may be considered two ferrules integrally connected; FIGS. 1A-C; paragraph [0029]); a connector housing at least partially surrounding the first and second optical ferrules (connector housing 40 maintaining ferrule 30 within; FIGS. 1A-C; paragraph [0029]) and having a first exterior wall positioned above the first and second optical ferrules (top side 66T; FIGS. 1A and 1B; paragraph [0032]) and a second exterior wall positioned beneath the first and second exterior walls of the housing (top and bottom latching features 74T and 74B; FIGS. 1A and 1B; paragraph [0032]); a latch coupling positioned on each of the first and second exterior walls of the housing (top and bottom recesses 70T and 70B are configured to receive polarity key 100. FIG. 1C; paragraph [0034]) wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity (Paragraph [0043] explains positioning polarity key 100 on either top side 66T or bottom side 66B to reverse polarity.).</p> <p>Regarding Claim 9, Cooke discloses a reversible polarity fiber optic connector (multi-fiber fiber-optic connector with switchable polarity key; title) with exchangeable arms for changing connector type (polarity key 100; FIGS. 3A-C, 5A-B, and 6; paragraph [0033]) comprising: at least first and second optical ferrules (multi-fiber ferrule 30, which may be considered two ferrules integrally connected; FIGS. 1A-C; paragraph [0029]); a common connector housing at least partially surrounding the first and second optical ferrules (connector housing 40 maintaining ferrule 30 within; FIGS. 1A-C; paragraph [0029]) and having a first exterior wall positioned above the first and second optical ferrules (top side 66T; FIGS. 1A and 1B; paragraph [0032]) and a second exterior wall positioned beneath the first and second optical ferrules (bottom side 66B; FIGS. 1A and 1B; paragraph [0032]); a coupling surface positioned on each of the first and second exterior walls of the common connector housing; a removable arm (polarity key 100; FIGS. 3A-C, 5A-B, and 6; paragraph [0033]) for engaging either of the first and second exterior wall coupling surfaces on the common connector housing (Top and bottom recesses 70T and 70B are configured to receive polarity key 100. FIG. 1C; paragraph [0034]), the removable arm including either a latch or a latch recess (securing feature 124 as latch recess; FIGS. 3A-C; paragraph [0035]); wherein positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity (Paragraph [0043] explains positioning polarity key 100 on either top side 66T or bottom side 66B to reverse polarity.).</p> <p>Claim 12 lacks an inventive step under PCT Article 33(3) as being obvious over Cooke et al. (hereinafter Cooke) in view of Senko Advanced Components, Inc. (hereinafter Senko).</p> <p>Regarding Claim 12, Cooke discloses the reversible polarity fiber optic connector of claim 9, but does not explicitly disclose further comprising a pull tab.</p> <p>Senko is directed to a latching connector with remote release (title) and teaches a pull tab (pull tab assembly 260; FIGS. 3A and 3B; paragraph [0053]).</p> <p>It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Cooke with the teaching of Senko for the purpose of minimizing stresses applied to cables and connectors due to obstructions to access of individual release mechanisms of connectors (paragraph [0004]).</p> <p>Claims 2-8, 10, 11, and 13-25 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest:</p> <p>[Cl. 2] The reversible polarity fiber optic connector of claim 1, wherein each of the latch couplings on the first and second exterior walls of the connector housing includes at least a recess with angled walls; and the latch includes at least a protrusion with slanted edges for coupling with the angled walls of the recess on the first exterior wall when the fiber optic connector is configured in the first polarity or the angled walls of the recess on the second exterior wall when the fiber optic connector is configured in the second polarity.</p>				

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2018/016049

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

[Cl. 3] The reversible polarity fiber optic connector of claim 1, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed.

Claims 4 and 5 depend from claim 3, and therefore meet the criteria set out in PCT Article 33(2)-(3) for at least the same reasons as claim 3.

[Cl. 6] The reversible polarity fiber optic connector of claim 1, wherein each of the latch couplings on the first and second exterior walls of the connector housing includes a groove; and at least a projection for coupling with the groove on the first exterior wall when the fiber optic connector is configured in the first polarity or the groove on the second exterior wall when the fiber optic connector is configured in the second polarity.

Claims 7 and 8 depend from claim 6, and therefore meet the criteria set out in PCT Article 33(2)-(3) for at least the same reasons as claim 6.

[Cl. 10] The reversible polarity fiber optic connector of claim 9 wherein positioning a removable arm with a latch on the coupling surface creates a latch-type connector and positioning a removable arm with a recess creates a recess-type connector.

[Cl. 11] The reversible polarity fiber optic connector of claim 9 wherein the housing includes a receiving track in the coupling surface and the removable arm includes a projection for engaging in the receiving track in the coupling surface.

[Cl. 13] The reversible polarity fiber optic connector of claim 12 wherein the removable arm includes a latch and the pull tab is a separate element from the removable arm.

[Cl. 14] The reversible fiber optic connector of claim 12 wherein removable arm includes a recess and the pull tab is integrated with the removable arm.

[Cl. 15] A reversible polarity fiber optic connector comprising: at least first and second optical ferrules; a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules; a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing; a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing; wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claims 16-18 depend from claim 15, and therefore meet the criteria set out in PCT Article 33(2)-(3) for at least the same reasons as claim 15.

Regarding claim 15, Cooke discloses a reversible polarity fiber optic connector (multi-fiber fiber-optic connector with switchable polarity key; title) comprising: at least first and second optical ferrules (multi-fiber ferrule 30, which may be considered two ferrules integrally connected; FIGS. 1A-C; paragraph [0029]); a connector housing at least partially surrounding the first and second optical ferrules (connector housing 40 maintaining ferrule 30 within; FIGS. 1A-C; paragraph [0029]) and having a first exterior wall positioned above the first and second optical ferrules (top side 66T; FIGS. 1A and 1B; paragraph [0032]) and a second exterior wall positioned beneath the first and second optical ferrules (bottom side 66B; FIGS. 1A and 1B; paragraph [0032]). Cooke fails to disclose a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing; a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing; wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

The prior art of record, individually or in combination, does not teach or fairly suggest a reversible polarity fiber optic connector comprising: at least first and second optical ferrules; a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules; a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing; a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing; wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2018/016049

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

[Cl. 19] A reversible polarity fiber optic connector comprising: at least first and second optical ferrules; a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules; a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing; a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing; wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claims 20-22 depend from claim 19, and therefore meet the criteria set out in PCT Article 33(2)-(3) for at least the same reasons as claim 19.

Regarding claim 19, Cooke discloses a reversible polarity fiber optic connector (multi-fiber fiber-optic connector with switchable polarity key; title) comprising: at least first and second optical ferrules (multi-fiber ferrule 30, which may be considered two ferrules integrally connected; FIGS. 1A-C; paragraph [0029]); a connector housing at least partially surrounding the first and second optical ferrules (connector housing 40 maintaining ferrule 30 within; FIGS. 1A-C; paragraph [0029]) and having a first exterior wall positioned above the first and second optical ferrules (top side 66T; FIGS. 1A and 1B; paragraph [0032]) and a second exterior wall positioned beneath the first and second optical ferrules (bottom side 66B; FIGS. 1A and 1B; paragraph [0032]).

Cooke fails to disclose a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing; a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing; wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

The prior art of record, individually or in combination, does not teach or fairly suggest a reversible polarity fiber optic connector comprising: at least first and second optical ferrules; a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules; a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing; a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing; wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

[Cl. 23] A reversible polarity fiber optic connector comprising: at least first and second optical ferrules; a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules; a removable push-pull tab; a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall; wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

Claims 24 and 25 depend from claim 23, and therefore meet the criteria set out in PCT Article 33(2)-(3) for at least the same reasons as claim 23.

Regarding claim 23, Cooke discloses a reversible polarity fiber optic connector (multi-fiber fiber-optic connector with switchable polarity key; title) comprising: at least first and second optical ferrules (multi-fiber ferrule 30, which may be considered two ferrules integrally connected; FIGS. 1A-C; paragraph [0029]); a connector housing at least partially surrounding the first and second optical ferrules (connector housing 40 maintaining ferrule 30 within; FIGS. 1A-C; paragraph [0029]) and having a first exterior wall positioned above the first and second optical ferrules (top side 66T; FIGS. 1A and 1B; paragraph [0032]) and a second exterior wall positioned beneath the first and second optical ferrules (bottom side 66B; FIGS. 1A and 1B; paragraph [0032]).

Cooke fails to disclose a removable push-pull tab; a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall; wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

The prior art of record, individually or in combination, does not teach or fairly suggest a reversible polarity fiber optic connector comprising: at least first and second optical ferrules; a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules; a removable push-pull tab; a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall; wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2018/016049

Supplemental Box

In case the space in any of the preceding boxes is not sufficient,
Continuation of:

Claims 1-25 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Electronic Acknowledgement Receipt

EFS ID:	32679643
Application Number:	15884327
International Application Number:	
Confirmation Number:	7275
Title of Invention:	OPTICAL CONNECTORS WITH REVERSIBLE POLARITY
First Named Inventor/Applicant Name:	Kimman WONG
Customer Number:	152878
Filer:	Edward Jarmolowicz
Filer Authorized By:	
Attorney Docket Number:	Senko.09300US01(P1183)
Receipt Date:	21-MAY-2018
Filing Date:	30-JAN-2018
Time Stamp:	15:51:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	S09300IDSMay2018.pdf	618282	no	23
			c822cb3504f1fd9a978512acc028f23e445e657b		

Warnings:

Information:					
2	Foreign Reference	CA2495693A1.pdf	1141002	no	17
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Warnings:					
Information:					
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26	Other Reference-Patent/App/Search documents	3702-ISR-WO.pdf	514331	no	9
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30	Other Reference-Patent/App/Search documents	EP14187661-EESR-dated-03-09-2015.pdf	247493	no	6
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31	Non Patent Literature	Huber-Suhner-Catalog-2009. PDF	13153200	no	104
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32	Other Reference-Patent/App/Search documents	PCTUS0857023-ISR-and-WO-dated_8-21-2008.PDF	1448773	no	8
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35	Other Reference-Patent/App/Search documents	PCTUS1354784-ISR-and-WO_dated-01-16-2014.pdf	904832	no	12
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Total Files Size (in bytes):			113681404		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/884,327	01/30/2018	Kimman WONG	Senko.09300US01(P1183)

CONFIRMATION NO. 7275

PUBLICATION NOTICE



OC000000101423441

152878
Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

Title:OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

Publication No.US-2018-0217340-A1

Publication Date:08/02/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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NOTICE OF ALLOWANCE AND FEE(S) DUE

152878 7590 09/06/2018
Senko Advanced Components, Inc.
450 Donald Lynch Blvd
Unit D
Marlborough, MA 01752

EXAMINER

JORDAN, ANDREW

ART UNIT

PAPER NUMBER

2883

DATE MAILED: 09/06/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/884,327	01/30/2018	Kimman WONG	Senko.09300US01(P1183)	7275

TITLE OF INVENTION: OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	12/06/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
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Senko Advanced Components, Inc.
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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/884,327	01/30/2018	Kimman WONG	Senko.09300US01(P1183)	7275

TITLE OF INVENTION: OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	12/06/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
JORDAN, ANDREW	2883	385-078000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

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2 _____

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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

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4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)

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☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/884,327	01/30/2018	Kimman WONG	Senko.09300US01(P1183)	7275
152878	7590	09/06/2018	EXAMINER	
Senko Advanced Components, Inc. 450 Donald Lynch Blvd Unit D Marlborough, MA 01752			JORDAN, ANDREW	
			ART UNIT	PAPER NUMBER
			2883	
DATE MAILED: 09/06/2018				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/884,327	Applicant(s) WONG et al.	
	Examiner ANDREW JORDAN	Art Unit 2883	AIA Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the IDS of 5/21/18.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-25. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some *c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
--	--

/ANDREW JORDAN/
Primary Examiner, Art Unit 2883

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

DETAILED ACTION

This is an AIA application.

The effective filing date of this AIA application is seen as January 30, 2017, the date of the earliest priority application (United States provisional patent application serial number 62/452,147) for any claims which are fully supported under the first paragraph of 35 U.S.C. 112 by the provisional application.

The effective filing date of this AIA application is seen as January 30, 2018, the actual filing date, for any claims that are not fully supported by the foregoing provisional application or by any other of the several other provisional applications to which benefit is claimed.

The claims originally filed **March 23, 2018** in response to the notice to file corrected application papers of March 13, 2018 are entered, currently outstanding, and subject to examination.

Claims 1-25 are currently pending.

No claims have been withdrawn.

No claims have been cancelled.

Claims 1-25 are currently outstanding and subject to examination.

This is a notice of allowability and is the first action on the merits.

Often, in the substance of the action below, formal matters are addressed first, claim rejections second, and any response to arguments third.

Special Definitions for Claim Language - MPEP § 2111.01(IV)

No special definitions are seen as present in the specification regarding the language used in the claims. Consequently, the words and phrases of the claims are given their plain meaning.

If special definitions are present, Applicant should bring those to the attention of the examiner and the prosecution history with its next response.

Claims Allowed

Claims 1-25 are allowed.

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance:

The prior art does not teach or suggest a removable latching system, removable arm system, or removable push-pull tab as set forth in the claimed combination of independent claim(s) 1, 9, and 15, 19, and 23, respectively.

The following references are seen as pertinent to the present application:

U.S. Patent Application Publication No. 2016/0349458 of Murray et al.
(Murray);

U.S. Patent Application Publication No. 2015/0378113 of Good et al. (Good);
and

U.S. Patent Application Publication No. 2016/0116685 of Wong et al. (Wong).

While the (apparently) corresponding international application PCT/US2018/016049 indicates that the Good reference may be more pertinent, examiner sees the alignment mechanism in Good as not providing a latch that holds the connection sufficiently in place. The Murray reference relies on a boot, and not a housing to provide connection for a latching mechanism.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Applicant's publication US 20180217340 A1 of August 2, 2018 is cited, as are several patent publications sharing inventors with the present application.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited references have elements related to Applicant's disclosure and/or claims or are otherwise associated with the other cited references, particularly with respect to optical connectors, including those addressing polarity and reversal thereof.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW JORDAN whose telephone number is (571) 270-1571. The examiner can normally be reached on most days 1000-1800 PACIFIC

TIME ZONE (messages are returned).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas (Tom) Hollweg can be reached on 571-270-1739. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Andrew Jordan/
Primary Examiner, Art Unit 2883
(571) 270-1571 (Pacific time)
August 30, 2018

<i>Notice of References Cited</i>	Application/Control No. 15/884,327		Applicant(s)/Patent Under Reexamination	
	Examiner ANDREW JORDAN		Art Unit 2883	Page 1 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20160116685-A1	04-2016	WONG; YIM	G02B6/3825	385/56
*	B	US-20180217339-A1	08-2018	Ma; Siu Kei	G02B6/3893	1/1
*	C	US-20180156988-A1	06-2018	Gniadek; Jeffrey	G02B6/387	1/1
*	D	US-6485194-B1	11-2002	Shirakawa; Tsuguhito	G02B6/381	385/78
*	E	US-4478473-A	10-1984	Frear; David L.	H01R13/622	439/312
*	F	US-5026138-A	06-1991	Boudreau; Robert A.	G02B6/4202	385/51
*	G	US-20150212282-A1	07-2015	Lin; Yen-Lin	G02B6/3893	385/76
*	H	US-20180217340-A1	08-2018	WONG; Kimman	G02B6/3893	1/1
*	I	US-10031296-B2	07-2018	Good; Paul Michael	G02B6/3831	1/1
*	J	US-20180172942-A1	06-2018	Bauco; Anthony Sebastian	G02B6/3873	1/1
*	K	US-20180172924-A1	06-2018	Bauco; Anthony Sebastian	G02B6/3873	1/1
*	L	US-20180172923-A1	06-2018	Bauco; Anthony Sebastian	G02B6/3873	1/1
*	M	US-20180164511-A1	06-2018	Childers; Darrell R.	G02B6/3831	1/1

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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	P					
	Q					
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	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Notice of References Cited</i>	Application/Control No. 15/884,327		Applicant(s)/Patent Under Reexamination	
	Examiner ANDREW JORDAN		Art Unit 2883	Page 2 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180156999-A1	06-2018	Buff; Scott Eaker	G02B6/4452	1/1
*	B	US-20180128987-A1	05-2018	Good; Paul Michael	G02B6/3883	1/1
*	C	US-9946035-B2	04-2018	Gustafson; Evan	G02B6/3821	1/1
*	D	US-9880361-B2	01-2018	Childers; Darrell R.	G02B6/3831	1/1
*	E	US-9829645-B2	11-2017	Good; Paul Michael	G02B6/3883	1/1
*	F	US-20170293090-A1	10-2017	Hopper; Scott Richard	G02B6/3821	1/1
*	G	US-20170293089-A1	10-2017	Gustafson; Evan	G02B6/3821	1/1
*	H	US-20170293088-A1	10-2017	Manes; Dennis	G02B6/3825	1/1
*	I	US-20170176691-A1	06-2017	Childers; Darrell R.	G02B6/3831	1/1
*	J	US-9557495-B2	01-2017	Raven; Asher	G02B6/3879	1/1
*	K	US-20170023746-A1	01-2017	Good; Paul Michael	G02B6/3831	1/1
*	L	US-9465172-B2	10-2016	Shih; Hsi-Chung	G02B6/3879	1/1
*	M	US-20160216458-A1	07-2016	Shih; Hsi-Chung	G02B6/3871	1/1

FOREIGN PATENT DOCUMENTS

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<i>Notice of References Cited</i>	Application/Control No. 15/884,327		Applicant(s)/Patent Under Reexamination	
	Examiner ANDREW JORDAN		Art Unit 2883	Page 3 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-9310569-B2	04-2016	Lee; Wei-Cheng	G02B6/3825	1/1
*	B	US-20150277059-A1	10-2015	Raven; Asher	G02B6/3879	385/78
*	C	US-20150241644-A1	08-2015	LEE; WEI-CHENG	G02B6/3825	385/76
*	D	US-8676022-B2	03-2014	Jones; Ashley W.	G02B6/3849	385/139
*	E	US-20130308916-A1	11-2013	Buff; Scott Eaker	G02B6/4452	385/135
*	F	US-20130308915-A1	11-2013	Buff; Scott Eaker	G02B6/4452	385/135
*	G	US-20130272671-A1	10-2013	Jones; Ashley W.	G02B6/3831	385/139
*	H	US-8152385-B2	04-2012	de Jong; Michael	G02B6/3879	385/53
*	I	US-20100220961-A1	09-2010	de Jong; Michael	G02B6/3879	385/77
*	J	US-20050207709-A1	09-2005	Del Grosso, Steven C.	G02B6/4472	385/71
*	K	US-6869227-B2	03-2005	Del Grosso; Steven C.	G02B6/4471	385/71
*	L	US-20040184741-A1	09-2004	Del Grosso, Steven C.	G02B6/3851	385/71
*	M	US-6634796-B2	10-2003	de Jong; Michael	G02B6/3831	385/139

FOREIGN PATENT DOCUMENTS

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<i>Notice of References Cited</i>	Application/Control No. 15/884,327		Applicant(s)/Patent Under Reexamination	
	Examiner ANDREW JORDAN		Art Unit 2883	Page 4 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-6623172-B1	09-2003	de Jong; Michael	G02B6/3806	385/59
*	B	US-6379052-B1	04-2002	de Jong; Michael	G02B6/3806	385/59
*	C	US-6364537-B1	04-2002	Maynard; Charlie	G02B6/3831	385/55
*	D	US-20010026661-A1	10-2001	de Jong , Michael	G02B6/3831	385/56
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FOREIGN PATENT DOCUMENTS

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	S					
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes 	Application/Control No. 15/884,327	Applicant(s)/Patent Under Reexamination WONG et al.
	Examiner ANDREW JORDAN	Art Unit 2883

CPC - Searched*		
Symbol	Date	Examiner
G02B6/38, /3821, and /3893	08/30/2018	aj

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
G02B6/38, /3821, and /3893 (See search history printout)	08/30/2018	aj
EAST search history attached	08/30/2018	aj
Inventor name search	08/30/2018	aj
Assignee and/or Applicant name search	08/30/2018	aj

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see attached EAST history	08/30/2018	aj

/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	
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Issue Classification 	Application/Control No. 15/884,327	Applicant(s)/Patent Under Reexamination WONG et al.
	Examiner ANDREW JORDAN	Art Unit 2883

CPC						
Symbol					Type	Version
G02B	/	6	/	3893	F	2013-01-01
G02B	/	6	/	3821	I	2013-01-01

CPC Combination Sets						
Symbol				Type	Set	Ranking
	/		/			

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 25	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883 (Primary Examiner) _____ (Date) 30 August 2018		O.G. Print Claim(s) 1	O.G. Print Figure 2

Issue Classification 	Application/Control No. 15/884,327	Applicant(s)/Patent Under Reexamination WONG et al.
	Examiner ANDREW JORDAN	Art Unit 2883

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G02B	/	6	/ 38

NON-CLAIMED			
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US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	25	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883	30 August 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

<i>Issue Classification</i> 	Application/Control No. 15/884,327	Applicant(s)/Patent Under Reexamination WONG et al.
	Examiner ANDREW JORDAN	Art Unit 2883

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10		19										
	2		11		20										
	3		12		21										
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	8		17												
	9		18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 25	
/ANDREW JORDAN/ Primary Examiner, Art Unit 2883 (Primary Examiner) _____ (Date) 30 August 2018		O.G. Print Claim(s) 1	O.G. Print Figure 2

<i>Index of Claims</i> 	Application/Control No. 15/884,327	Applicant(s)/Patent Under Reexamination WONG et al.
	Examiner ANDREW JORDAN	Art Unit 2883

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM			DATE							
Final	Original	08/30/2018								
	1	=								
	2	=								
	3	=								
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15884327
Filing Date	2018-01-30
First Named Inventor	WONG, Kimman
Art Unit	2883
Examiner Name	JORDAN, Andrew
Attorney Docket Number	S09300US01

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(Not for submission under 37 CFR 1.99)

Application Number		15884327
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Art Unit	2883	
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Art Unit		2883
Examiner Name	JORDAN, Andrew	
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(Not for submission under 37 CFR 1.99)

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(Not for submission under 37 CFR 1.99)

Application Number		15884327
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Examiner Name	JORDAN, Andrew	
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Application Number	15884327
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**INFORMATION DISCLOSURE
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¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15884327
Filing Date	2018-01-30
First Named Inventor	WONG, Kimman
Art Unit	2883
Examiner Name	JORDAN, Andrew
Attorney Docket Number	S09300US01

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/ESJ/	Date (YYYY-MM-DD)	2018-05-21
Name/Print	/Edward S. Jarmolowicz/	Registration Number	47238

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Bibliographic Data

Application No: 15/884,327

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged: /ANDREW JORDAN/

Examiner's Signature

Initials

Title:

OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/30/2018	385	2883	Senko.09300US01(P1183)
RULE			

APPLICANTS

SENKO Advanced Components, Inc., Marlborough, MA, UNITED STATES

INVENTORS

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Jeffrey GNIADEK Northbridge, MA, UNITED STATES

Kazuyoshi TAKANO Southborough, MA, UNITED STATES

Siu Kei MA Hong Kong, HONG KONG

CONTINUING DATA

This application has PRO of 62581961 11/06/2017

This application has PRO of 62546920 08/17/2017

This application has PRO of 62485042 04/13/2017

This application has PRO of 62463901 02/27/2017

This application has PRO of 62463898 02/27/2017

This application has PRO of 62457150 02/09/2017

This application has PRO of 62452147 01/30/2017

FOREIGN APPLICATIONS

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03/12/2018

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STATE OR COUNTRY

HONG KONG

ADDRESS

Senko Advanced Components, Inc.

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Unit D

Marlborough, MA 01752

UNITED STATES

FILING FEE RECEIVED

\$1,495

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15884327
Filing Date	2018-01-30
First Named Inventor	WONG
Art Unit	NA
Examiner Name	NA
Attorney Docket Number	P1183US01 (S09300US01)

U.S.PATENTS

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
/AJ/	1	8636424	B1	2014-01-18	Kuffel et al.	
	2	8770863	B1	2014-07-08	Cooke et al.	
	3	4979792		1990-12-25	Weber et al.	
	4	5265181		1999-11-23	Chang	
	5	5289554		1994-02-22	Cubukciyan et al.	
	6	5335301		1994-08-02	Newman et al.	
	7	5521997		1996-05-28	Rovenolt et al.	
/AJ/	8	5041025		1991-08-20	Haitmanek	

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Examiner Name	NA
Attorney Docket Number	P1183US01 (S09300US01)

/AJ/	9	9709753	B1	2017-7-18	Chang et al.
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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20130378113	A1	2015-31-12	Good et al.	
	2	20160259135	A1	2016-09-08	Gnaidek et al.	
	3	20130259429	A1	2013-10-03	Czosnowski et al.	

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Art Unit	NA	
Examiner Name	NA	
Attorney Docket Number	P1183US01 (S09300US01)	

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Examiner Signature	/ANDREW JORDAN/ (08/28/2018)	Date Considered	
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Signature	/Edward S. Jarmolowicz 47238/	Date (YYYY-MM-DD)	2018-01-31
Name/Print	Edward S. Jarmolowicz	Registration Number	47,238

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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	("20180217340").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	ON	2018/08/24 23:38
S2	1	"62979226".fmid.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/24 23:41
S3	2	S1 or S2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/24 23:43
S4	31	revers\$4 near2 polar\$4 near2 (fiber or fibre) near2 optic\$4 near2 connect\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 21:34
S5	67	(revers\$4 near2 polar\$4) with ((fiber or fibre) near2 optic\$4 near2 connect\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 21:34
S6	123193	revers\$4 near2 polar\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 21:39
S7	186271	(fiber or fibre) near2 optic\$4 near2 connect\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 21:39
S8	36	S5 not S4	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2018/08/28 21:54

			EPO; JPO; DERWENT; IBM_TDB			
S9	36	S8 and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 21:55
S10	11	("20130259429" "20130378113" "20160259135" "4979792" "5041025" "5265181" "5289554" "5335301" "5521997" "8636424" "8770863" "9709753").PN.	US-PGPUB; USPAT	OR	ON	2018/08/28 22:28
S11	175	("20020191919" "20030053787" "20040052473" "20040136657" "20040141693" "20040161958" "20040234209" "20050111796" "20050141817" "20060089049" "20060127025" "20060269194" "20060274411" "20070025665" "20070028409" "20070079854" "20070098329" "20070149062" "20070230874" "20070232115" "20070243749" "20080008430" "20080044137" "20080069501" "20080101757" "20080226237" "20080267566" "20090022457" "20090028507" "20090196555" "20090214162" "20090220197" "20100034502" "20100092136" "20100247041" "20100322561" "20110044588" "20110131801" "20110177710" "20120099822" "20120189260" "20120269485" "20120301080" "20130071067" "20130089995" "20130094816" "20130121653" "20130170797" "20130183012" "20130216185" "20130322825" "20140016901" "20140050446" "20140133808" "20140334780" "20140348477" "20150378113" "20160259135" "20170254966" "3721945" "4327964" "44778743" "4762388" "4764129" "4840451" "4872736" "4979792" "5041025" "5212752" "5265181" "5289554" "5317663" "5335301" "5348487" "5444806" "5481634" "5506922" "5521997" "5570445" "5588079" "5684903" "5687268" "5781681" "5937130" "5956444" "5971626" "6041155" "6049040" "6134370" "6178283" "62006577" "6206581" "6227717" "6238104" "6247849" "6461054" "6471412" "6478472" "6530696" "6551117" "6579014" "6634801" "6648520" "6682228" "6695486" "6854894" "6865362" "6872039" "6935789" "7036993" "7077576" "7090406" "7090407" "7091421" "7111990"	US-PGPUB; USPAT	OR	ON	2018/08/28 22:29

		"7113679" "7150587" "7153041" "7198409" "7207724" "7258493" "7264402" "7281859" "7315682" "7325976" "7325980" "7329137" "7331718" "7354291" "7371082" "7387447" "7390203" "7431604" "7463903" "7465180" "7510335" "7513695" "7540666" "7581775" "7591595" "7594766" "7641398" "7695199" "7699533" "7785019" "7824113" "7867395" "8152385" "8186890" "8192091" "8202009" "8251733" "8267595" "8270796" "8408815" "8465317" "8534928" "8622634" "8636424" "8651749" "8678670" "8727638" "8770863" "9366829" "9465172" "9658409" "9709753" "9778425" "9798084" "D323143" "D533504" "D534124" "D543146" "D558675" "D572661" "D641709" "RE37080").PN.				
S12	176	S10 or S11	US-PGPUB; USPAT	OR	ON	2018/08/28 22:33
S13	136	S12 and (S4 or S5 or S6 or S7)	US-PGPUB; USPAT	OR	ON	2018/08/28 22:34
S14	176	S12 or (S12 and (S4 or S5 or S6 or S7))	US-PGPUB; USPAT	OR	ON	2018/08/28 22:35
S15	176	S12 or (S12 and (S4 or S5 or S6 or S7)) and S6	US-PGPUB; USPAT	OR	ON	2018/08/28 22:35
S16	12	(S12 or (S12 and (S4 or S5 or S6 or S7))) and S6	US-PGPUB; USPAT	OR	ON	2018/08/28 22:35
S17	1	("20130259429").PN. OR ("9709753").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2018/08/28 22:36
S18	24	(revers\$4 near2 polar\$4) same ((fiber or fibre) near2 optic\$4 near2 connect\$4) same (latch\$4 or coupl\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 22:39
S19	14833	385/78.clas. 385/78.fs. G02B6/38.cpc. G02B6/3821.cpc. G02B6/3893.cpc. G02B6/3893.cpc. G02B6/3821.cpc. (385/78).ccls. (385/78).ccls. (385/78) .fs. (385/78).fs. (385/78).ccls,fs. (385/78).ccls,fs. (G02B6/3893 or G02B6/3821).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 22:48
S20	2098	(G02B6/3893 and G02B6/3821).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 22:48
S21	25	G02B6/38.cpc. and G02B6/3821.cpc. and G02B6/3893.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2018/08/28 22:49

			DERWENT; IBM_TDB			
S22	0	S6 and S21	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 22:53
S23	12	S6 and S20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 22:54
S24	272	((Kimman near2 WONG) or (Jeffrey near2 GNI ADEK) or (Kazuyoshi near2 TAKANO) or (Siu near2 MA) or (Siu near2 Kei near2 MA)).inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 22:59
S25	3	((Kimman near2 WONG) and (Jeffrey near2 GNI ADEK) and (Kazuyoshi near2 TAKANO) and ((Siu near2 MA) or (Siu near2 Kei near2 MA))).inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 23:00
S26	11	S24 and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 23:00
S27	2	S25 and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 23:01
S28	0	us-20130378113-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 23:05
S29	0	us-2013378113-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 23:05
S30	0	us-20130378113-\$.did.	US-PGPUB; USPAT; USOCR;	OR	ON	2018/08/28 23:05

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S31	5	"20151231".pd. and good.inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 23:07
S32	2	us-20160116685-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/28 23:27
S33	6	us-4778743-\$.did. ep-1074868-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:04
S34	6	us-4778743-\$.did. ep-1074868-\$.did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:04
S35	8	"16778113".fmid.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:05
S36	336	frear.inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:08
S37	2	"19841023".pd. and frear.inv.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:08
S38	18	(revers\$4 near2 polar\$4) and ((fiber or fibre) near2 optic\$4 near2 connect\$4) and ((remov\$4 or exchang\$4) near2 (arm\$3 or extens\$4 or extend\$4 or project\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:19
S42	5	(US-20160116685-\$ or US-	US-PGPUB;	OR	ON	2018/08/30

		20180217339-\$ or US-20180156988-\$).did. or (US-6485194-\$ or US-4478473-\$).did.	USPAT			02:26
S44	2	us-20150212282-\$).did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:29
S45	4	us-20160349458-\$).did. US-20090022457-\$).did.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/30 02:31
S46	1	(US-6485194-\$).did.	USPAT	OR	ON	2018/08/30 02:47

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S39	2	((revers\$4 near2 polar\$4) same ((fiber or fibre) near2 optic\$4 near2 connect\$4) same (latch\$4 or coupl\$4)).clm.	US-PGPUB; USPAT	OR	ON	2018/08/30 02:10
S40	8	((revers\$4 near2 polar\$4) and ((fiber or fibre) near2 optic\$4 near2 connect\$4) and (latch\$4 or coupl\$4)).clm.	US-PGPUB; USPAT	OR	ON	2018/08/30 02:11
S41	2	((revers\$4 near2 polar\$4) and ((fiber or fibre) near2 optic\$4 near2 connect\$4) and ((remov\$4 or exchang\$4) near2 (arm\$3 or extens\$4 or extend\$4 or project\$4))).clm.	US-PGPUB; USPAT	OR	ON	2018/08/30 02:18
S43	1	"Term Removed"	USPAT	OR	ON	2018/08/30 02:26
S47	1	"Term Removed"	USPAT	OR	ON	2018/08/30 02:47

8/ 30/ 2018 3:22:57 AM
C:\Users\ajordan1\Documents\EAST\Workspaces\15_884_327 Wong OPTICAL CONNECTORS.wsp



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/884,327	01/30/2018	Kimman WONG	Senko.09300US01(P1183)	7275
152878	7590	09/20/2018	EXAMINER	
Senko Advanced Components, Inc.			JORDAN, ANDREW	
450 Donald Lynch Blvd			ART UNIT	PAPER NUMBER
Unit D			2883	
Marlborough, MA 01752			NOTIFICATION DATE	DELIVERY MODE
			09/20/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Application No. : 15884327
Applicant : Wong
Filing Date : 01/30/2018
Date Mailed : 09/20/2018

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

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/Ashley Gerstlauer/
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IDENTIFICATION OF SPECIFICATION/DRAWING INCONSISTENCIES

- ☐ On Page of the specification there is a brief description of FIG. , but the drawings filed do not include a drawing with that designation. Applicant must respond either by supplying the omitted drawing or by amending the specification to remove all references to that drawing.
- ☒ The drawings filed 03/23/2018 include FIG. 21A-21D,22A-22E, but the specification's brief description of the drawings does not describe a drawing with that designation. Applicant must respond either by amending the specification to add a brief description of that drawing or by correcting the drawings to remove the drawing in question.
- ☐ In the utility application, drawings are present in the application and are referred to in the detailed description of the invention, but the specification does not contain a brief description of the several views as required by 37 CFR 1.74 and 37 CFR 1.77(b)(9).
- ☐ The design application does not contain a description of the figure or figures of the drawing as required by 37 CFR 1.153(a) and 37 CFR 1.154(b)(4).
- ☐ In the plant application, the specification does not contain a brief description of the drawing as required by 37 CFR 1.163(c)(8).
- ☐ Page of the specification refers to FIG. , but no drawing with that designation is described in the brief description of the drawings and no drawing with that designation is present in the application. Applicant must respond either by amending the specification to remove all references to that drawing, or by supplying that drawing and amending the specification to add a brief description of it.
- ☐ In the reissue application, FIG. , is labeled as “New” but is not described in the reissue specification’s brief description of the drawings. Applicant must respond by amending the reissue specification’s brief description of the drawings to add a brief description of the new drawing.
- ☐ OTHER:
- ☐ COMMENTS:

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15884327
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First Named Inventor	WONG, Kimman
Art Unit	2883
Examiner Name	JORDAN, Andrew
Attorney Docket Number	S09300US01

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
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	2	44779743		1984-10-23	Frear	
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	10	5265181	A	1993-11-23	Chang	
	11	5570445	a	1996-10-29	Chou et al.	
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	15	5348487	A	1994-09-02	Marazzi et al.	
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	21	5684903	A	1997-11-04	Kyomasu et al	
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	33	6227717	B1	2001-05-08	OTT ET AL	
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	44	6865362	B2	2004-02-03	BURKHOLDER ET AL	
	45	6695486	B2	2004-02-24	FALKENBERG ET AL	
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/ANDREW JORDAN/ (08/30/2018)

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15884327
Filing Date	2018-01-30
First Named Inventor	WONG, Kimman
Art Unit	2883
Examiner Name	JORDAN, Andrew
Attorney Docket Number	S09300US01

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/ANDREW JORDAN/ (08/30/2018)

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Examiner Name	JORDAN, Andrew
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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/ESJ/	Date (YYYY-MM-DD)	2018-05-21
Name/Print	/Edward S. Jarmolowicz/	Registration Number	47238

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S49	1	"6206577".pn.	US-PGPUB; USPAT	OR	ON	2018/10/08 23:11
S48	0	"62006577".pn.	US-PGPUB; USPAT	OR	ON	2018/10/08 23:10

EAST Search History (Interference)

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CONNECTORS.wsp

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: WONG

Application No.: 15/884,327

Confirmation No.: 7275

Filed: January 30, 2018

For: OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

October 23, 2018

RESPONSE TO NOTICE TO FILED CORRECTED APPLICATION PAPERS

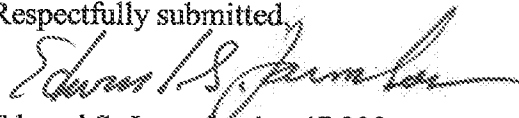
TO THE COMMISSIONER FOR PATENTS,

Sirs:

In response to 09/20/2018 Notice, Applicants submit the following substitute specification under 37 CFR 1.125(b). Attached are a clean form, without markings, of the substitute specification and a marked-up copy of the substitute specification. Titled Substitute Specification, showing all the changes relative to the immediate prior version of the specification of record. No new matter has been added.

The specification has been amended to provide a description for each drawing view of FIG. 21A-FIG. 22D. Accordingly, the requirements of 37 CFR 1.74 and 1.77(b)(9) are believed to be satisfied.

Respectfully submitted,



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Filed via EFSW: Oct. 23, 2018

Abstract:

Reversible polarity fiber optic connectors are provided having housings at least
5 partially surrounding first and second optical ferrules with walls above and beneath the
ferrules. Positioning removable elements such as latches, removable arms, or push-pull
tabs on the first wall above the ferrules yields fiber optic connectors with a first polarity
type, and positioning the removable elements on the second wall beneath the ferrules yields
fiber optic connectors with a second, opposite polarity type. Various engagement
10 mechanisms are provided on either the connector housing walls or on the removable
elements, or both, to assist in affixing the removable element to the connector housing.

Claims:

1. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

5 a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

10 a latch coupling positioned on each of the first and second exterior walls of the housing;

a removable latch for engaging either of the first and second exterior wall latch couplings on the connector housing;

15 wherein positioning the removable latch on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

2. The reversible polarity fiber optic connector of claim 1, wherein

20 each of the latch couplings on the first and second exterior walls of the connector housing includes at least a recess with angled walls; and

the latch includes at least a protrusion with slanted edges for coupling with the angled walls of the recess on the first exterior wall when the fiber optic

connector is configured in the first polarity or the angled walls of the recess on the second exterior wall when the fiber optic connector is configured in the second polarity.

5 3. The reversible polarity fiber optic connector of claim 1, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the first and second ferrules causes the removable latch to be depressed.

10 4. The reversible polarity fiber optic connector of claim 3, wherein the pull tab comprises at least a first opening and a second opening for engaging the removable latch;

15 wherein the first opening is configured to allow the connector housing and the removable latch to pass through; and

the second opening is configured to allow the removable latch to partially pass through.

20 5. The reversible polarity fiber optic connector of claim 3, wherein the pull tab further comprises a first deformable portion and a second deformable portion;

wherein the first deformable portion is configured to cooperate with the second deformable portion to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

5 6. The reversible polarity fiber optic connector of claim 1, wherein

each of the latch couplings on the first and second exterior walls of the connector housing includes a groove; and

10 at least a projection for coupling with the groove on the first exterior wall when the fiber optic connector is configured in the first polarity or the groove on the second exterior wall when the fiber optic connector is configured in the second polarity.

15 7. The reversible polarity fiber optic connector of claim 6, further comprising a pull tab for engaging the removable latch; wherein pulling the pull tab in a direction away from the reversible polarity fiber optic connector depresses the removable latch.

20 8. The reversible polarity fiber optic connector of claim 7, wherein the pull tab comprises:
an opening for engaging the removable latch; and
a front protrusion configured to depress the removable latch when the pull tab is pulled in a direction away from the first and second ferrules.

9. A reversible polarity fiber optic connector with exchangeable arms for changing connector type comprising:

at least first and second optical ferrules;

5 a common connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a coupling surface positioned on each of the first and second exterior walls of the common connector housing;

10 a removable arm for engaging either of the first and second exterior wall coupling surfaces on the common connector housing, the removable arm including either a latch or a latch recess;

wherein positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and
15 positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

10. The reversible polarity fiber optic connector of claim 9 wherein positioning a
20 removable arm with a latch on the coupling surface creates a latch-type connector and positioning a removable arm with a recess creates a recess-type connector.

11. The reversible polarity fiber optic connector of claim 9 wherein the housing includes a receiving track in the coupling surface and the removable arm includes a projection for engaging in the receiving track in the coupling surface.

5

12. The reversible polarity fiber optic connector of claim 9 further comprising a pull tab.

13. The reversible polarity fiber optic connector of claim 12 wherein the removable arm includes a latch and the pull tab is a separate element from the removable arm.

10

14. The reversible fiber optic connector of claim 12 wherein removable arm includes a recess and the pull tab is integrated with the removable arm.

15

15. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

20

a first aperture in the first exterior wall of the housing and a second aperture in the second exterior wall of the housing;

a removable push-pull tab including a protrusion for positioning through either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion in the first aperture of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion in the second aperture of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

16. The reversible polarity fiber optic connector of claim 15 further comprising first and second apertures respectively beneath the first and second exterior walls of the housing for receiving the protrusion.

17. The reversible polarity fiber optic connector of claim 15, further comprising a spring to urge the push-pull tab forward.

18. The reversible polarity fiber optic connector of claim 15, wherein the push-pull tab protrusion is retained by a housing latch, the housing latch being urged forward by a spring.

19. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

a first deformable region in the first exterior wall of the housing and a second deformable region in the second exterior wall of the housing;

a removable push-pull tab including a protrusion for positioning within though either of the first or second deformable regions in the first and second exterior walls, respectively, of the connector housing;

wherein positioning the removable push-pull tab with its protrusion through the first deformable region of the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion through the second deformable region of the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

20. The combination of the reversible polarity fiber optic connector of claim 19 and a tool for deforming the deformable region of either the first exterior wall of the housing or the second exterior wall of the housing.

21. The reversible polarity fiber optic connector of claim 19, further comprising a spring to urge the push-pull tab forward.

22. The reversible polarity fiber optic connector of claim 19 further comprising first and second apertures respectively beneath the first and second exterior walls of the housing for receiving the protrusion from the deformable region.

5

23. A reversible polarity fiber optic connector comprising:

at least first and second optical ferrules;

a connector housing at least partially surrounding the first and second optical ferrules and having a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules;

10

a removable push-pull tab;

a first push-pull tab retainer positioned on the first exterior wall and a second push-pull tab retainer positioned on the second exterior wall;

15

wherein positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second polarity, the second polarity being opposite to the first polarity.

20

24. The reversible polarity fiber optic connector of claim 23 wherein the first and second push-pull tab retainers each include a projection.

25. The reversible polarity fiber optic connector of claim 23 wherein each projection is a clip for receiving a portion of the push-pull tab.

OPTICAL CONNECTORS WITH REVERSIBLE POLARITY**Cross-Reference to Related Patent Applications:**

5 [0001] The present application claims priorities to United States Provisional Patent Applications No. 62/452,147 filed January 30, 2017, No. 62/457,150 filed February 9, 2017, No. 62/463,898 filed February 27, 2017, No. 62/463,901 filed February 27, 2017, No. 62/485,042 filed April 13, 2017, No. 62/546,920, filed August 17, 2017, and No. 62/581,961 filed November 6, 2017; the disclosures of which are incorporated herein by reference in their entireties.

10 **Field of the Invention:**

[0002] The present disclosure relates generally optical connectors with reversible polarity.

Background:

15 [0003] The prevalence of the Internet has led to unprecedented growth in communication networks. Consumer demand for service and increased competition has caused network providers to continuously find ways to improve quality of service while reducing cost.

20 [0004] Certain solutions have included deployment of high-density interconnect panels. High-density interconnect panels may be designed to consolidate the increasing volume of interconnections necessary to support the fast-growing networks into a compacted form factor, thereby increasing quality of service and decreasing costs such as floor space and support overhead. However, room for improvement in the area of data centers, specifically as it relates to fiber optic connections, still exists. For example, manufacturers of connectors are always looking to reduce the size of the devices, while

increasing ease of deployment, robustness, and modifiability after deployment. In particular, more optical connectors may need to be accommodated in the same footprint previously used for a smaller number of connectors in order to provide backward compatibility with existing data center equipment. For example, one current footprint is known as the small form-factor pluggable footprint (SFP). This footprint currently accommodates two LC-type ferrule optical connections. However, it may be desirable to accommodate four optical connections (two duplex connections of transmit/receive) within the same footprint. Another current footprint is the quad small form-factor pluggable (QSFP) footprint. This footprint currently accommodates four LC-type ferrule optical connections. However, it may be desirable to accommodate eight optical connections of LC-type ferrules (four duplex connections of transmit/receive) within the same footprint.

[0005] In communication networks, such as data centers and switching networks, numerous interconnections between mating connectors may be compacted into high-density panels. Panel and connector producers may optimize for such high densities by shrinking the connector size and/or the spacing between adjacent connectors on the panel. While both approaches may be effective to increase the panel connector density, shrinking the connector size and/or spacing may also increase the support cost and diminish the quality of service.

[0006] In a high-density panel configuration, adjacent connectors and cable assemblies may obstruct access to the individual release mechanisms. Such physical obstructions may impede the ability of an operator to minimize the stresses applied to the cables and the connectors. For example, these stresses may be applied when the user reaches into a dense group of connectors and pushes aside surrounding optical fibers and

connectors to access an individual connector release mechanism with his/her thumb and forefinger. Overstressing the cables and connectors may produce latent defects, compromise the integrity and/or reliability of the terminations, and potentially cause serious disruptions to network performance.

- 5 Accordingly, there is a need for smaller fiber optic connectors that will meet the needs of future developments in smaller SFPs and are reconfigurable for flexible deployment.

Summary of the Invention:

- 10 [0007] In a first aspect, the present disclosure provides a reversible polarity fiber optic connector including at least first and second optical ferrules and a connector housing at least partially surrounding the first and second optical ferrules. The housing has a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules. A latch coupling is positioned
- 15 on each of the first and second exterior walls of the housing. A removable latch may engage either the first or second exterior wall latch coupling on the connector housing. Positioning the removable latch on the first exterior wall yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall yields a fiber optic connector with a second, opposite polarity.
- 20 [0008] In another aspect, the present disclosure provides a reversible polarity fiber optic connector with exchangeable arms for changing connector type. Thus, a common connector body may be formed into different connector types. The connector includes at least first and second optical ferrules and a common connector housing at least partially surrounding the first and second optical ferrules. The housing has a first exterior

wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules. A coupling surface is positioned on each of the first and second exterior walls of the common connector housing. To create a connector, a removable arm engages either the first or second exterior wall coupling surface; the removable arm includes either a latch or a latch recess depending upon the type of optical connector to be formed. Further, positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with a second, opposite polarity.

[0009] In another aspect, the present disclosure provides a reversible polarity fiber optic connector with a push-pull tab. The connector includes at least first and second optical ferrules and has a connector housing at least partially surrounding the first and second optical ferrules. A first exterior wall is positioned above the first and second optical ferrules and a second exterior wall is positioned beneath the first and second optical ferrules. A first aperture is in the first exterior wall of the housing and a second aperture is in the second exterior wall of the housing. A removable push-pull tab includes a protrusion for positioning within either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing. Positioning the removable push-pull tab with its protrusion within the first aperture yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion within the second aperture yields a fiber optic connector with a second, opposite polarity.

[0010] In yet another aspect, the present disclosure provides a reversible polarity fiber optic connector including at least first and second optical ferrules and a connector

housing at least partially surrounding the first and second optical ferrules. A first exterior wall is positioned above the first and second optical ferrules and a second exterior wall is positioned beneath the first and second optical ferrules. A removable push-pull tab is provided. A first push-pull tab retainer is positioned on the first exterior wall and a second
5 push-pull tab retainer is positioned on the second exterior wall. Positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second, opposite polarity.

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Brief Description of the Drawings:

[0011] FIG. 1A is a perspective view of one embodiment of a reversible polarity fiber optic connector according to some aspects of the present disclosure;

15 [0012] FIG. 1B is a side view of the reversible polarity fiber optic connector of FIG. 3A with the removable latch being removed from the connector housing;

[0013] FIG. 2A is a perspective view of the reversible polarity fiber optic connector of FIG. 1A;

20 [0014] FIG. 2B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 2A;

[0015] FIG. 2C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 2A;

[0016] FIG. 2D is a perspective view of the fiber optic connector of FIG. 1A with its polarity reversed;

[0017] FIG. 3A is a perspective view of an embodiment of a reversible polarity fiber optic connector with a pull tab according to aspects of the present disclosure;

[0018] FIG. 3B is an exploded view of the reversible polarity fiber optic connector of FIG. 3A;

5 [0019] FIG. 4A is a perspective view of the polarity of the reversible polarity fiber optic connector of FIG. 3A;

[0020] FIG. 4B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 4A;

10 [0021] FIG. 4C.1 is an exploded view of positioning the latch in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 4A;

[0022] FIG. 4C.2 is an exploded view of attaching the removed components of FIG. 4B in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 4A;

15 [0023] FIG. 4D is a perspective view of the reversible polarity fiber optic connector of FIG. 4A with its polarity reversed;

[0024] FIG. 5A is a perspective view of another embodiment of a reversible polarity fiber optic connector with a pull tab according to aspects of the present disclosure;

[0025] FIG. 5B is an exploded view of the reversible polarity fiber optic connector of FIG. 5A;

20 [0026] FIG. 6A is a perspective view of the polarity of the fiber optic connector of FIG. 5A;

[0027] FIG. 6B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 5A;

[0028] FIG. 6C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 6A;

[0029] FIG. 6D is a perspective view of the reversible polarity fiber optic connector of FIG. 6A with its polarity reversed;

5 [0030] FIG. 7A is a perspective view of a common connector housing of a reversible polarity fiber optic connector with exchangeable arms for changing connector type in an embodiment according to aspects of the present disclosure;

[0031] FIG. 7B is the front view of the common connector housing of FIG. 7A;

[0032] FIG. 7C is the top view of the common connector housing of FIG. 7A;

10 [0033] FIG. 7D is the side view of the common connector housing of FIG. 7A;

[0034] FIG. 8A.1 shows how the common connector housing of FIG. 7A is used to create a latch-type connector;

[0035] FIG. 8A.2 is an exploded view of FIG. 8A.1;

15 [0036] FIG. 8B.1 shows how the common connector housing of FIG. 7A is used to create a recess-type connector;

[0037] FIG. 8B.2 is an exploded view of FIG. 8B.1;

[0038] FIG. 9A is a perspective view of FIG. 8A.1 of the polarity of the latch-type fiber optic connector of FIG. 8A.1;

20 [0039] FIG. 9B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 8A.1;

[0040] FIG. 9C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 8A.1;

[0041] FIG. 9D is a perspective view of the reversible polarity fiber optic connector of FIG. 8A.1 with its polarity reversed;

[0042] FIG. 10A is a perspective view of FIG. 8B.1 of the polarity of the recess-type fiber optic connector of FIG. 8B.1;

5 [0043] FIG. 10B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 8B.1;

[0044] FIG. 10C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 8B.1;

10 [0045] FIG. 10D is a perspective view of the reversible polarity fiber optic connector of FIG. 8B.1 with its polarity reversed;

[0046] FIGS. 11A and 11B respectively depict exploded and perspective views of a reversible polarity optical connector according to a further embodiment of the disclosure;

15 [0047] FIGS. 12A-12D depict the operation of the reversible polarity optical connector of FIGS. 11A and 11B;

[0048] FIGS. 13A-13D depict the process for changing the polarity of the optical connector of FIGS. 11A and 11B;

20 [0049] FIGS. 14A and 14B respectively depict exploded and perspective views of a reversible polarity optical connector according to a further embodiment of the disclosure;

[0050] FIGS. 15-15D depict the operation of the reversible polarity optical connector of FIGS. 14A and 14B;

[0051] FIGS. 16A-16D depict the process for changing the polarity of the optical connector of FIGS. 14A and 14B;

[0052] FIGS. 17A-17C respectively depict perspective, partial cross-section, and exploded views of a reversible polarity optical connector according to a further embodiment of the disclosure;

[0053] FIGS. 18A-18D depict the assembly of the push-pull tab to the connector body of the connector of FIGS. 17A-17C;

[0054] FIGS. 19A-19B depict the removal of the push-pull tab from the connector body using a tool;

[0055] FIGS. 20A-20D depict the process for changing the polarity of the optical connector of FIGS. 17A-17C.

Detailed Description:

[0056] This disclosure is not limited to the particular systems, devices and methods described, as these may vary. The terminology used in the description is for the purpose of describing the particular versions or embodiments only, and is not intended to limit the scope.

[0057] As used in this document, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art. Nothing in this disclosure is to be construed as an admission that the embodiments described in this disclosure are not entitled to antedate such disclosure by virtue of prior invention. As used in this document, the term "comprising" means "including, but not limited to."

[0058] The following terms shall have, for the purposes of this application, the respective meanings set forth below.

[0059] The connectors of the present disclosure may be configured for fiber optic transmission or electrical signal transmission. The connector may be any suitable type now
5 known or later developed, such as, for example, a ferrule connector (FC), a fiber distributed data interface (FDDI) connector, an LC connector, a mechanical transfer (MT) connector, a square connector (SC) connector, an SC duplex connector, or a straight tip (ST) connector. The connector may generally be defined by a connector housing. In some embodiments, the housing may incorporate any or all of the components described herein.

10 [0060] Various embodiments described herein generally provide a remote release mechanism such that a user can remove cable assembly connectors that are closely spaced together without damaging surrounding connectors, accidentally disconnecting surrounding connectors, disrupting transmissions through surrounding connectors, and/or the like. Various embodiments also provide narrow pitch LC duplex connectors and
15 narrow width multi-fiber connectors.

[0061] As discussed herein, current connectors may be improved by various means, such as, for example, reducing the footprint, increasing the structural strength, enabling polarity changes, etc. Various embodiments disclosed herein offer improvements over the current state of the art, as will be further discussed below.

20 [0062] In some embodiments, the fiber optic connector may be a narrow pitch duplex LC connector including two LC connectors. In some embodiments, such as that shown, the two LC connectors may comprise a single combined unit. In alternative embodiments, the LC connectors may be separate members, wherein an air gap exists

between the two members, or wherein the two separate members are located adjacent and flush to each other (i.e., no air gap exists). In some embodiments, each of the LC connectors includes a respective ferrule and a respective extending member or modular arm. The connector may have a pitch of 4.8 mm, defined as the axis-to-axis distance between the central axes of the LC connectors. In other embodiments, the connector pitch may be less than that of the pitch of conventional connectors, for example less than 6.25 mm and less than about 5.25 mm. In some embodiments, the pitch may be about 4.8 mm or less.

[0063] In current designs, if a fiber optic connector, particularly a duplex connector, needs to have the ferrules rotated or swapped, for example, for exchanging transmit and receive optical fibers, it can be a time consuming and difficult process. Generally, if a duplex connector needs to be rotated, current systems require twisting the individual LC connector tips 180 degrees. However, this process also twists the fibers that enter the connector tip. Twisting the fiber at any stage of the connection can cause wear and/or damage to the delicate fibers. Thus, most systems involve an alternative solution, wherein the duplex connector is partially or completely disassembled in order to access the ferrules or fibers and manually relocate them within the duplex connector. However, swapping ferrules side to side is a delicate operation. In order to prevent damage to the internal fibers, great care must be taken. Thus, this operation usually requires specialized tools and preparation time to perform safely and accurately.

[0064] Therefore, embodiments as described herein, allow for easy, quick, and safe swapping of the left and right side ferrules in a connector. Thus, embodiments discussed herein allow for a change in polarity of the duplex connector without twisting the fibers or performing any complex disassembly of the duplex connector.

[0065] FIGS. 1A and 1B depict a fiber optic connector with reversible polarity according to one aspect of the present disclosure. As shown in FIG. 1A, a reversible polarity fiber optic connector may include first and second optical ferrules 110a and 110b and a connector housing 120 at least partially surrounding the first and second optical ferrules. A removable latch 130 is depicted in FIG. 1A in its assembled state and in FIG. 1B removed from the connector housing 120.

[0066] FIG. 1B is a side view of the reversible polarity fiber optic connector of FIG. 1A with the removable latch 130 being separated from the connector housing. As shown, the connector housing 120 may have a first exterior wall 121a positioned above the first and second optical ferrules and a second exterior wall 121b positioned beneath the first and second optical ferrules. A latch coupling 122 is positioned on each of the first and second exterior walls of the housing. The removable latch 130 may include a protrusion 131 for engaging the housing latch coupling 122. In particular, the latch coupling 122 may include angled walls that interact with slanted edges of the protrusion 131 to prevent accidental disassembly of the latch 130. Although the latch coupling 122 is depicted as a recess on the housing accommodating a latch protrusion, these elements may be reversed with the latch including a recess and the housing including a protrusion. Other mechanical coupling mechanisms may be used to interconnect the housing and the removable latch. For example, an embodiment may involve a coupling system wherein the removable latch is inserted into a recess in the connector housing and twisted (e.g., 90°, 180°, etc.) to secure the latch to the recess. Alternative coupling may use a more complex shape. For example, a u-shaped recess in the connector housing may engage a cooperatively-shaped projection in the latch that is inserted and fed through the u-shape until secure. It should thus be

understood, that any system or method of coupling may be used to attach the removable latch to the connector housing, including various locations (e.g., sliding from the front, sides, back, bottom, top, etc.).

[0067] FIGS. 2A-2D depict the process for changing the polarity of the fiber optic connector of FIG. 1A from a first polarity, FIG. 2A to a second, opposite polarity, FIG. 2D. The removable latch 130 may be removed from the latch coupling on the first exterior wall of the connector housing, FIG. 2B, positioned adjacent the second exterior wall on beneath the ferrules, FIG. 2C, and then coupled with the latch coupling on the second exterior wall of the connector housing to yield a connector 100R, FIG. 2D, having the opposite polarity of connector 100. In this manner, transmit and receive optical fibers may be reversed without necessitating any fiber twist or complex repositioning of the optical ferrules.

[0068] In typical embodiments, the latch of the connector housing is required to be flexible. Thus, when a latch and a connector housing (e.g., duplex connector) are built as one unified member (as is currently done), the fiber optic connector is built of a similar flexible or less rigid material. Building the connector housing out of a plastic or polymeric material, limits the amount of rigidity that it can have. Thus, as fiber optic connectors continue to reduce in size, the strength of the housing has been reduced. Therefore, it would be advantageous to build the connector housing out of a more robust material while still allowing the latch to remain flexible. In order to accomplish this, in some embodiments according to aspects of the present disclosure, the connector housing may be manufactured out of a very rigid or strong material (e.g., steel, graphene, carbon, metal alloys, or any material of suitable properties). Because the connector housing and the removable latch

need only interlock with each other, the removable latch may still be made out of a more flexible material. Thus, the removable nature of the latch disclosed herein allow for a more robust and secure overall design when dealing with the shrinking footprint of fiber optic connectors.

5 [0069] FIG. 3A is a perspective view of another embodiment of a reversible polarity fiber optic connector 300. As shown, the reversible polarity fiber optic connector may further comprise a pull tab 340 for engaging a removable latch 330. The pull tab 340 depresses the latch 330 as the tab is pulled in a direction away from the fiber optic ferrules.

[0070] FIG. 3B is an exploded view of the reversible polarity fiber optic
10 connector of FIG. 3A. As shown, the pull tab 340 may comprise a first opening 341 and a second opening 344. The first opening 341 is configured to allow the connector housing and the removable latch to pass through while the second opening is configured to accommodate the tip of the latch. The pull tab may further comprise a first deformable portion 342 and a second deformable portion 344. In operation, the first deformable
15 portion 342 cooperates with the second deformable portion 344 to depress the removable latch when the pull tab is pulled in a direction away from the ferrules.

[0071] FIGS. 4A-4D depict the process for changing the polarity of the fiber optic connector 300 from a first polarity, FIG. 4A to a second polarity 300R, FIG. 4D. The pull tab 340 may be disengaged from the connector housing 320 and the removable latch 330
20 on the first exterior wall of the connector housing, FIG. 2B. The removable latch is then detached from the latch coupling on the first exterior wall of the connector housing, FIG. 4C.1. Next, the removable latch is engaged with the latch coupling on the second exterior wall of the connector housing, beneath the ferrules, FIG. 4C.2. Finally, the pull tab 340 is

positioned surrounding the connector housing and engaging the removable latch tip, resulting in the assembled optical connector 300R having polarity opposite to that of connector 300, FIG. 4D.

[0072] FIG. 5A and 5B are a perspective view and exploded view, respectively,

5 of another embodiment of a reversible polarity fiber optic connector 500. The connector 500 includes a connector housing 520, a latch 530, and a pull tab 540. On the first and second exterior walls of connector housing 520 are latch couplings that include a groove 522. A recess 521 is also provided in the housing. The latch 530 includes a protrusion 531 that is received within groove 522. The latch further includes a projection 532 that is
10 received in the housing between the optical ferrules. The pull tab 540 includes an opening 541 for engaging the removable latch 530. A front protrusion 542 is configured to depress the removable latch 530 when the pull tab is pulled in a direction away from the ferrule side of the optical connector.

[0073] FIGS. 6A-6D depict the process for changing the polarity of the fiber optic
15 connector 500 from a first polarity, FIG. 6A to a second polarity, FIG. 6D. The pull tab 540 is disengaged from the connector housing and the removable latch 530 on the first exterior wall of the connector housing, FIG. 6B, and the removable latch is decoupled from the latch coupling on the first exterior wall of the connector housing. Then the removable latch may be coupled with the latch coupling on the second exterior wall of the connector
20 housing, beneath the optical ferrules in FIG. 6C, and the pull tab 540 is engaged with the connector housing and the removable latch on the second exterior wall of the connector housing to create reverse polarity connector 500R, FIG. 6D.

[0074] It is of interest within the optical connectivity industry to have multiple styles of optical connectors for multiple purposes and/or multiple implementation styles. Thus, in order to more easily provide flexibility, a solution is needed that allows for on-the-fly, in-the-field, or in manufacturing modification of the connector. The below
5 embodiment provides a universal type fiber optic connector which has a unique housing design that allows for different latches or arms to be attached.

[0075] FIG. 7A is a perspective view of a common connector housing 720 of a reversible polarity fiber optic connector 700 with exchangeable arms for changing connector type in an embodiment according to aspects of the present disclosure. As shown,
10 the reversible polarity fiber optic connector may comprise first and second optical ferrules 710a and 710b and the common connector housing 720 at least partially surrounding the first and second optical ferrules.

[0076] FIG. 7B, 7C and 7D are the front view, top view and side view, respectively, of the common connector housing 720. As shown, the common connector
15 housing may have a first exterior wall 725a positioned above the first and second optical ferrules and a second exterior wall 725b positioned beneath the first and second optical ferrules. The connector housing 720 may further have a coupling surface 724 positioned on each of the first and second exterior walls and include a receiving track 726 in the coupling surface.

20 [0077] FIG. 8A.1 shows the common connector housing 720 used to create a latch-type connector 700 and FIG. 8B.1 shows the common connector housing 720 used to create a recess-type connector 800. Both of connectors 700 and 800 include a removable arm 730 or 830 for engaging either of the first and second exterior wall coupling surfaces

724 on the connector housing, FIGS. 8A.2 and 8B.2 respectively. The removable arms 730 and 830 may each respectively include a projection 735 or 835 for engaging in the receiving track 726 of the coupling surface 724, FIGS. 8A.2 and 8B.2 respectively. As with the previous embodiments, positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with the opposite polarity.

[0078] Still referring to FIG. 8A.2 and 8B.2 respectively the removable arms may include either a latch or a recess: removable arm 730 includes a latch 733 while removable arm 830 includes a recess 834. Thus, a latch-type connector 700 is created through assembly of the removable latch arm to the common connector body 720 as shown in FIG. 8A.1 and a recess-type connector 800 is created through assembly of the removable recess arm to the common connector body 720 as shown in FIG. 8B.1.

[0079] The fiber optic connector may further include a pull tab. When a removable arm with a latch 730 is positioned on the coupling surface of the common connector housing 720 to create a latch-type connector 700, the pull tab 740 is a separate element from the removable arm, FIG. 8A.2. When a removable arm includes a recess 830 is positioned on the coupling surface of the common connector housing 720 to create a recess-type connector 800, the pull tab 840 is integrated with the removable arm, FIG. 8B.2.

[0080] FIGS. 9A-9D depict the process for changing the polarity of the latch-type fiber optic connector from a first polarity 700, FIG. 9A to a second polarity 700R, FIG. 9D. The sub-assembly of the removable arm 730 and the pull tab 740 may be decoupled

from the coupling surface 724 of the first exterior wall of the connector housing, FIG. 9B. Then the sub-assembly of the removable arm 730 and the pull tab 740 may be coupled with the coupling surface of the second exterior wall of the connector housing, FIG. 9C, creating the opposite polarity connector 700R.

5 **[0081]** FIGS. 10A-10C depicts the process for changing the polarity of the recess-type fiber optic connector 800 from a first polarity, FIG. 10A to a second polarity, FIG. 10D. The removable arm 830 with a recess and a pull tab as an integral structure may be decoupled from the coupling surface 724 of the first exterior wall of the connector housing, FIG. 10B. Then the removable arm may be coupled with the coupling surface 724 of the
10 second exterior wall of the common connector housing 720, FIG. 10C to create opposite polarity optical connector 800R, FIG. 10D.

[0082] FIGS. 11A and 11B depict a further embodiment 1100 of the reversible polarity optical connectors of the present disclosure. In FIG. 11A, a push-pull tab 1130 may interconnect with either a first exterior wall 1110 of housing 1105 or with a second
15 exterior wall 1115 of housing 1105. Ferrules 1120 and 1125 are at least partially surrounded by housing 1105 and may be LC connectors in an embodiment. As in previous embodiments, the push-pull tab may include a tab recess 1145. Alternatively, push-pull tab 1130 may include a latch (not shown). Various features of the push-pull tab 1130 are provided to assist in affixing the push-pull tab to the first exterior wall 1110 or the second
20 exterior wall 1115 of the housing 1105. This includes push-pull tab clips 1135 that clip onto the optical connector, optionally in a boot region, and protrusion 1140 that fits within a first aperture, 1109A, beneath the housing exterior wall 1110 or a second aperture, 1109B, beneath housing exterior wall 1115 (to be discussed in more detail below), and

projection 1131 for inserting into the housing between ferrules 1120 and 1125. Each of these features is fully reversible such that the push-pull tab is easily removed and repositioned on the opposite exterior wall to change polarity of the connector.

[0083] As best seen in FIGS. 12B and 12D, push-pull tab protrusion 1140 may be inserted into first aperture 1109A of housing 1105 through a first exterior housing aperture 1107A. Alternatively, in the reverse-polarity configuration, the push-pull tab protrusion 1140 may be inserted into second housing aperture 1109B through second exterior housing aperture 1107B. When the push-pull tab 1130 is moved forward, the protrusion slides within the aperture 1109A or 1109B, as shown in FIG. 12B. To maintain the push-pull tab in a forward-biased position, tab position spring 1150 is provided. During insertion or removal of the protrusion 1140, tab position spring 1150 is compressed, depicted in FIG. 12B. When the position spring 1150 is in its relaxed (uncompressed) position, FIGS. 12C and 12D, the protrusion 1140 is slid forward within the aperture 1109A or 1109B.

[0084] To change polarity of the optical connector 1100, FIGS. 13A-13D, the push-pull tab 1130 is removed by withdrawing the protrusion 1140 from the housing 1105 through exterior housing aperture 1107A along with detaching clips 1135 and decoupling projection 1131, thus releasing the push-pull tab from the first exterior housing wall 1110 (FIG. 13B). The push-pull tab is moved toward second exterior housing wall 1115 and the protrusion 1140 is inserted into aperture 1109B through exterior housing aperture 1107B in FIG. 13C. Projection 1131 is fitted between ferrules 1120 and 1125 and clips 1135 are affixed to the connector. The resultant connector 1100R of 13D is of opposite polarity to the connector 1100 of FIG. 13A.

[0085] Various alternatives to the protrusion 1140 of optical connector 1100 may be used in the optical connectors of this disclosure. For example, the protrusion may be provided by the connector housing with receiving elements provided in the push-pull tab. Variations to the shape of the projection and apertures may be made without affecting the function of the reversible-polarity connector.

[0086] Another alternative embodiment is depicted in FIGS. 14A and 14B in which a hook-shaped protrusion 1440 is provided for engagement within the connector housing. As in the previous embodiment, the push-pull tab 1430 includes a tab recess 1445, connector-attachment clips 1435 and projection 1431 for positioning between ferrules 1420 and 1425. In FIG. 14B, the push-pull tab 1430 is positioned on first exterior housing wall 1410 and has a first polarity. In this position, the hook-shaped protrusion 1440 engages a housing projection 1460, held in a forward-biased position by push-pull tab position spring 1465, as seen in FIGS. 15B and 15D. To release the protrusion 1440, push-pull tab position spring 1465 is compressed in FIG. 15C such that housing projection 1460 is retracted sufficiently to allow removal of protrusion 1440 through the housing 1405, FIG. 15D.

[0087] To change polarity of the optical connector 1400 from the first polarity of FIG. 16A, the push-pull tab 1430 is removed by withdrawing the protrusion 1440 from the housing 1405 through the housing along with detaching clips 1435 and decoupling projection 1431, thus releasing the push-pull tab from the first exterior housing wall 1110 (FIG. 16B). The push-pull tab is moved toward second exterior housing wall 1415 and the protrusion 1440 is inserted into the housing 1405. Projection 1431 is fitted between ferrules 1420 and 1425 and clips 1435 are affixed to the connector in FIG. 16C. The

resultant connector 1400R of FIG. 16D is of opposite polarity to the connector of FIG. 16A.

[0088] Protrusions from a push-pull tab may be inserted into a housing via features other than a housing aperture. Such a connector is depicted in FIG. 17 and features a deformable housing region to allow entry of a push-pull tab protrusion during affixing of the push-pull tab to the connector housing. As seen in FIG. 17A, the connector 1700 includes a connector housing 1705 which may optionally include a back body housing portion 1709 for connecting with a housing front portion 1707 (FIG. 17C). The back body housing portion 1709 includes a deformable region 1780, seen in the partial cross-section of FIG. 17B and the perspective view of FIG. 17C. The push-pull tab 1730 includes a protrusion 1740 with a projection 1741 extending therefrom.

[0089] Turning to FIG. 18, to affix the push-pull tab to the connector housing, the protrusion 1740 penetrates the deformable region 1780 (FIG. 18B) causing the deformable region to yield and accept entry of the protrusion 1740 into the housing. As the projection 1741 enters the housing as depicted in FIG. 18C, the deformable region 1780 returns to its original position (FIG. 18D), securing the push-pull tab 1730 to the connector housing.

[0090] Removal of the push-pull tab 1730 is depicted in FIGS. 19A and 19B. A removal tool 1900, which may be shaped similar to a small screwdriver, depresses deformable region 1780, allowing projection 1741 to slide along an edge of the deformable region 1780, followed by the protrusion 1740, releasing the push-pull tab 1730.

[0091] To change polarity of the optical connector 1700 from the first polarity of FIG. 20A, the push-pull tab 1730 is removed in FIG. 20B by using the removal tool technique depicted in FIGS. 19A and 19B. The push-pull tab is moved toward the second

exterior housing wall and the protrusion 1740 is inserted into the housing 1705 through the deformable region 1780 in FIG. 20C. The resultant connector 1700R of FIG. 20D is of opposite polarity to the connector of FIG. 20A.

[0092] In another aspect of the disclosure, a retaining member may be provided

5 in the connector housing to retain a push-pull tab. As seen in FIGS. 21A-21D, a connector 2100 having a housing 2105 is provided with a housing front portion 2107 and a back portion 2109. FIG. 21A depicts an assembled connector 2100 with housing 2105. FIG. 21B depicts an exploded view of connector 2100 of FIG. 21A. Push-pull tab 2130 has a receiving surface 2132, which during use of connector 2100 provides a surface over which
10 retainer 2111 can slide across during tab movement. Extending from the housing back portion is a retainer 2111 which may include a pair of retaining clips, as shown, or any other structure configured to retain the push-pull tab 2130. FIG. 21C depicts connector 2100 showing a section view cut given by the arrows and broken line near the proximal end of connector 2100. Optionally, when the retainer 2111 includes clips, the clips may
15 be hook-shaped as seen in the cross-sectional view of FIG. 21D. As shown in FIG. 21D, receiving surface 2132 may be a recess with a protrusion along the edge that engages the hook-shaped edge of the clips.

[0093] FIG. 22A through FIG. 22E depicts the operation of polarity change for connector 2100 of FIG. 21A – FIG. 21D. FIG. 22A depicts connector 2100 with pull-push
20 tab clips 2135 (opposing side not shown) engaged around connector. To operate connector 2100, user can move push-pull tab 2130 forward or toward front of connector or backward or toward rear of connector, and as describe in FIG. 21 above tab moves along connector receiving surface 2123. This engages or releases connector 2100 from a receptacle as is

known in the art. To change the polarity of connector 2100 from the polarity depicted in FIG. 22A to the second, opposite polarity of FIG. 22E, the retainer 2111 is removed from receiving surface 2132. Referring to FIG. 21B, lifting push-pull tab 2130 in direction of up-arrow, separates retainer 2111 from receiving surface. As shown in FIG. 22C, push-pull tab clips separate from the connector as the retainer is removed. Continuing with FIG. 22C, push-pull tab 2130 is moved to the opposite housing exterior wall in FIG. 22C. FIG. 22D depicts receiving surface 2132 engages with the retainer 2111. In FIG. 21E the assembled connector 2100R having the opposite polarity to the connector of FIG. 22A is depicted, fully assembled. Retainer 2111 is in contact with receiving surface 2132, and push-pull tab 2130 is secured to connector body, as shown in FIG. 22E.

[0094] In the above detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description, drawings, and claims are not meant to be limiting. Other embodiments may be used, and other changes may be made, without departing from the spirit or scope of the subject matter presented herein. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the Figures, can be arranged, substituted, combined, separated, and designed in a wide variety of different configurations, all of which are explicitly contemplated herein.

[0095] The present disclosure is not to be limited in terms of the particular embodiments described in this application, which are intended as illustrations of various aspects. Many modifications and variations can be made without departing from its spirit

and scope, as will be apparent to those skilled in the art. Functionally equivalent methods and apparatuses within the scope of the disclosure, in addition to those enumerated herein, will be apparent to those skilled in the art from the foregoing descriptions. Such modifications and variations are intended to fall within the scope of the appended claims.

5 The present disclosure is to be limited only by the terms of the appended claims, along with the full scope of equivalents to which such claims are entitled. It is to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting.

[0096] With respect to the use of substantially any plural and/or singular terms
10 herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0097] It will be understood by those within the art that, in general, terms used
herein, and especially in the appended claims (for example, bodies of the appended claims)
15 are generally intended as “open” terms (for example, the term “including” should be interpreted as “including but not limited to,” the term “having” should be interpreted as “having at least,” the term “includes” should be interpreted as “includes but is not limited to,” et cetera). While various compositions, methods, and devices are described in terms of “comprising” various components or steps (interpreted as meaning “including, but not
20 limited to”), the compositions, methods, and devices can also “consist essentially of” or “consist of” the various components and steps, and such terminology should be interpreted as defining essentially closed-member groups. It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent

will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to embodiments containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (for example, "a" and/or "an" should be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation is explicitly recited, those skilled in the art will recognize that such recitation should be interpreted to mean at least the recited number (for example, the bare recitation of "two recitations," without other modifiers, means at least two recitations, or two or more recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, et cetera" is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (for example, "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, et cetera). In those instances where a convention analogous to "at least one of A, B, or C, et cetera" is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (for example, "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and

C together, B and C together, and/or A, B, and C together, et cetera). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either
5 of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

[0098] In addition, where features or aspects of the disclosure are described in terms of Markush groups, those skilled in the art will recognize that the disclosure is also thereby described in terms of any individual member or subgroup of members of the
10 Markush group.

[0099] As will be understood by one skilled in the art, for any and all purposes, such as in terms of providing a written description, all ranges disclosed herein also encompass any and all possible subranges and combinations of subranges thereof. Any listed range can be easily recognized as sufficiently describing and enabling the same range
15 being broken down into at least equal halves, thirds, quarters, fifths, tenths, et cetera. As a non-limiting example, each range discussed herein can be readily broken down into a lower third, middle third and upper third, et cetera. As will also be understood by one skilled in the art all language such as "up to," "at least," and the like include the number recited and refer to ranges which can be subsequently broken down into subranges as discussed above.
20 Finally, as will be understood by one skilled in the art, a range includes each individual member. Thus, for example, a group having 1-3 cells refers to groups having 1, 2, or 3 cells. Similarly, a group having 1-5 cells refers to groups having 1, 2, 3, 4, or 5 cells, and so forth.

[0100] Various of the above-disclosed and other features and functions, or alternatives thereof, may be combined into many other different systems or applications. Various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art, each of which is also intended to be encompassed by the disclosed embodiments.

5

Electronic Acknowledgement Receipt

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Information:					
2		s9300subsitute.pdf	1575715	yes	37
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	Abstract		37	37	
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3		s9300modified.pdf	1552493	yes	37
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

OPTICAL CONNECTORS WITH REVERSIBLE POLARITY

Cross-Reference to Related Patent Applications:

5 [0001] The present application claims priorities to United States Provisional Patent Applications No. 62/452,147 filed January 30, 2017, No. 62/457,150 filed February 9, 2017, No. 62/463,898 filed February 27, 2017, No. 62/463,901 filed February 27, 2017, No. 62/485,042 filed April 13, 2017, No. 62/546,920, filed August 17, 2017, and No. 62/581,961 filed November 6, 2017; the disclosures of which are incorporated herein by reference in their entireties.

10 Field of the Invention:

[0002] The present disclosure relates generally optical connectors with reversible polarity.

Background:

15 [0003] The prevalence of the Internet has led to unprecedented growth in communication networks. Consumer demand for service and increased competition has caused network providers to continuously find ways to improve quality of service while reducing cost.

20 [0004] Certain solutions have included deployment of high-density interconnect panels. High-density interconnect panels may be designed to consolidate the increasing volume of interconnections necessary to support the fast-growing networks into a compacted form factor, thereby increasing quality of service and decreasing costs such as floor space and support overhead. However, room for improvement in the area of data centers, specifically as it relates to fiber optic connections, still exists. For example, manufacturers of connectors are always looking to reduce the size of the devices, while

increasing ease of deployment, robustness, and modifiability after deployment. In particular, more optical connectors may need to be accommodated in the same footprint previously used for a smaller number of connectors in order to provide backward compatibility with existing data center equipment. For example, one current footprint is known as the small form-factor pluggable footprint (SFP). This footprint currently accommodates two LC-type ferrule optical connections. However, it may be desirable to accommodate four optical connections (two duplex connections of transmit/receive) within the same footprint. Another current footprint is the quad small form-factor pluggable (QSFP) footprint. This footprint currently accommodates four LC-type ferrule optical connections. However, it may be desirable to accommodate eight optical connections of LC-type ferrules (four duplex connections of transmit/receive) within the same footprint.

[0005] In communication networks, such as data centers and switching networks, numerous interconnections between mating connectors may be compacted into high-density panels. Panel and connector producers may optimize for such high densities by shrinking the connector size and/or the spacing between adjacent connectors on the panel. While both approaches may be effective to increase the panel connector density, shrinking the connector size and/or spacing may also increase the support cost and diminish the quality of service.

[0006] In a high-density panel configuration, adjacent connectors and cable assemblies may obstruct access to the individual release mechanisms. Such physical obstructions may impede the ability of an operator to minimize the stresses applied to the cables and the connectors. For example, these stresses may be applied when the user reaches into a dense group of connectors and pushes aside surrounding optical fibers and

connectors to access an individual connector release mechanism with his/her thumb and forefinger. Overstressing the cables and connectors may produce latent defects, compromise the integrity and/or reliability of the terminations, and potentially cause serious disruptions to network performance.

- 5 Accordingly, there is a need for smaller fiber optic connectors that will meet the needs of future developments in smaller SFPs and are reconfigurable for flexible deployment.

Summary of the Invention:

- 10 [0007] In a first aspect, the present disclosure provides a reversible polarity fiber optic connector including at least first and second optical ferrules and a connector housing at least partially surrounding the first and second optical ferrules. The housing has a first exterior wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules. A latch coupling is positioned
- 15 on each of the first and second exterior walls of the housing. A removable latch may engage either the first or second exterior wall latch coupling on the connector housing. Positioning the removable latch on the first exterior wall yields a fiber optic connector with a first polarity and positioning the removable latch on the second exterior wall yields a fiber optic connector with a second, opposite polarity.
- 20 [0008] In another aspect, the present disclosure provides a reversible polarity fiber optic connector with exchangeable arms for changing connector type. Thus, a common connector body may be formed into different connector types. The connector includes at least first and second optical ferrules and a common connector housing at least partially surrounding the first and second optical ferrules. The housing has a first exterior

wall positioned above the first and second optical ferrules and a second exterior wall positioned beneath the first and second optical ferrules. A coupling surface is positioned on each of the first and second exterior walls of the common connector housing. To create a connector, a removable arm engages either the first or second exterior wall coupling surface; the removable arm includes either a latch or a latch recess depending upon the type of optical connector to be formed. Further, positioning the removable arm on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable arm on the second exterior surface of the housing yields a fiber optic connector with a second, opposite polarity.

[0009] In another aspect, the present disclosure provides a reversible polarity fiber optic connector with a push-pull tab. The connector includes at least first and second optical ferrules and has a connector housing at least partially surrounding the first and second optical ferrules. A first exterior wall is positioned above the first and second optical ferrules and a second exterior wall is positioned beneath the first and second optical ferrules. A first aperture is in the first exterior wall of the housing and a second aperture is in the second exterior wall of the housing. A removable push-pull tab includes a protrusion for positioning within either of the first or second apertures in the first and second exterior walls, respectively, of the connector housing. Positioning the removable push-pull tab with its protrusion within the first aperture yields a fiber optic connector with a first polarity and positioning the removable push-pull tab with its protrusion within the second aperture yields a fiber optic connector with a second, opposite polarity.

[0010] In yet another aspect, the present disclosure provides a reversible polarity fiber optic connector including at least first and second optical ferrules and a connector

housing at least partially surrounding the first and second optical ferrules. A first exterior wall is positioned above the first and second optical ferrules and a second exterior wall is positioned beneath the first and second optical ferrules. A removable push-pull tab is provided. A first push-pull tab retainer is positioned on the first exterior wall and a second push-pull tab retainer is positioned on the second exterior wall. Positioning the removable push-pull tab in the retainer on the first exterior wall of the connector housing yields a fiber optic connector with a first polarity and positioning the removable push-pull tab in the retainer on the second exterior wall of the housing yields a fiber optic connector with a second, opposite polarity.

Brief Description of the Drawings:

[0011] FIG. 1A is a perspective view of one embodiment of a reversible polarity fiber optic connector according to some aspects of the present disclosure;

[0012] FIG. 1B is a side view of the reversible polarity fiber optic connector of FIG. 3A with the removable latch being removed from the connector housing;

[0013] FIG. 2A is a perspective view of the reversible polarity fiber optic connector of FIG. 1A;

[0014] FIG. 2B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 2A;

[0015] FIG. 2C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 2A;

[0016] FIG. 2D is a perspective view of the fiber optic connector of FIG. 1A with its polarity reversed;

[0017] FIG. 3A is a perspective view of an embodiment of a reversible polarity fiber optic connector with a pull tab according to aspects of the present disclosure;

[0018] FIG. 3B is an exploded view of the reversible polarity fiber optic connector of FIG. 3A;

5 [0019] FIG. 4A is a perspective view of the polarity of the reversible polarity fiber optic connector of FIG. 3A;

[0020] FIG. 4B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 4A;

10 [0021] FIG. 4C.1 is an exploded view of positioning the latch in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 4A;

[0022] FIG. 4C.2 is an exploded view of attaching the removed components of FIG. 4B in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 4A;

15 [0023] FIG. 4D is a perspective view of the reversible polarity fiber optic connector of FIG. 4A with its polarity reversed;

[0024] FIG. 5A is a perspective view of another embodiment of a reversible polarity fiber optic connector with a pull tab according to aspects of the present disclosure;

[0025] FIG. 5B is an exploded view of the reversible polarity fiber optic connector of FIG. 5A;

20 [0026] FIG. 6A is a perspective view of the polarity of the fiber optic connector of FIG. 5A;

[0027] FIG. 6B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 5A;

[0028] FIG. 6C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 6A;

[0029] FIG. 6D is a perspective view of the reversible polarity fiber optic connector of FIG. 6A with its polarity reversed;

5 [0030] FIG. 7A is a perspective view of a common connector housing of a reversible polarity fiber optic connector with exchangeable arms for changing connector type in an embodiment according to aspects of the present disclosure;

[0031] FIG. 7B is the front view of the common connector housing of FIG. 7A;

[0032] FIG. 7C is the top view of the common connector housing of FIG. 7A;

10 [0033] FIG. 7D is the side view of the common connector housing of FIG. 7A;

[0034] FIG. 8A.1 shows how the common connector housing of FIG. 7A is used to create a latch-type connector;

[0035] FIG. 8A.2 is an exploded view of FIG. 8A.1;

15 [0036] FIG. 8B.1 shows how the common connector housing of FIG. 7A is used to create a recess-type connector;

[0037] FIG. 8B.2 is an exploded view of FIG. 8B.1;

[0038] FIG. 9A is a perspective view of FIG. 8A.1 of the polarity of the latch-type fiber optic connector of FIG. 8A.1;

20 [0039] FIG. 9B is an exploded view of a step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 8A.1;

[0040] FIG. 9C is an exploded view of a next step in the process of changing the polarity of the reversible polarity fiber optic connector of FIG. 8A.1;