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CABLE PATCH PANEL WITH MOVABLE RETAINER

(57) Abstract:  
The present disclosure is directed to a cable patch panel (100) with a movable retaining member (104) for increasing accessibility to the panel during cable installation or maintenance. The patch panel (100) includes a retaining member (104) and a supporting member (106). The retaining member (104) holds at least one connector adapter (80). The supporting member (106) supports the retaining member (104) and moves the retaining member (104) between a locking position and a maintenance position. The supporting member (106) may hold the retaining member (104) at a locking angle in the locking position and at a maintenance angle in the maintenance position.
CABLE PATCH PANEL WITH MOVABLE RETAINER

BACKGROUND

[0002] Some fiber optic applications employ optical connectors and adapters for installation, interconnection and maintenance of optical fibers. Examples of such applications include multi-dwelling units, cabinets, local area networks and industrial networks. In these applications, optical fibers are typically connected to each other through the adapters mounted within patch panels, cabinets or racks. For example, a patch panel typically includes multiple connectors pre-installed into the back side of the adapters, thus providing partially populated adapters. The front side of the adapters provides multiple ports or sockets for receipt of multiple connectors of optical fibers. As such, the adapters allow fairly rapid connection and disconnection of the connectors of optical fibers.

[0003] The patch panels are typically designed to include a large number of optical connectors and adapters in a limited space. Further, the patch panels are frequently installed at areas that provide limited access to the patch panels. Thus, there may be limited access to the adapters and connectors for installation or interconnection (e.g., plugging or unplugging) of optical fibers during maintenance.

[0004] There is also a need for cable management to protect and organize fiber optic cables. For example, fiber optic cables are damaged and/or lose their signal transmission performance when excessive bending of the cables occurs. Thus, it is important to keep the fiber optic cables below their minimum bend radii during installation and/or maintenance.

SUMMARY

[0005] This disclosure is directed to a cable patch panel. In one possible configuration and by non-limiting example, the cable patch panel includes a movable retaining member for increasing accessibility to the panel during cable installation or maintenance. Various
aspects are described in this disclosure, which include, but are not limited to, the following aspects.

[0006] In one aspect, a patch panel unit includes a retaining member and a supporting member. The retaining member is configured to hold at least one connector adapter. The supporting member is configured to support the retaining member and move the retaining member between a locking position and a maintenance position. The supporting member may hold the retaining member at a locking angle in the locking position and at a maintenance angle in the maintenance position. The maintenance angle is different from the locking angle.

[0007] The supporting member may include a slot and a stopper. The stopper is configured to pivotally engage the retaining member between the locking angle and the maintenance angle. The slot is configured to slidably engage the retaining member between the locking position and the maintenance position. The retaining member may have opposing side plates including a tab. The tab is configured to be engaged with the stopper in the locking position and the slot in the maintenance position. The maintenance and locking angles may be defined as an angle between a longitudinal side plate axis of the opposing side plates and a longitudinal slot axis of the slot.

[0008] In another aspect, a patch panel system includes a frame, a retaining member, and a supporting member. The frame may have a base portion and opposing side portions extending from the base portion. The retaining member may have a face plate and opposing side plates extending from the face plate along a longitudinal side plate axis. The retaining member may include at least one adapter engaging opening at the face plate. The at least one adapter engaging opening is configured to engage at least one connector adapter. The supporting member may include a tab, a slot, and a stopper. The tab protrudes from at least one of the opposing side plates of the retaining member and longitudinally extends at a tab angle along a longitudinal tab axis relative to the longitudinal side plate axis. The slot is formed in at least one of the opposing side portions of the frame. At least part of the slot longitudinally extends along a longitudinal slot axis and is configured to slidably engage the tab therealong when the longitudinal tab axis is in line with the longitudinal slot axis. The stopper is formed in the at least one of the opposing side portions of the frame and is associated with the slot to allow the tab to move between the slot and the stopper. The stopper is configured to retain the tab. The retaining member may be held by the frame and movable between a maintenance position and a locking position. The retaining member may be in the maintenance position when
the slot engages the tab with the longitudinal tab axis in line with the longitudinal slot axis. The retaining member may be in the locking position when the stopper engages the tab with the longitudinal tab axis not in line with the longitudinal slot axis.

[0009] Yet another aspect is a method of supporting a retaining member for at least one fiber optic adapter. The method may include engaging a tab of the retaining member into a stopper of a frame to secure the retaining member to the frame in a locking position, rotating the retaining member about the tab within the stopper to move the retaining member from the locking position to a transition position, and sliding the retaining member along a slot of the frame to support the retaining member in a maintenance position. The method may further include sliding the retaining member into the stopper along the slot of the frame to arrange the retaining member in the transition position, and rotating the retaining member about the tab within the stopper from the transition position to the locking position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a partial perspective view of a patch panel system in accordance with an example of the present disclosure.

[0011] FIG. 2 is a perspective view of the patch panel system of FIG. 1 with a retaining member in a locking position.

[0012] FIG. 3 is a perspective view of the retaining member of FIG. 2 with an example tab.

[0013] FIG. 4 is a schematic view of an example tab engaging portion of a frame of FIG. 2.

[0014] FIG. 5 is a perspective view of the retaining member of FIG. 2 in a transition position.

[0015] FIG. 6 is a perspective view of the retaining member of FIG. 2 in the maintenance position.

[0016] FIGS. 7A and 7B are a perspective view of an example patch panel unit.

DETAILED DESCRIPTION

[0017] Various embodiments will be described in detail with reference to the drawings, wherein like reference numerals represent like parts and assemblies throughout the several views. Reference to various embodiments does not limit the scope of the
claims attached hereto. Additionally, any examples set forth in this specification are not intended to be limiting and merely set forth some of the many possible embodiments for the appended claims.

[0018] FIG. 1 is a partial perspective view of a patch panel system 100 in accordance with an example of the present disclosure. The patch panel system 100 can include a frame 102, a retaining member 104, and a supporting member 106.

[0019] The frame 102 is configured to support the retaining member 104 between a locking position (FIG. 2) and a maintenance position (FIG. 6). The frame 102 can include a base portion 110 and opposing side portions 112 and 114. The base portion 110 can be used to install the frame 102 to a predetermined area. The opposing side portions 112 and 114 extend from the base portion 110 and are arranged in parallel. In some embodiments, the opposing side portions 112 and 114 are configured to movably (e.g., pivotally and/or slidably) support the retaining member 104. As depicted, a plurality of the retaining members 104 can be engaged between the opposing side portions 112 and 114.

[0020] The retaining member 104 operates to hold at least one fiber optic adapter 80. One example of the retaining member 104 is illustrated and described in more detail with reference to FIGS. 2 and 4.

[0021] In some embodiments, the adapters 80 are configured to align and connect optical fibers therewithin. The adapters 80 can be populated with a plurality of first optical connectors 82 at first ends 84 and a plurality of second optical connectors 86 at second ends 88. A plurality of first optical fiber cables 90 are terminated with the first connectors 82 and loaded into the adapters 80 at the first ends 84. A plurality of second optical fiber cables 92 are terminated with the second connectors 86 and plugged into the adapters 80 at the second ends 88 to be connected to the first optical fiber cables 90. In some embodiments, the adapters 80 have first and second ports or sockets at the first and second ends 84 and 88 to engage the first and second connectors 82 and 86, respectively. In some embodiments, the first connectors 82 are pre-installed into the adapters 80 at the first ends 84 and ready for interconnection with the second connectors 86 engaged into the adapters 80 at the second ends 88.

[0022] The supporting member 106 is configured to support the retaining member 104 and move the retaining member 104 relative to the frame 102 between the locking position (FIG. 2) and the maintenance position (FIG. 6). The supporting member 106 holds the retaining member 104 at a locking angle (ANG_L) relative to the frame 102 in the locking position and at a maintenance angle (ANG_M) relative to the frame 102 in the maintenance
position. The locking angle (ANG_L) and the maintenance angle (ANG_M) can be defined as an angle between a longitudinal side plate axis (Ap) of the retaining member 104 (FIG. 2) and a longitudinal slot axis (Ap) of the frame 102 (FIG. 3). In one example, the locking angle (ANG_L) is zero degree, as shown in FIG. 2, and the maintenance angle (ANG_M) ranges between zero to 45 degree upwards with respect to the base portion 110 of the frame 102. One example of the supporting member 106 is illustrated and described in more detail with reference to FIGS. 2-4.

[0023] In some embodiments, the patch panel system 100 can be configured to stack multiple rows of adapters and connectors. In the depicted example, the patch panel system 100 includes two rows 190 and 192 of adapters and connectors, which are vertically arranged. The rows 190 and 192 can be configured identically. For example, each of the rows 190 and 192 includes the retaining member 104 and the supporting member 106. In some embodiments, the first row 190 is configured such that a tab 130 is movable along a tag engaging portion 132 between the locking position and the maintenance position (FIG. 2) as described below, while the second row 192 is configured to be fixed to the frame 102 (FIG. 1). For example, the frame 102 does not have the tab engaging portion 132 (FIG. 2) for the second row 192 while it has the tab engaging portion 132 for the first row 190.

[0024] FIG. 2 is a perspective view of the patch panel system 100 of FIG. 1 with the retaining member 104 in the locking position.

[0025] As depicted, the retaining member 104 can include a face plate 118 and opposing side plates 122 and 124. The opposing side plates 122 and 124 extend from the face plate 118 along a longitudinal side plate axis (Ap) and are configured in parallel. The retaining member 104 further includes at least one adapter engaging opening 126 at the face plate 118. The adapter engaging openings 126 are configured to secure the adapters 80 in place.

[0026] The supporting member 106 can include a tab 130 and a tab engaging portion 132. One example of the tab 130 is illustrated and described with reference to FIG. 3. One example of the tab engaging portion 132 is illustrated and described with reference to FIG. 4.

[0027] FIG. 3 is a perspective view of an example tab 130 of the retaining member 104 of FIG. 2. The tab 130 protrudes from at least one of the opposing side plates 122 and 124 of the retaining member 104 and longitudinally extends along a longitudinal tab axis (ANG_T). The tab 130 is tilted at a tab angle (ANGT) relative to the longitudinal side plate
axis (Ap). The tab angle (ANG1) is defined as an angle between the longitudinal tab axis (AT) and the longitudinal side plate axis (Ap).

[0028] As depicted, the tab 130 includes first and second engaging surfaces 136 and 138 that are arranged in parallel with the longitudinal tab axis (AT). The first engaging surface 136 is arranged opposite to the second engaging surface 138 with respect to the longitudinal tab axis (AT). The tab 130 further includes first and second retaining surfaces 140 and 142 that are spaced apart along the longitudinal tab axis (Ap). In some embodiments, the first and second engaging surfaces 136 and 138 and the first and second retaining surfaces 140 and 142 form substantially a rectangular shape of the tab 130.

[0029] In some embodiments, the tab 130 can be provided on both of the side plates 122 and 124 of the retaining member 104. In other embodiments, the tab 130 can be provided on only one of the side plates 122 and 124 of the retaining member 104.

[0030] FIG. 4 is a schematic view of an example tab engaging portion 132 of the side portion 112, 114 of FIG. 2. The tab engaging portion 132 can include a slot 150 and a stopper 152.

[0031] The slot 150 can be provided in the side portion 112, 114 of the frame 102. At least part of the slot 150 longitudinally extends along a longitudinal slot axis (As) and configured to slidably engage the tab 130 along the longitudinal slot axis (As) when the longitudinal tab axis (AT) is in line with the longitudinal slot axis (As), as shown in FIG. 5 (the transition position) and FIG. 6 (the maintenance position).

[0032] In some embodiments, the slot 150 can have first and second inner slot surfaces 156 and 158 that are arranged in parallel with the longitudinal slot axis (As). The first and second inner slot surfaces 156 and 158 are configured to slidably engage the first and second engaging surfaces 136 and 138 of the tab 130, respectively, along the longitudinal slot axis (As).

[0033] The stopper 152 is configured to retain the tab 130 at the locking angle (ANG1), which is defined as an angle of the longitudinal side plate axis (Ap) relative to the longitudinal slot axis (As) in the locking position, as shown in FIG. 2. The stopper 152 can be provided in the side portion 112, 114 and associated with the slot 150 to permit the tab 130 to move between the slot 150 and the stopper 152.

[0034] In some embodiments, the stopper 152 can be arranged at a portion of the slot 150 and include first and second notches 160 and 162. The first and second notches 160 and 162 are formed on the first and second inner slot surfaces 156 and 158, respectively, and configured to engage at least part of the first and second retaining surfaces 140 and
142, respectively, in the locking position. As such, the stopper 152 is configured to permit the retaining member 104 to pivot about the tab 130 therewithin between the locking position (FIG. 2) and the transition position (FIG. 5).

[0035] In some embodiments, the tab engaging portion 132 can be provided on both of the side portions 112 and 114 of the frame 102 to correspond to the tabs 130 that are provided on both of the side plates 122 and 124 of the retaining member 104. In other embodiments, the tab engaging portion 132 can be provided on only one of the side portions 112 and 114 of the frame 102 to correspond to the tab 130 that is provided on only one of the side plates 122 and 124 of the retaining member 104.

[0036] In some embodiments, the longitudinal slot axis (As) can be configured to be in parallel with the base portion 110 of the frame 102. Further, the stopper can be configured to retain the tab 130 with the longitudinal side plate axis (Ap) of the retaining member 104 in parallel with the longitudinal slot axis (As) of the frame 102 when the retaining member 104 is in the locking position. In this configuration, the locking angle (ANG_L) is zero and the maintenance angle (ANG_M) is equal to the tab angle (ANG_t), as explained below.

[0037] Referring to FIGS. 2, 5 and 6, an example operation of the retaining member 104 between the locking position and the maintenance position is illustrated and described. As shown above, the retaining member 104 is in the locking position in FIG. 2. FIG. 5 is a perspective view of the retaining member 104 of FIG. 2 in a transition position, and FIG. 6 is a perspective view of the retaining member 104 of FIG. 2 in the maintenance position. The retaining member 104 can move either from the locking position to the maintenance position through the transition position, or vice versa.

[0038] As illustrated in FIG. 2, the retaining member 104 is in the locking position. In the locking position, the tab 130 of the retaining member 104 is engaged with the stopper 152 of the frame 102. In some embodiments, the stopper 152 is configured to retain the tab 130 so that the retaining member 104 is held at the locking angle (ANG_L) in the locking position, which is defined as an angle of the longitudinal side plate axis (Ap) relative to the longitudinal slot axis (As). In the depicted example, the locking angle (ANG_L) is zero, and the longitudinal side plate axis (Ap) and the longitudinal slot axis (As) are in parallel. Where the longitudinal slot axis (As) is arranged in parallel with the base portion 110 of the frame 102, as depicted, the retaining member 104 is held in parallel with the base portion 110 of the frame 102 in the locking position.

[0039] As illustrated in FIG. 5, the retaining member 104 is in the transition position. The retaining member 104 can be in the transition position before it completely moves to
either the locking position or the maintenance position. For example, the retaining member 104 moves from the locking position to the transition position before it finally moves to the maintenance position. To be moved from the locking position to the maintenance position, the retaining member 104 is rotated or pivoted about the tab 130 within the stopper 152 from the locking angle (ANG_L) and the maintenance angle (ANG_M). As the retaining member 104 is pivoted, the first and second retaining surfaces 140 and 142 of the tab 130 are disengaged from the first and second notches 160 and 162 of the stopper 152 until the longitudinal tab axis (A_p) is in line with the longitudinal slot axis (As). As a result, the retaining member 104 is rotated to the maintenance angle (ANG_M) between the longitudinal side plate axis (A_p) and the longitudinal slot axis (A_s).

In the orientation of FIG. 5, the retaining member 104 is pivoted up about the tab 130 at the maintenance angle (ANG_M). As the longitudinal tab axis (As) is in line with the longitudinal slot axis (As) in the transition position, the maintenance angle (ANG_M) is equal to the tab angle (ANGL).

[0040] As illustrated in FIG. 6, the retaining member 104 is in the maintenance position. In the maintenance position, the retaining member 104 is held by the side portions 112 and 114 of the frame 102 at the maintenance angle (ANG_M). The retaining member 104 can move from the transition position to the maintenance position. Once the retaining member 104 is in the transition position, the retaining member 104 can be slid from the stopper 152 to the slot 150 along the longitudinal slot axis (As) to move the retaining member 104 from the transition position to the maintenance position. As the retaining member 104 moves from the transition position to the maintenance position, the tab 130 of the retaining member 104 is slid out from the stopper 152 to the slot 150. The tab 130 is slidably engaged with the slot 150 along the longitudinal slot axis (A_s), but constrained within the slot 150 so that the retaining member 104 is prevented from being rotated. Thus, the retaining member 104 remains held by the frame 102 at the maintenance angle (ANG_M) when the tab 130 is engaged with the slot 150 in the maintenance position. As such, the maintenance angle (A_M) is equal to the tab angle (ANGL) because the longitudinal tab axis (As) remains in line with the longitudinal slot axis (As) in the maintenance position. In the orientation of FIG. 6, the retaining member 104 is raised up so that the face plate 108 faces upwards at the maintenance angle (A_M).

[0041] As described, the retaining member 104 exposes the face plate 118 thereof over the frame 102 in the maintenance position so that the fiber optic adapters 80 secured in the face plate 118 are easily accessible during installation or maintenance of the second fiber.
optic connectors 86 at the second ends 88. For example, when the patch panel system 100 is installed in a limited space adjacent the floor, access to the adapters 80 mounted on the retaining member 104 of the patch panel system 100 can be limited due to the geometry of the retaining member 104 relative to the frame 102 in the locking position. However, when the retaining member 104 is moved to the maintenance position, the retaining member 104 is tilted at the maintenance angle (ANG_M) with respect to the frame 102 so that the face plate 118 is exposed over the frame 102, increasing accessibility thereto.

[0042] In the maintenance position, the retaining member 104 also improves access to the adjacent row (second row) 192 of adapters and connectors by moving the first row 190 of the adapters and connectors of the retaining member 104 away from the second row 192, as shown in FIG. 1.

[0043] Further, the retaining member 104 angled in the maintenance position can provide strain relief to the fiber optic cables 92 so as to help prevent cable damage and/or loss of cable performance during installation or maintenance. The tilted retaining member 104 helps reduce the likelihood of falling below the minimum bend radius of the cable as the cable travels to the adapter 80 during installation or maintenance.

[0044] FIGS. 7A and 7B are a perspective view of an example patch panel unit 200. As depicted, in some embodiments, the opposing side portions 112 and 114 can be part of the patch panel unit 200 with one or more retaining members 104 and supporting members 106 (for one or more rows 190 and 192 of connectors and adapters), and can be separate from the rest of a frame 202. In some embodiments, the frame 202 for the patch panel unit 200 need not have the base portion 110 as illustrated above. The patch panel unit 200, as illustrated, can be used to populate a frame 202 or any other structure as desired, such as a rack or a cabinet. The patch panel unit 200 can be used singly, with or without the row 190, or in a stack as desired. The patch panel unit 200 can be used in multiples across a horizontal space in the frame 202, such as a rack, a cabinet, or any other structure suitable for securing one or more of the patch panel unit 200.

[0045] The various embodiments described above are provided by way of illustration only and should not be construed to limit the claims attached hereto. Those skilled in the art will readily recognize various modifications and changes that may be made without following the example embodiments and applications illustrated and described herein, and without departing from the true spirit and scope of the following claims.
### List of Reference Numerals and Corresponding Features

<table>
<thead>
<tr>
<th>Reference Numeral</th>
<th>Corresponding Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>adapter</td>
</tr>
<tr>
<td>82</td>
<td>first connectors</td>
</tr>
<tr>
<td>84</td>
<td>first ends</td>
</tr>
<tr>
<td>86</td>
<td>second connectors</td>
</tr>
<tr>
<td>88</td>
<td>second ends</td>
</tr>
<tr>
<td>90</td>
<td>first optical fiber cables</td>
</tr>
<tr>
<td>92</td>
<td>fiber optic cables</td>
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<tr>
<td>100</td>
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</tr>
<tr>
<td>102</td>
<td>frame</td>
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<tr>
<td>104</td>
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</tr>
<tr>
<td>106</td>
<td>supporting member</td>
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<tr>
<td>118</td>
<td>face plate</td>
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<tr>
<td>122</td>
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</tr>
<tr>
<td>124</td>
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<td>126</td>
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<tr>
<td>130</td>
<td>tab</td>
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<tr>
<td>132</td>
<td>tab engaging portion</td>
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<td>first engaging surface</td>
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<td>138</td>
<td>second engaging surface</td>
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<td>150</td>
<td>slot</td>
</tr>
<tr>
<td>152</td>
<td>stopper</td>
</tr>
<tr>
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<td>first inner slot surfaces</td>
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<tr>
<td>158</td>
<td>second inner slot surfaces</td>
</tr>
<tr>
<td>160</td>
<td>first notches</td>
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<tr>
<td>162</td>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>202</td>
<td>frame</td>
</tr>
</tbody>
</table>
WHAT IS CLAIMED IS:

1. A patch panel unit (100) comprising:
   a retaining member (104) configured to hold at least one connector adapter (80); and
   a supporting member (106) configured to support the retaining member (104) and move the retaining member (104) between a locking position and a maintenance position, wherein the supporting member (106) holds the retaining member (104) at a locking angle (ANG_L) in the locking position and at a maintenance angle (ANG_M) in the maintenance position, the maintenance angle (ANG_M) different from the locking angle (ANG_L).

2. The patch panel unit (100) of claim 1, wherein the supporting member (106) includes a slot (150) and a stopper (152), the stopper (152) configured to pivotally engage the retaining member (104) between the locking angle (ANG_L) and the maintenance angle (ANG_M), and the slot (150) configured to slidably engage the retaining member (104) between the locking position and the maintenance position.

3. The patch panel unit (100) of claim 2, wherein the retaining member (104) has opposing side plates (122, 124) including a tab (130), the tab (130) configured to be engaged with the stopper (152) in the locking position and the slot (150) in the maintenance position.

4. The patch panel unit (100) of claim 3, wherein the maintenance and locking angles (ANG_L, ANG_M) are defined as an angle between a longitudinal side plate axis (AP) of the opposing side plates (122, 124) and a longitudinal slot axis (AS) of the slot (150).

5. The patch panel unit (100) of claim 4, wherein the locking angle (ANG_L) is zero.

6. The patch panel unit (100) of claim 4, wherein the maintenance angle (ANG_M) ranges between zero and 45 degrees.

7. A patch panel system (100) comprising:
a frame (102) having a base portion (110) and opposing side portions (112, 114)
 extending from the base portion (110);

a retaining member (104) having a face plate (108) and opposing side plates (122, 124)
 extending from the face plate (108) along a longitudinal side plate axis (A_p), the
 retaining member (104) including at least one adapter engaging opening (126) at the face
 plate (108), wherein the at least one adapter engaging opening (126) is configured to
 engage at least one connecter adapter (80); and

a supporting member (106) comprising:

a tab (130) protruding from at least one of the opposing side plates (122, 124) of the retaining member (104) and longitudinally extending at a tab angle
(ANG1) along a longitudinal tab axis (A_t) relative to the longitudinal side plate
axis (A_p);

a slot (150) formed in at least one of the opposing side portions (112, 114)
 of the frame (102), at least part of the slot (150) longitudinally extending along
 a longitudinal slot axis (As) and configured to slidably engage the tab (130)
 therealong when the longitudinal tab axis (Ap) is in line with the longitudinal
 slot axis (As); and

a stopper (152) formed in the at least one of the opposing side portions
(112, 114) of the frame (102) and associated with the slot (150) to allow the tab
(130) to move between the slot (150) and the stopper (152), the stopper (152)
 configured to retain the tab (130),

wherein the retaining member (104) is held by the frame (102) and movable
between a maintenance position and a locking position,

wherein the retaining member (104) is in the maintenance position when the slot
(150) engages the tab (130) with the longitudinal tab axis (A_t) in line with the longitudinal
slot axis (A_s), and

wherein the retaining member (104) is in the locking position when the stopper
(152) engages the tab (130) with the longitudinal tab axis (A_t) not in line with the
longitudinal slot axis (As).

8. The patch panel system (100) of claim 7, wherein the retaining member (104) is
held by the frame (102) at a maintenance angle (ANG_M) in the maintenance position and
at a locking angle (ANG_L) in the locking position, the maintenance and locking angles
(ANG_m, ANG_L) being defined as an angle between the longitudinal side plate axis (A_p) and the longitudinal slot axis (A_s).

9. The patch panel system (100) of claim 8, wherein the maintenance angle (ANG_m) is equal to the tab angle (ANG_l).

10. The patch panel system (100) of claim 8, wherein the longitudinal slot axis (A_s) is in parallel with the base portion (11) of the frame (102), and wherein the stopper (152) is configured to retain the tab (130) with the longitudinal side plate axis (A_p) of the retaining member (104) in parallel with the longitudinal slot axis (A_s) of the frame (102) when the retaining member (104) is in the locking position.

11. The patch panel system (100) of claim 10, wherein the locking angle (ANG_L) is zero.

12. The patch panel system (100) of claim 8, wherein the stopper (152) is configured to allow the retaining member (104) to pivot about the tab (130) between the locking angle (ANG_L) and the maintenance angle (ANG_M).

13. The patch panel system (100) of claim 7, wherein the tab angle (130) ranges between zero and 45 degrees.

14. The patch panel system (100) of claim 7, wherein the tab (130) has first and second engaging surfaces (136, 138) and first and second retaining surfaces (140, 142), the first and second engaging surfaces (136, 138) in parallel with a longitudinal tab axis (A_T) and oppositely arranged with respect to the longitudinal tab axis (A_T), and the first second retaining surfaces (140, 142) spaced apart along the longitudinal tab axis (A_T);

wherein the slot (150) has first and second inner slot surfaces (156, 158) in parallel with the longitudinal slot axis (A_s), the first and second inner slot surfaces (156, 158) configured to slidably engage the first and second engaging surfaces (136, 138) of the tab (130), respectively, along the longitudinal slot axis (A_s); and
wherein the stopper (152) is arranged at a portion of the slot (150) and has first and second notches (160, 162), the first and second notches (160, 162) formed on the first and second inner slot surfaces (156, 168) and configured to engage at least part of the first and second retaining surfaces (140, 142) of the tab (130), respectively.

15. A method of supporting a retaining member (104) for at least one fiber optic adapter (80), the method comprising:

   engaging a tab (130) of the retaining member (104) into a stopper (152) of a frame (102) to secure the retaining member (104) to the frame (102) in a locking position;
   rotating the retaining member (104) about the tab (130) within the stopper (152) to move the retaining member (104) from the locking position to a transition position; and
   sliding the retaining member (104) along a slot (150) of the frame (102) to support the retaining member (104) in a maintenance position.

16. The method of claim 15, further comprising:

   sliding the retaining member (104) into the stopper (152) along the slot (150) of the frame (102) to arrange the retaining member (104) in the transition position; and
   rotating the retaining member (104) about the tab (130) within the stopper (152) from the transition position to the locking position.

17. The method of claim 15, wherein the retaining member (104) is held by the frame (102) at a maintenance angle (ANG_M) relative to the frame (102) in the maintenance position.

18. The method of claim 17, wherein the maintenance angle (ANG_M) ranges between zero and 45 degrees relative to the frame (102).
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).

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

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 an 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.:

   1-6

### 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.
A. CLASSIFICATION OF SUBJECT MATTER
INV. G02B6/44
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
G02B A47B

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
  *A* document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search: 6 August 2015
Date of mailing of the international search report: 05/11/2015

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
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Authorized officer: Jones, Julian

Form PCT/ISA210 (second sheet) (April 2005)
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Form PCT/ISA/210 (patent family annex) (April 2005)
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6

   Rotating retaining member.

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2. claims: 7-18

   Longitudinal moving retaining member with stop.

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