[0028] A backshell 60 is configured to secure to a threaded area 59 of the cable end 56 of the electrical connector 52. Optionally, the backshell 60 may be snapped onto the cable end 56 of the electrical connector 52. The backshell 60 is configured to receive the cable bundle 58. The backshell 60 secures the cable bundle 58 and protects the cable bundle 58 from forces that may be imposed on the cable bundle 58 and/or the electrical connector 52. The backshell 60 also prevents the cable bundle 58 from being disengaged from the electrical connector 52 and/or the corresponding electrical component. The backshell 60 may also provide electromagnetic shielding for the cable bundle 58. The backshell 60 includes a connector end 62 and a cable clamp end 64. The cable bundle 58 is inserted into the connector end 62. The connector end 62 may include a cable shield termination body 114 (shown in Figure 2) to terminate a shield of the cable bundle 58. The cable shield termination body may include a corrosion-resisting steel termination band or the like. The cable bundle 58 extends through the backshell 60 and is secured at the cable clamp end 64. The cable clamp end 64 may include a cable tie, a saddle clamp, a cable bundling string, and/or a heat-recoverable, e.g. heat-shrinkable boot, e.g. a heat-shrinkable molded boot. Alternatively, the cable clamp end 64 may be fabricated from radially expanded elastomeric material in a similar shape as described herein as heat-recoverable component.

[0029] Figure 2 is a perspective view of a backshell 100 formed in accordance with an embodiment that may be used with the electrical assembly 50 in place of the backshell 60. Figure 3 is a cross-sectional view of the backshell 100 taken along line 3-3. The backshell 100 includes a strain relief end 102 and a connector end 104. The connector end 104 includes a connector body 105 having a connector interface 106 and a shield interface 107 (shown in Figure 3). A coupling nut 108 is joined to the connector interface 106. The coupling nut 108 is configured to couple to the electrical connector 52. For example, the coupling nut 108 may engage a rear accessory thread 59 of the electrical connector 52. The connector body 105 provides an electrical connection to the electrical connector 52 to protect the backshell 100 from electromagnetic interference generated by the cable bundle 58. The connector body 105 includes teeth 117 that are configured to engage the electrical connector 52 to prevent the backshell 100 from rotating with respect to the electrical connector 52. The coupling nut 108 engages the connector interface 106 to secure the connector body 105 to the electrical connector 52. Referring to Figure 3, an outer surface 110 of the connector body 105 engages an inner surface 112 of the coupling nut 108 so that the connector body 105 is positioned within the coupling nut 108.

[0030] Referring back to Figure 2, a shield termination body 114 is joined to the shield interface 107 of the connector body 105. The shield termination body 114 is configured to provide electromagnetic shielding to achieve a predetermined electromagnetic compatibility. For example, the shield termination body 114 may be configured to optimize electromagnetic compatibility of the backshell 100. The shield termination body 114 may include a shield termination device, for example, a corrosion resistant shield termination band or the like. The shield termination body 114 includes a connector end 116 and a relief end 118. The connector end 116 has a longitudinal axis 115 and a face 117 that defines a plane. The relief end 118 has a longitudinal axis 119 and a face 121 that defines a plane. The face 117 of the connector end 116 is oriented at an angle A with respect to the face 121 of the relief end 118. In an example embodiment, the face 117 is oriented approximately 45 degrees with respect to the face 121. Alternatively, the face 117 may be oriented at any angle with respect to the face 121. The longitudinal axes 115 and 119 are also oriented at an angle with respect to one another. In one embodiment, the longitudinal axes 115 and 119 may be oriented at an angle between 0 and 180 degrees.

[0031] The shield interface 107 of the connector body 105 includes tabs 122 (illustrated in Figure 3). The shield interface 107 is inserted into the connector end 116 of the shield termination body 114 so that the tabs 122 secure the shield termination body 114 to the connector body 105. The shield termination body 114 also includes a spring 115. The spring 115 is configured to engage teeth 117′ on the coupling nut 108. The spring 115 engages the teeth 117′ to limit rotation of the coupling nut 108 with respect to the shield termination body 114. The spring 115 allows the coupling nut 108 to rotate both clockwise and counter-clockwise so that the nut can be secured to, and disengaged from, the shield termination body 114. Alternatively, the spring 115 may only allow the coupling nut 108 to rotate in a single direction to secure the coupling nut 108 to the shield termination body 114. In such an embodiment, the spring 115 must be disengaged from the teeth 117′ to disengage the coupling nut 108 from the shield termination body 114.

[0032] Figure 4 illustrates an expanded view of a portion of the coupling nut 108. The coupling nut 108 has teeth 220 that enable the coupling nut 108 to rotate in two directions 228 and 230. Each tooth 220 is formed by surfaces 222 that extend outward from an end 224 of the coupling nut 108 and join at a peak 226. The surfaces 222 extend at a non-orthogonal angle with respect to a plane 223 formed by the end 224 of the coupling nut 108. The spring 115 is configured to rest within a tooth 220 to retain the coupling nut 108 on the shield termination body 114. The spring 115 can be disengaged from the tooth 220 by rotating the

coupling nut 108 in either direction 228 or 230. When the coupling nut 108 is rotated, the spring 115 slides along the surface 222 to ratchet along the teeth 220 until the coupling nut 108 is in a desired position.

[0033] Figure 5 illustrates an alternative coupling nut 241 formed in accordance with an embodiment and that may be used with the backshell 100. The coupling nut 241 has teeth 240 that enable the coupling nut 241 to rotate in a single direction 242. The teeth 240 lock the coupling nut 241 in position and prevent rotation of the coupling nut 241 in the direction 244. Each tooth 240 is formed from a pair of surfaces 246 and 248. The surface 246 extends at a 90 degree angle with respect to a plane 241′ formed by an end 243 of the coupling nut 241. Alternatively, the surface 246 may extend at any angle less than 90 degrees that locks the spring 115 within the tooth 240. The surface 248 extends from the end 243 of the coupling nut 241 at an angle that is greater than 90 degrees. Alternatively, the horizontal side of the spring 115 and coupling nut 241 can be increased between horizontal to 45 degrees as in Figure 4 to achieve a desirable disengaging force.

[0034] The surface 248 enables the coupling nut 241 to rotate in the direction 242. When the coupling nut 241 is rotated in the direction 242, the spring 115 slides along the surface 248 and ratchets along the teeth 240 until the coupling nut 241 is in a desired position. The spring 115 locks within the teeth 240 so that the spring engages the surface 246. The spring 115 is prevented from sliding along the surface 246 and prevents the coupling nut 241 from being rotated in the direction 244. To rotate the coupling nut 241 in the direction 244, the spring 115 must first be manually disengaged from the teeth 240 of the coupling nut 241.

[0035] Referring back to Figure 2, a strain relief 124 is joined to the relief end 118 of the shield termination body 114. The strain relief 124 includes a cable clamp end 126 and a shield end 128. The shield end 128 is joined to the relief end 118 of the shield termination body 114. The shield end 128 includes a band 130 that wraps around the relief end 118 of the shield termination body 114. The band 130 is secured to the shield termination body 114 with a locking pin 132. In an example embodiment, the locking pin 132 does not require tools to be secured to and/or removed from the band 130. The locking pin 132 enables the band 130 to be disengaged from the shield termination body 114 so that the strain relief 124 can rotate with respect to the shield termination body 114.

[0036] The cable clamp end 126 of the strain relief 124 includes a cable clamp 134. In the illustrated embodiment, the cable clamp 134 includes a saddle clamp 135. In alternative embodiments, the cable clamp 134 may include a heat-recoverable component, e.g. a heat-

face 117 of the connector end 116 of the shield termination body 114. In one embodiment, the face 129 of the strain relief 124 is configured to position a 0, 45, and 90 degrees with respect to the face 117 of the shield termination body 114. Optionally, the faces 117 and 129 may be oriented at any angle C.

[0040] In one embodiment, the groove 144 includes protrusions 146 (illustrated in Figure 7). Protrusions 146 are positioned at 180 degree increments around the groove 144. Alternatively, the groove 144 may include four protrusions 146 positioned at 90 degree increments around the groove 144. In another embodiment, the groove 144 may include any number of protrusions 146. The band 130 includes corresponding notches 148 (illustrated in Figure 8). The notches 148 are positioned at 90 degree increments around the band 130. Alternatively, the band 130 may include any number of notches 148 that corresponds to the number of protrusions 146. The notches 148 are configured to receive the protrusions 146 so that the band 130 locks into a position with respect to the groove 144. In one embodiment, the notches 148 and protrusions 146 are oriented so that the strain relief 124 locks into positions having the face 129 of the strain relief 124 oriented at 0, 45, and 90 degrees with respect to the face 117 of the shield termination body 114. Alternatively, the backshell 100 may not include the protrusions 146 and notches 148. In such an embodiment, the band 130 may rotate freely with groove 144 so that the face 129 of the strain relief 124 can be oriented at any angle C with respect to the face 117 of the shield termination body 114. Alternatively, strain-relief 124 may be fitted through one or more openings and matching tabs on body 114 to assemble the body 114 and strain-relief 124 together during installation. Protrusion or protrusions ~~144~~ 146 located around the groove ~~362~~ 144 may be placed at one or more locations to stop the rotation of the strain-relief 124 at a desired angle - 00, 45 or 90 degree.

[0041] Figure 9 illustrates the backshell 100 in various positions. At position 200, the faces 117 and 129 of the backshell 100 are oriented at an angle C having 0 degrees. At position 202, the faces 117 and 129 of the backshell 100 are positioned at an angle C having 45 degrees. At position 204, the faces 117 and 129 of the backshell 100 are oriented at an angle C having 90 degrees. The strain relief 124 of the backshell 100 rotates about the shield termination body 114 to position the backshell 100 in any one of positions 200, 202, and 204. The angle B of the strain relief 124 and the angle A of the shield termination body 114 create the angle C between the face 117 of the shield termination body 114 and the face 129 of the strain relief 124.

[0042] The angle C accommodates different applications of the backshell 100. The backshell 100 is adaptable for use at any angle 0, 45, and 90 degrees. In one embodiment, the

protrusions 146 and the notches 148 lock the backshell into position at any one of 0, 45, and 90 degrees. Optionally, the strain relief 124 may rotate freely about the shield termination body 114 to position the faces 117 and 129 of the backshell 100 at any angle. The locking pin 132 enables the band 130 of the strain relief 124 to be disengaged from the groove 144 of the shield termination body 114. In one embodiment, the locking pin 132 is operated without tools to disengage the band 130 from the groove 144. Disengaging the band 130 from the groove 144 allows the strain relief 124 to rotate with respect to the shield termination body 114. The strain relief 124 is rotated to position the backshell 100 in any one of positions 200, 202, and 204. In another embodiment, the strain relief 124 may be rotated to position the faces 117 and 129 of the backshell 100 at any angle.

[0043] Figure 10 illustrates a backshell 300 formed in accordance with an embodiment and that may be used with the electrical assembly 50. The backshell 300 has a strain relief end 302 and a connector end 304. The connector end 304 includes a backshell body 306 and a coupling nut 308. The backshell body 306 includes a connector interface ~~305~~ 307 and a shield interface ~~307~~305. The coupling nut 308 is configured to be joined to a rear accessory thread 59 of the electrical connector 52 to couple the backshell 300 and the electrical connector 52. The backshell body 306 joins a body of the electrical connector 52 to protect the backshell 300 from electromagnetic interference generated by the cable bundle 58. The backshell body 306 may also include teeth 310 to limit the backshell 300 from rotating with respect to the electrical connector 52. The coupling nut 308 screws onto the connector interface 305 of the backshell body 306 to join the backshell body 306 to the electrical connector 52.

[0044] The backshell body 306 includes at least one spring 312 that is configured to engage teeth 314 that are provided on the coupling nut 308. The spring 312 engages the teeth 314 to limit a rotation of the coupling nut 308 with respect to the backshell body 306. In the illustrated embodiment, the teeth 314 enable the coupling nut 308 to rotate in a two directions 316 and 318. Each tooth 314 includes surfaces ~~320~~ that extend at an angle greater than 90 degrees from an end 322 of the coupling nut 308. The spring 312 is configured to rest within a tooth 314 to retain the coupling nut 308 on the backshell body 306. When the coupling nut 308 is rotated in either direction 316 or 318, the spring 312 ratchets within the teeth 314 until the coupling nut 308 is in a desired position. One of the directions 316, 318 tightens the coupling nut 308 onto the backshell body 306. The other direction 316, 318 disengages the coupling nut 308 from the backshell body 306. In an alternative embodiment, the teeth 314 of the coupling nut 308 may be configured to allow rotation of the coupling nut 308 in only one of the directions 316, 318. In such an embodiment, the spring 312 must be manually

be determined with reference to the appended claims~~, along with the full scope of equivalents to which such claims are entitled~~.

What is claimed is:

1. A rotationally configurable backshell to be joined to an electrical connector, the rotationally configurable backshell comprising:

a connector body having a connector interface and a shield interface, the connector interface configured to engage and form an electrical connection with the electrical connector;

a shield termination body having a connector end and a relief end; the connector end joined to the connector interface of the connector body, a face of the connector end oriented at an angle with respect to a face of the relief end, the shield termination body configured to shield a cable extending from the electrical connector; and

a strain relief having a shield end and a cable clamp end; a face of the shield end oriented at an angle with respect to a face of the cable clamp end, the shield end rotatably joined to the relief end of the shield termination body, the shield end of the strain relief rotatable with respect to the relief end of the shield termination body so that the face of the cable clamp end of the strain relief is positionable at variable angles with respect to the face of the connector end of the shield termination body, the cable clamp end of the strain relief configured to secure the cable extending from the electrical connector~~.~~

wherein a face of the connector end of the shield termination body is oriented at an angle with respect to a face of the relief end thereof and a face of the shield end of the strain relief is oriented at an angle with respect to a face of the cable clamp end thereof.

2. The rotationally configurable backshell of claim 1, wherein the face of the cable clamp end of the strain relief is positionable at an angle between 0 degrees and 90 degrees with respect to the face of the connector end of the shield termination body.

3. The rotationally configurable backshell of claim 1, wherein the face of the connector end of the shield termination body is oriented at a 45 degree angle with respect to the face of the relief end of the shield termination body.

4. The rotationally configurable backshell of claim 1, wherein the face of the shield end of the strain relief is oriented at a 45 degree angle with respect to the face of the cable clamp end of the strain relief.

5. The rotationally configurable backshell of claim 1, wherein the relief end of the shield termination body includes protrusions and the shield end of the strain relief includes notches, the notches of the strain relief configured to receive the protrusions of the shield termination body to limit rotation of the strain relief with respect to the shield termination body.