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Connector Assembly and Related Methods

Abstract

A connector assembly includes a connector body, a lock member, and an inner housing. The connector body includes a plurality of walls and an inner portion. The plurality of walls define a cavity configured to receive a terminal. The inner portion is disposed within the cavity. The lock member is removably-disposed within the cavity and defines an aperture configured to receive the terminal. The inner housing is removably-disposed within the cavity and defines a slot configured to receive the terminal. The inner housing includes a detent configured to engage the lock member. During actuation of the lock member from a first position to a second position, the detent engages the lock member and moves the lock member toward the inner portion and the terminal to detect whether the terminal is properly disposed within the connector body.

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Background/Summary

FIELD

[0001] The present disclosure relates to a connector assembly and more particularly to a connector assembly having a connector configured to detect an unseated terminal.

BACKGROUND

[0002] Modern vehicles (e.g., automobiles) rely on electrical wiring and electrical connections to facilitate communication between various electronic components within the vehicle. Connection systems (e.g., connectors and terminals) play an important role in ensuring the integrity of these electrical connections and in the reliability and performance of the vehicle. Conventional connection systems typically include a housing and one or more terminals designed to make contact and establish electrical pathways with terminals located in a mating connector housing.

[0003] Ensuring the secure engagement and retention of terminals within the connector housing, and the secure engagement and retention between components (e.g., seals, terminal and connector position assurance pieces, etc.) within and/or between the connector housings, is crucial for maintaining a reliable electrical connection. Some connection systems utilize mechanisms such as locking clips, levers, or additional components designed to engage terminals and/or components within the connector housing. These solutions often require precise tolerancing, and/or present assembly challenges related to the connector design, to ensure that all of the components of the connection system are properly assembled.

[0004] In view of the foregoing, while known mechanisms for securing terminals and/or components within the connector housing have proven acceptable for their intended purpose, a continuous need for improvement remains in the pertinent art to address the challenges associated with connection system assembly.

[0005] The background description provided here is for the purpose of generally presenting the context of the disclosure. Work of the presently named inventors, to the extent it is described in this background section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present disclosure.

SUMMARY

[0006] One aspect of the disclosure provides a connector assembly. The connector assembly includes a connector body, a lock member, and an inner housing. The connector body includes a plurality of walls and an inner portion. The plurality of walls define a cavity configured to receive a terminal. The inner portion is disposed within the cavity. The lock member is removably-disposed within the cavity and defines an aperture configured to receive the terminal. The inner housing is removably-disposed within the cavity and defines a slot configured to receive the terminal. The inner housing includes a detent configured to engage the lock member. During actuation of the lock member from a first position to a second position, the detent engages the lock member and moves the lock member toward the inner portion and the terminal to detect whether the terminal is properly disposed within the connector body.

[0007] Another aspect of the disclosure provides a connector assembly. The connector assembly includes a connector body, a lock member, and an inner housing. The connector body includes a plurality of walls and an inner portion having a locking arm. The plurality of walls define a cavity configured to receive a terminal. The inner portion is disposed within the cavity. The lock member is removably-disposed within the cavity and defines an aperture configured to receive the terminal. The inner housing is removably-disposed within the cavity and defines a slot configured to receive the terminal. The inner housing includes a detent configured to engage the lock member. During actuation of the lock member from a first position to a second position, the detent engages the lock member and moves the lock member toward the inner portion and the terminal to detect whether the terminal is secured by the locking arm.

[0008] Yet another aspect of the disclosure provides a method of assembling a connector assembly.

The method includes disposing a lock member in a cavity of a connector body. The method includes disposing an inner housing in the cavity. The method includes disposing a terminal in a slot of the inner housing, an aperture of the lock member, and a hole of an inner portion of the connector body. The method includes actuating the lock member from a first position to a second position by engaging a detent of the inner housing with the lock member and moving the lock member toward the inner portion and the terminal to detect whether the terminal is properly disposed within the connector body. The method includes, in accordance with the terminal not being properly disposed within the connector body, moving the terminal to a proper position by moving the lock member via the detent of the inner housing.

[0009] Further areas of applicability of the present disclosure will become apparent from the detailed description, the claims, and the drawings. The detailed description and specific examples are intended for purposes of illustration only and are not intended to limit the scope of the disclosure.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present disclosure will become more fully understood from the detailed description and the accompanying drawings.

[0011] FIG. **1** is a rear exploded view of a connector assembly in accordance with the principles of the present disclosure.

[0012] FIG. **2** is a front exploded view of the connector assembly of FIG. **1**.

[0013] FIG. **3** is a perspective view of a connector body of a connector assembly in accordance with the principles of the present disclosure.

[0014] FIG. **4** is a perspective view of inner housing of a connector assembly in accordance with the principles of the present disclosure.

[0015] FIG. **5** is a perspective view of a connector assembly in an assembled configuration in accordance with the principles of the present disclosure.

[0016] FIG. **6** is a front view of a connector assembly in an assembled configuration in accordance with the principles of the present disclosure.

[0017] FIG. **7** is a cross-sectional view of a connector assembly in a first stage of assembly in accordance with the principles of the present disclosure.

[0018] FIG. **8** is a cross-sectional view of a connector assembly in a second stage of assembly in accordance with the principles of the present disclosure.

[0019] FIG. **9** is a flowchart depicting an example method for assembling a connector assembly in accordance with the principles of the present disclosure.

[0020] In the drawings, reference numbers may be reused to identify similar and/or identical elements.

DETAILED DESCRIPTION

Introduction

[0021] One aspect of the disclosure provides a system and method for detecting a location of a terminal relative to a connector housing. In particular, an inner connector body may include a detent that engages an independent secondary lock (ISL) to ensure a location of the ISL relative to an outer connector body and, thereby, ensure a location of a terminal relative to the outer connector body. In particular, the detent may be located in a cavity of the inner connector body, and the ISL may be disposed within the cavity, such that, during actuation of the ISL from a first position to a second position, the detent engages the ISL and pushes the ISL toward an inner wall of the outer connector body and toward the terminal. The movement of the ISL toward the inner wall of the outer connector body during actuation can detect a terminal that is not properly disposed (e.g.,

unseated) within the outer connector body.
[0022] With reference to FIGS. **1** and **2**, an example connector assembly **100** is shown. As will be explained in more detail below, the connector assembly **100** may be installed in a vehicle (e.g., an automobile) to facilitate the transmission of electricity between various electronic components within the vehicle. For example, the connector assembly **100** may be a female connector detachably coupled to a mating connector (e.g., a male connector, not shown) such that, during operation, of the vehicle, electricity is transmitted between the connector assemblies and to various electronic components within the vehicle.
[0023] In various implementations, the connector assembly **100** includes a connector body **102**, a lock member **104**, an inner housing **106**, a connector position assurance (CPA) device **108**, and/or one or more terminal assemblies **110**, among others. The connector body **102** includes a plurality of walls **120** that define a cavity **122**. The lock member **104** and the inner housing **106** are removably-disposed in the cavity **122**. The CPA device **108** may be removably-coupled to the connector body **102** to maintain connection between the connector assembly **100** and a corresponding mating connector assembly (not shown).
Connector Body
[0024] With reference to FIG. **3**, an example connector body **102** is shown. In various implementations, the connector body **102** may include a first end **124**A, a second end **124**B, a first sidewall **126**A, a second sidewall **126**B, a third sidewall **126**C, a fourth sidewall **126**D, and an inner portion **128**, among others. The second end **124**B may be spaced apart from (e.g., opposite) the first end **124**A. The first sidewall **126**A may be disposed between the first end **124**A and the second end **124**B. The second sidewall **126**B may be spaced apart from (e.g., opposite) the first sidewall **126**A. The third sidewall **126**C may be disposed between the first sidewall **126**A and the second sidewall **126**B. The fourth sidewall **126**D may be spaced apart from (e.g., opposite) the third sidewall **126**C.
[0025] In various implementations, the first sidewall **126**A, the second sidewall **126**B, the third sidewall **126**C, and the fourth sidewall **126**D define the cavity **122**. The cavity **122** may be accessible via the first end **124**A and/or the second end **124**B of the connector body **102**. The cavity **122** receives the lock member **104**, the inner housing **106**, and/or the terminal assemblies **110**, among others.
[0026] In various implementations, the inner portion **128** is disposed within the cavity **122**. The inner portion **128** may be coupled to (e.g., integrally formed with) the first sidewall **126**A, the second sidewall **126**B, the third sidewall **124**C, and/or the fourth sidewall **124**D. The inner portion **128** may include a wall **130** defining a plurality of holes **132** (i.e., apertures) that receive portions of the terminal assemblies **110** (e.g., terminals) and a plurality of locking arms **133**. In some example configurations, each locking arm **133** may be disposed in a respective hole **132** and include an end **135** (see e.g., FIGS. **7** and **8**). When the terminal assemblies **110** are properly disposed within the holes **132**, the locking arms **133** (e.g., the end **135**) may inhibit removal of the terminals from the cavity **122** (e.g., the holes **132**). The inner portion **128** may facilitate the connection and/or alignment of the terminal assemblies **110** with corresponding terminal assemblies of the mating connector (not shown).
[0027] In various implementations, the first sidewall **126**A of the connector body **102** may define at least one channel **134**. The channel **134** may receive portions of the lock member **104** and the inner housing **106**. The channel **134** may be accessible via the first end **124**A of the connector body **102**.
[0028] In various implementations, the connector body **102** may include a plurality of locking features (i.e., locking arms and/or tabs, etc.), such as a first locking feature **136**A, a second locking feature **136**B, a third locking feature **136**C, and/or a fourth locking feature **136**D. The locking features engage the inner housing **106** and inhibit removal of the inner housing **106** from the cavity **122**. In some example configurations, the first locking feature **136**A and/or the second locking feature **136**B may extend from the third sidewall **126**C. The second locking feature **136**B may be

offset from the first locking feature **136**A. The third locking feature **136**C and/or the fourth locking feature **136**D may extend from the fourth sidewall **126**D. The fourth locking feature **136**D may be offset from the third locking feature **136**C. The connector body **102** is shown including four locking features, however the connector body **102** may include more or less than four locking features.

Lock Member

[0029] With reference to FIGS. **1** and **2**, an example lock member **104** (i.e., an independent secondary lock (ISL)) is shown. In various implementations, the lock member **104** includes a first portion **140**, a second portion **142**, a first arm **144-1**, a second arm **144-2**, a plurality of protrusions **146**, a plurality of apertures **148**, and/or a plurality of nubs **150**, among others. The second portion **142** may be coupled to the first portion **140**. The first arm **144-1** and/or the second arm **144-2** may be coupled to the first portion **140**. The plurality of protrusions **146** may extend from the first portion **140**. In some examples, the first portion **140** defines the apertures **148**. The first arm **144-1** and the second arm **144-2** may help facilitate the alignment of the lock member **104** in the cavity **122**. For example, the first arm **144-1** and the second arm **144-2** may engage portions of the connector body **102** (e.g., the third sidewall **126**C, the fourth sidewall **126**D, etc.) to align the lock member **104** within the cavity **122**.

[0030] In various implementations, the second portion **142** includes a main body portion **152**A and a first tab portion **152**B-**1** and a second tab portion **152**B-**2**. The main body portion **152**A may extend from the first portion **140** in a first direction (e.g., parallel to the Y-axis) and may be received by the channel **134** of the connector body **102**. The first tab portion **152**B-**1** may extend from the main body portion **152**A in a second direction (e.g., parallel to the X-axis) that is transverse to (e.g., orthogonal) the first direction. The second tab portion **152**B-**2** may extend from the main body portion **152**A in a third direction that is opposite the second direction.

[0031] In various implementations, the first tab portion **152**B-**1** and the second tab portion **152**B-**2** may be received by the channel **134** of the connector body **102**. For example, the first tab portion **152**B-**1** and the second tab portion **152**B-**2** may be disposed under the lips **138** of the connector body **102** in the assembled configuration, such that the main body portion **152**A inhibits movement (e.g., translation) of lock member **104** relative to the connector body **102** in the second direction, while the first tab portion **152**B-**1** and the second tab portion **152**B-**2** inhibit movement (e.g., translation) of lock member **104** relative to the connector body **102** in the first direction.

[0032] In various implementations, the protrusions **146** include various sizes and configurations and may extend from the first portion **140**. In some example configurations, the protrusions **146** extend from the first portion **140** in a direction opposite the second portion **142**. The protrusions **146** may help facilitate the alignment of the lock member **104** in the cavity **122**. For example, the protrusions **146** may engage portions of the connector body **102** (e.g., the second sidewall **126**B) and/or may be disposed in portions (e.g., voids, channels, etc.) defined by the connector body **102** to align the lock member **104** within the cavity **122**.

[0033] In various implementations, the nubs **150** are disposed within the apertures **148**. For example, a nub **150** may be disposed within each aperture **148**. In the assembled configuration, the apertures **148** may receive portions of the terminal assemblies **110** (e.g., terminals). In various implementations, the lock member **104** inhibits removal of the terminal assemblies **110** from the cavity **122**. For example, in the assembled configuration, the nubs **150** may engage a portion of the terminal assemblies **110** to inhibit removal thereof from the apertures **148**

Inner Housing

[0034] Referring now to FIG. **4**, an example inner housing **106** is shown. In various implementations, the inner housing **106** may include a main body **160**, a first detent **162**A, a second detent **162**B, a plurality of projections **164**, and/or a plurality of slots **166** (i.e., apertures), among others. In some examples, the main body **160** may include a first side **168**A, a second side **168**B spaced apart from (e.g., opposite) the first side **168**A, a third side **168**C disposed between the first

side **168**A and the second side **168**B, and a fourth side **168**D spaced apart from (e.g., opposite) the third side **168**C.

[0035] In various implementations, the first detent **162**A and the second detent **162**B engage portions of the lock member **104**. In some example configurations, the first detent **162**A may extend from the first side **168**A and/or may be disposed proximate the third side **168**C. The second detent **162**B may extend from the first side **168**A and/or may be disposed proximate the fourth side **168**D. The second detent **162**B may be offset from the first detent **162**A. In various implementations, the first side **168**A defines a length **170**. In some example configurations, the first detent **162**A and/or the second detent **162**B may be disposed proximate a midpoint **172** of the length **170**.

[0036] In various implementations, the first detent **162**A and the second detent **162**B may comprise one or more of a variety of shapes, sizes, and/or configurations. The first detent **162**A and the second detent **162**A may each include a ramp **163** (e.g., a ramped surface) extending from, and defining an obtuse angle relative to, the first side **168**A of the inner housing **106**. In various implementations, the ramp **163** detects unseated terminals. For example, the ramp **163** may engage the lock member **104** and push the lock member **104** (e.g., in the Z-direction) to detect the unseated terminals.

[0037] In various implementations, the ramp **163** accounts for manufacturing tolerances (e.g., in the Y-direction) associated with the connector body **102**, the lock member **104**, and/or the inner housing **106**. For example, the ramp **163** pushes the lock member **104** (e.g., in the Z-direction) to engage unseated terminals regardless of the tolerance stack up of the connector body **102**, the lock member **104**, and/or the inner housing **106**. The ramp **163** engages various sized and/or configured lock members. For example, the ramp **163** may engage different sized and/or configured lock members at different locations along the ramp. The inner housing **106** is shown and generally described herein as including two detents, however the inner housing **106** may include more or less than two detents.

[0038] In various implementations, the projections **164** may include various sizes and configurations and may extend from the main body **160**. The projections **164** may help facilitate the alignment of the inner housing **106** in the cavity **122** of the connector body **102**. For example, the projections **164** may be received by corresponding channels of the connector body **102**. The projections **164** may engage portions of the connector body **102** (e.g., the second sidewall **126**B) and/or may be disposed in portions (e.g., voids, channels, etc.) defined by the connector body **102** to align the inner housing **106** in the cavity **122**.

[0039] In various implementations, the slots **166** receive portions of the terminal assemblies **110** (e.g., terminals). In various implementations, the inner housing **106** inhibits removal of the terminal assemblies **110** from the cavity **122**.

Terminal Assemblies

[0040] Referring again to FIGS. **1** and **2**, the terminal assembly **110** may include a terminal **180** and one or more electrical wires **182** coupled to the terminal **180**. The electrical wires **182** may be electrically connected with an electrical device, an electrical component, a battery, and/or a power source associated with the vehicle. In various implementations, the terminal **180** may connect with a corresponding terminal of the mating connected. The connector assembly **100** is shown including one terminal assembly, however the connector assembly **100** may include more than one terminal assembly. As explained in more detail below, the terminals **180** may each include an end **186** configured to engage a locking arm **133** (e.g., the end **135**) when the terminals **180** are in a properly seated configuration to secure the terminals **180** within the hole **132** (see, e.g., FIGS. **7** and **8**).

Assembled Configuration

[0041] With reference to FIGS. **5** and **6**, the connector assembly **100** is shown in an assembled configuration. In the assembled configuration, the lock member **104**, the inner housing **106**, and/or portions of the terminal assemblies **110** are disposed in the cavity **122** of the connector body **102**.

In various implementations, the lock member **104** is disposed between the inner portion **128** of the connector body **102** and the inner housing **106**.

[0042] In various implementations, the second portion **142** of the lock member **104** and a portion of the inner housing **106** are disposed in the channel **134** of the connector body **102**. In various implementations, the inner housing **106** may be connected with the first locking feature **136**A, the second locking feature **136**B, the third locking feature **136**C, and/or the fourth locking feature **136**D to inhibit removal of the inner housing **106** and the lock member **104** from the cavity **122**.

[0043] In various implementations, the lock member **104** and the inner housing **106** are positioned in the cavity **122** such that apertures **148** of the lock member **104**, the slots **166** of the inner housing **106**, and the holes **132** of the inner portion **128** are aligned. Each of the terminals **180** of the terminal assemblies **110** is disposed in a respective aperture **148**, a respective slot **166**, and a respective hole **132**. Each of the terminals **180** may be engaged by (e.g., secured with) a respective locking arm **133** of the inner portion **128** of the connector body **102** to inhibit removal of the terminal from the cavity **122**.

Flowchart

[0044] FIG. **9** is a flowchart of an example method **200** for assembling a connector assembly **100**. The method **200** may begin at **204**. At **204**, a user or a machine (e.g., a robot, etc.) may dispose a lock member **104** in a cavity **122** of a connector body **102**. In various implementations, disposing the lock member **104** in the cavity **122** may include inserting the lock member **104** into the cavity **122** in an insertion direction (e.g., Z-direction) and disposing a second portion **142** of the lock member **104** in a channel **134** of the connector body **102**. The method **200** may proceed to **208**.

[0045] At **208**, the user or the machine may dispose an inner housing **106** in the cavity **122**. In various implementations, disposing the inner housing **106** in the cavity **122** may include inserting the inner housing **106** into the cavity **122** in the insertion direction (e.g., Z-direction) and disposing a portion of the inner housing **106** in the channel **134** of the connector body **102**. In various implementations, the lock member **104** and the inner housing **106** are disposed in the cavity **122** such that that apertures **148** of the lock member **104**, slots **166** of the inner housing **106**, and holes **132** of an inner portion **128** of the connector body **102** are aligned. The method **200** may proceed to **212**.

[0046] At **212**, the user or the machine may dispose (e.g., insert in the insertion direction) a terminal **180** of a terminal assembly **110** in a slot **166** of the inner housing **106**, an aperture **148** of the lock member **104**, and a hole **132** of the inner portion **128**. The method **200** is generally shown and described herein as including one terminal assembly, however the method **200** may include more than one terminal assembly. The method **200** may proceed to **216**.

[0047] At **216**, the method **200** may include detecting whether the terminal **180** is properly disposed (e.g., seated) within the connector body **102**. For example, the user or the machine may actuate the lock member **104** from a first position to a second position by engaging a detent (e.g., detent **162**A) of the inner housing **106** with the lock member **104** and moving the lock member **104** toward the inner portion **128** and the terminal **180** (e.g., in the insertion direction) to detect whether the terminal **180** is properly disposed within the connector body **102**.

[0048] In various implementations, in accordance with the terminal **180** being properly disposed within the connector body **102**, the terminal **180** is engaged (e.g., locked) with a locking arm **133** of the inner portion **128** (see, e.g., FIG. **8**). During actuation of the lock member **104** from the first position to the second position, the inner housing **106** is permitted to connect (e.g., lock) with locking features **136**A-**136**D of the connector body **102** in accordance with the terminal **180** being properly disposed within the connector body **102**.

[0049] In various implementations, in accordance with the terminal **180** not being properly disposed (e.g., unseated) within the connector body **102**, the terminal **180** is not engaged (e.g., locked) with the locking arm **133** (see, e.g., FIG. **7**). For example, the terminal **180** may not be properly engaged (i.e., secured) with the locking arm **133** and/or may be spaced apart from the

locking arm **133** in a direction opposite the insertion direction. During actuation of the lock member **104** from the first position to the second position, the inner housing **106** is inhibited from connecting (e.g., locking) with the locking features **136**A-**136**D of the connector body **102** in accordance with the terminal **180** not being properly disposed within the connector body **102**. The method **200** may proceed to **220**.

[0050] At **220**, in accordance with the terminal **180** not being properly disposed (e.g., unseated) within the connector body **102**, the user or machine may engage the lock member **104** with the terminal **180** and may move (e.g., in the insertion direction) the terminal **180** to a proper position (e.g., seated position) by moving the lock member **104** via the detent of the inner housing **106**. In accordance with the terminal **180** being moved to the proper position (e.g., seated position), the inner housing **106** is permitted to connect (e.g., lock) with locking features **136**A-**136**D of the connector body **102**. Then the method **200** may end.

[0051] The foregoing description is merely illustrative in nature and is in no way intended to limit the disclosure, its application, or uses. The broad teachings of the disclosure can be implemented in a variety of forms. Therefore, while this disclosure includes particular examples, the true scope of the disclosure should not be so limited since other modifications will become apparent upon a study of the drawings, the specification, and the following claims. In the written description and claims, one or more steps within a method may be executed in a different order (or concurrently) without altering the principles of the present disclosure. Similarly, one or more instructions stored in a non-transitory computer-readable medium may be executed in a different order (or concurrently) without altering the principles of the present disclosure. Unless indicated otherwise, numbering or other labeling of instructions or method steps is done for convenient reference, not to indicate a fixed order.

[0052] Further, although each of the embodiments is described above as having certain features, any one or more of those features described with respect to any embodiment of the disclosure can be implemented in and/or combined with features of any of the other embodiments, even if that combination is not explicitly described. In other words, the described embodiments are not mutually exclusive, and permutations of one or more embodiments with one another remain within the scope of this disclosure.

[0053] The terminology used herein is for the purpose of describing particular exemplary configurations only and is not intended to be limiting. As used herein, the singular articles “a,” “an,” and “the” may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms “comprises,” “comprising,” “including,” and “having,” are inclusive and therefore specify the presence of features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. Additional or alternative steps may be employed.

[0054] Spatial and functional relationships between elements (for example, between modules, circuit elements, semiconductor layers, etc.) are described using various terms, including “connected,” “engaged,” “coupled,” “adjacent,” “next to,” “on top of,” “above,” “below,” and “disposed.” Unless explicitly described as being “direct,” when a relationship between first and second elements is described in the above disclosure, that relationship encompasses a direct relationship where no other intervening elements are present between the first and second elements as well as an indirect relationship where one or more intervening elements are present between the first and second elements. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., “between” versus “directly between,” “adjacent” versus “directly adjacent,” etc.). As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

[0055] The term “set” does not necessarily exclude the empty set-in other words, in some circumstances a “set” may have zero elements. The term “non-empty set” may be used to indicate exclusion of the empty set-in other words, a non-empty set will always have one or more elements. The term “subset” does not necessarily require a proper subset. In other words, a “subset” of a first set may be coextensive with (equal to) the first set. Further, the term “subset” does not necessarily exclude the empty set-in some circumstances a “subset” may have zero elements.
[0056] The terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections. These elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as “first,” “second,” and other numerical terms do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the example configurations.
[0057] The phrase “at least one of A, B, and C” should be construed to mean a logical (A OR B OR C), using a non-exclusive logical OR, and should not be construed to mean “at least one of A, at least one of B, and at least one of C.” The phrase “at least one of A, B, or C” should be construed to mean a logical (A OR B OR C), using a non-exclusive logical OR.
[0058] The following Clauses provide an exemplary configuration for a connector assembly and related methods, as described above.
[0059] Clause 1: A connector assembly comprising: a connector body including a plurality of walls and an inner portion, wherein: the plurality of walls define a cavity configured to receive a terminal, and the inner portion is disposed within the cavity; a lock member removably-disposed within the cavity and defining an aperture configured to receive the terminal; and an inner housing removably-disposed within the cavity and defining a slot configured to receive the terminal, the inner housing including a detent configured to engage the lock member, wherein: during actuation of the lock member from a first position to a second position, the detent engages the lock member and moves the lock member toward the inner portion and the terminal to detect whether the terminal is properly disposed within the connector body.
[0060] Clause 2: The connector assembly of clause 1, wherein, in accordance
[0061] with the terminal not being properly disposed within the connector body, the lock member is configured to move the terminal to a proper position by the lock member being moved via the detent of the inner housing.
[0062] Clause 3: The connector assembly of clause 1 or 2, wherein: the connector body includes a locking feature that is configured to engage the inner housing and inhibit removal of the inner housing from the cavity; and the inner housing is inhibited from connecting with the locking feature when the terminal not properly disposed within the connector body.
[0063] Clause 4: The connector assembly of any of clauses 1 through 3, wherein: the inner portion of the connector body includes a locking arm configured to engage the terminal and inhibit removal of the terminal from the cavity; the terminal is secured by the locking arm when the terminal is properly disposed within the connector body; and the terminal is not secured by the locking arm when the terminal is not properly disposed within the connector body.
[0064] Clause 5: The connector assembly of any of clauses 1 through 4, wherein the detent includes a ramp.
[0065] Clause 6: The connector assembly of any of clauses 1 through 5, wherein: the detent extends from a side of the inner housing; the side defines a length; and the detent is disposed proximate a midpoint of the length.
[0066] Clause 7: The connector assembly of any of clauses 1 through 6, wherein the inner housing includes an additional detent offset from the detent.
[0067] Clause 8: The connector assembly of any of clauses 1 through 7, wherein: the inner housing

includes a first side, a second side opposite the first side, and a third side disposed between the first side and the second side; the detent extends from the first side; and the detent is disposed proximate the third side.

[0068] Clause 9: The connector assembly of clause 8, wherein: the inner housing includes an additional detent and a fourth side opposite the third side; the additional detent extends from the first side; and the additional detent is disposed proximate the fourth side.

[0069] Clause 10: The connector assembly of any of clauses 1 through 9, wherein: the plurality of walls of the connector body include a sidewall defining a channel; and in an assembled configuration: portions of the lock member and the inner housing are disposed in the channel, a hole of the inner portion is aligned with the aperture of the lock member and the slot of the inner housing, and the terminal is disposed in the hole, the aperture, and the slot.

[0070] Clause 11: A connector assembly comprising: a connector body including a plurality of walls and an inner portion having a locking arm, wherein: the plurality of walls define a cavity configured to receive a terminal, and the inner portion is disposed within the cavity; a lock member removably-disposed within the cavity and defining an aperture configured to receive the terminal; and an inner housing removably-disposed within the cavity and defining a slot configured to receive the terminal, the inner housing including a detent configured to engage the lock member; wherein, during actuation of the lock member from a first position to a second position, the detent engages the lock member and moves the lock member toward the inner portion and the terminal to detect whether the terminal is secured by the locking arm.

[0071] Clause 12: The connector assembly of clause 11, wherein, in accordance with the terminal not being secured by the locking arm, the lock member is configured to move the terminal to connect with the locking arm by the lock member being moved via the detent of the inner housing.

[0072] Clause 13: The connector assembly of clause 11 or 12, wherein: the connector body includes a locking feature that is configured to connect with the inner housing and to inhibit removal of the inner housing from the cavity; and in accordance with the terminal not being properly disposed within the connector body, the inner housing is inhibited from connecting with the locking feature.

[0073] Clause 14: The connector assembly of any of clause 11 through 13, wherein: the inner portion of the connector body includes a wall defining a hole configured to receive the terminal; and the locking arm is disposed within the hole.

[0074] Clause 15: The connector assembly of any of clauses 11 through 14, wherein the detent includes a ramp.

[0075] Clause 16: The connector assembly of any of clauses claim 11 through 15, wherein: the detent extends from a side of the inner housing; the side defines a length; and the detent is disposed proximate a midpoint of the length.

[0076] Clause 17: The connector assembly of any of clauses 11 through 16, wherein the inner housing includes an additional detent offset from the detent.

[0077] Clause 18: The connector assembly of any of clauses 11 through 17, wherein: the inner housing includes a first side, a second side opposite the first side, and a third side disposed between the first side and the second side; the detent extends from the first side; and the detent is disposed proximate the third side.

[0078] Clause 19: The connector assembly of clause 18, wherein: the inner housing includes a fourth side opposite the third side and an additional detent; the additional detent extends from the first side; and the additional detent is disposed proximate the fourth side.

[0079] Clause 20: A method of assembling a connector assembly, the method comprising: disposing a lock member in a cavity of a connector body; disposing an inner housing in the cavity; disposing a terminal in a slot of the inner housing, an aperture of the lock member, and a hole of an inner portion of the connector body; actuating the lock member from a first position to a second position by engaging a detent of the inner housing with the lock member and moving the lock

member toward the inner portion and the terminal to detect whether the terminal is properly disposed within the connector body; and in accordance with the terminal not being properly disposed within the connector body, moving the terminal to a proper position by moving the lock member via the detent of the inner housing.

Claims

1. A connector assembly comprising: a connector body including a plurality of walls and an inner portion, wherein: the plurality of walls define a cavity configured to receive a terminal, and the inner portion is disposed within the cavity; a lock member removably-disposed within the cavity and defining an aperture configured to receive the terminal; and an inner housing removably-disposed within the cavity and defining a slot configured to receive the terminal, the inner housing including a detent configured to engage the lock member, wherein: during actuation of the lock member from a first position to a second position, the detent engages the lock member and moves the lock member toward the inner portion and the terminal to detect whether the terminal is properly disposed within the connector body.
2. The connector assembly of claim 1 wherein, in accordance with the terminal not being properly disposed within the connector body, the lock member is configured to move the terminal to a proper position by the lock member being moved via the detent of the inner housing.
3. The connector assembly of claim 1 wherein: the connector body includes a locking feature that is configured to engage the inner housing and inhibit removal of the inner housing from the cavity; and the inner housing is inhibited from connecting with the locking feature when the terminal not properly disposed within the connector body.
4. The connector assembly of claim 1 wherein: the inner portion of the connector body includes a locking arm configured to engage the terminal and inhibit removal of the terminal from the cavity; the terminal is secured by the locking arm when the terminal is properly disposed within the connector body; and the terminal is not secured by the locking arm when the terminal is not properly disposed within the connector body.
5. The connector assembly of claim 1 wherein the detent includes a ramp.
6. The connector assembly of claim 1 wherein: the detent extends from a side of the inner housing; the side defines a length; and the detent is disposed proximate a midpoint of the length.
7. The connector assembly of claim 1 wherein the inner housing includes an additional detent offset from the detent.
8. The connector assembly of claim 1 wherein: the inner housing includes a first side, a second side opposite the first side, and a third side disposed between the first side and the second side; the detent extends from the first side; and the detent is disposed proximate the third side.
9. The connector assembly of claim 8 wherein: the inner housing includes an additional detent and a fourth side opposite the third side; the additional detent extends from the first side; and the additional detent is disposed proximate the fourth side.
10. The connector assembly of claim 1 wherein: the plurality of walls of the connector body include a sidewall defining a channel; and in an assembled configuration: portions of the lock member and the inner housing are disposed in the channel, a hole of the inner portion is aligned with the aperture of the lock member and the slot of the inner housing, and the terminal is disposed in the hole, the aperture, and the slot.
11. A connector assembly comprising: a connector body including a plurality of walls and an inner portion having a locking arm, wherein: the plurality of walls define a cavity configured to receive a terminal, and the inner portion is disposed within the cavity; a lock member removably-disposed within the cavity and defining an aperture configured to receive the terminal; and an inner housing removably-disposed within the cavity and defining a slot configured to receive the terminal, the inner housing including a detent configured to engage the lock member; wherein, during actuation

of the lock member from a first position to a second position, the detent engages the lock member and moves the lock member toward the inner portion and the terminal to detect whether the terminal is secured by the locking arm.

12. The connector assembly of claim 11 wherein, in accordance with the terminal not being secured by the locking arm, the lock member is configured to move the terminal to connect with the locking arm by the lock member being moved via the detent of the inner housing.

13. The connector assembly of claim 11 wherein: the connector body includes a locking feature that is configured to connect with the inner housing and to inhibit removal of the inner housing from the cavity; and in accordance with the terminal not being properly disposed within the connector body, the inner housing is inhibited from connecting with the locking feature.

14. The connector assembly of claim 11 wherein: the inner portion of the connector body includes a wall defining a hole configured to receive the terminal; and the locking arm is disposed within the hole.

15. The connector assembly of claim 11 wherein the detent includes a ramp.

16. The connector assembly of claim 11 wherein: the detent extends from a side of the inner housing; the side defines a length; and the detent is disposed proximate a midpoint of the length.

17. The connector assembly of claim 11 wherein the inner housing includes an additional detent offset from the detent.

18. The connector assembly of claim 11 wherein: the inner housing includes a first side, a second side opposite the first side, and a third side disposed between the first side and the second side; the detent extends from the first side; and the detent is disposed proximate the third side.

19. The connector assembly of claim 18 wherein: the inner housing includes a fourth side opposite the third side and an additional detent; the additional detent extends from the first side; and the additional detent is disposed proximate the fourth side.

20. A method of assembling a connector assembly, the method comprising: disposing a lock member in a cavity of a connector body; disposing an inner housing in the cavity; disposing a terminal in a slot of the inner housing, an aperture of the lock member, and a hole of an inner portion of the connector body; actuating the lock member from a first position to a second position by engaging a detent of the inner housing with the lock member and moving the lock member toward the inner portion and the terminal to detect whether the terminal is properly disposed within the connector body; and in accordance with the terminal not being properly disposed within the connector body, moving the terminal to a proper position by moving the lock member via the detent of the inner housing.