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(54) **CONNECTOR WITH A SLOT FOR A SMALL CIRCUIT BOARD**

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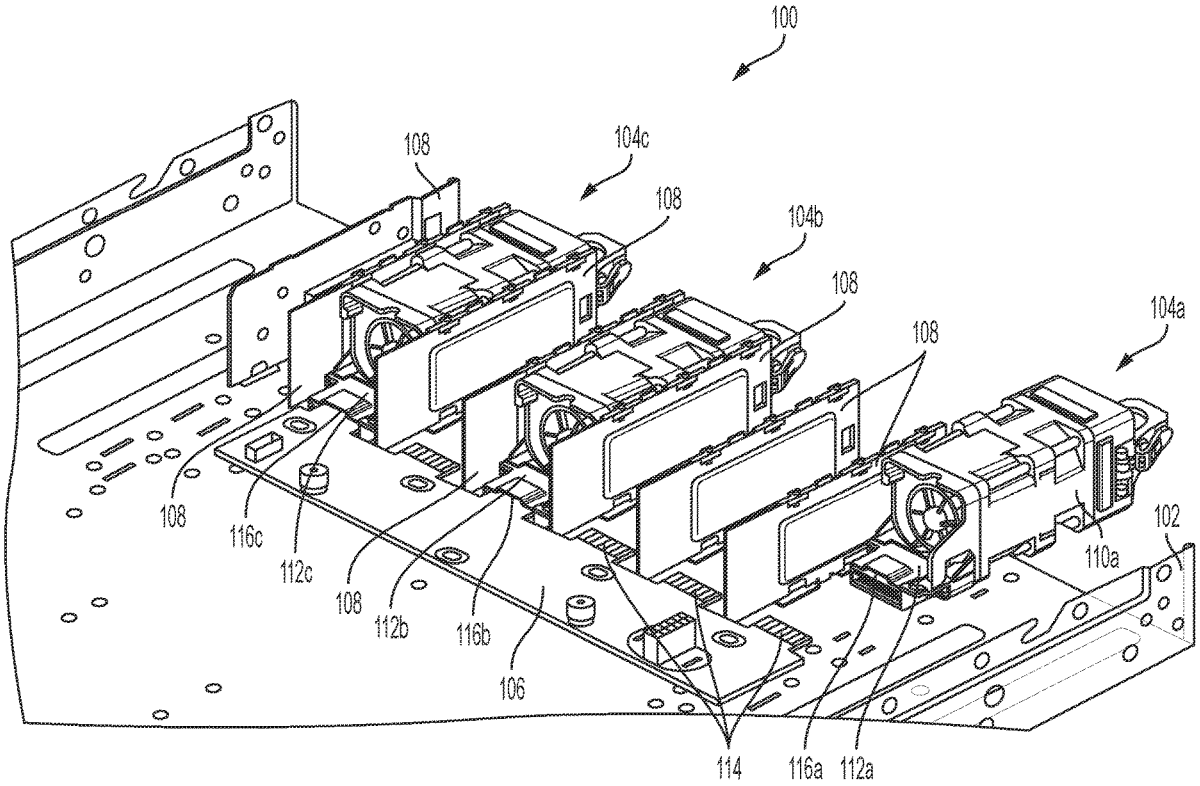
(57) **ABSTRACT**

A connector consisting of a body, a first slot, a second slot, a first terminal, and a second terminal is disclosed. The first slot is provided on the body to receive a first printed circuit board (PCB). The second slot is provided on the body to receive a second PCB. The first slot and the second slot are separate and distinct slots. When the first PCB and the second PCB are received in the first slot and the second slot, respectively, the first terminal electrically connects the first PCB and the second PCB, and the second terminal connects to only the second PCB. Providing the first slot on the connector allows adding expansion cards, control cards, and the like to enhance functionality of computing systems.



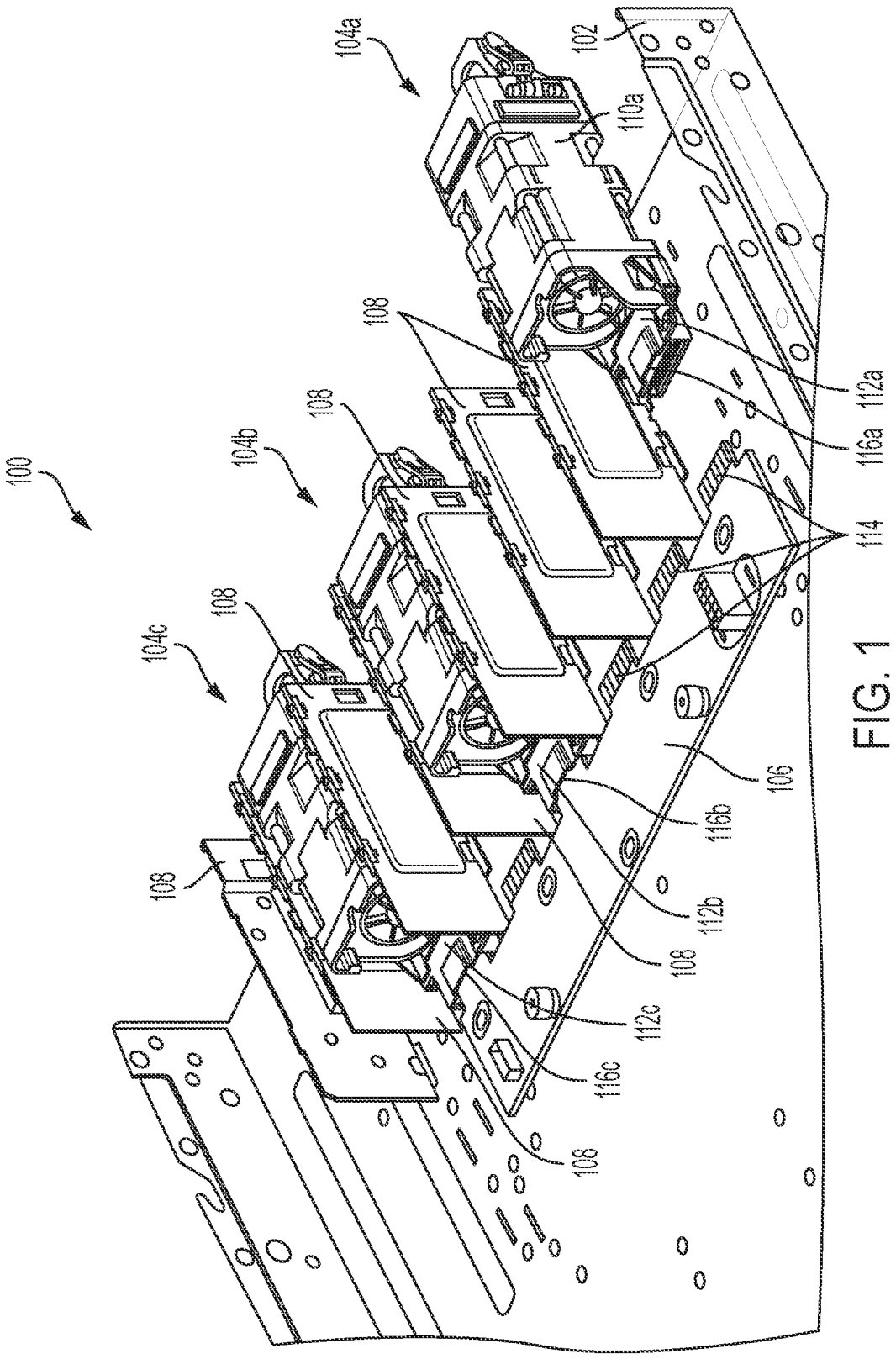

100
102
104a
104b
104c
106
108
110a
112a
112b
112c
114
116a
116b
116c

FIG. 1

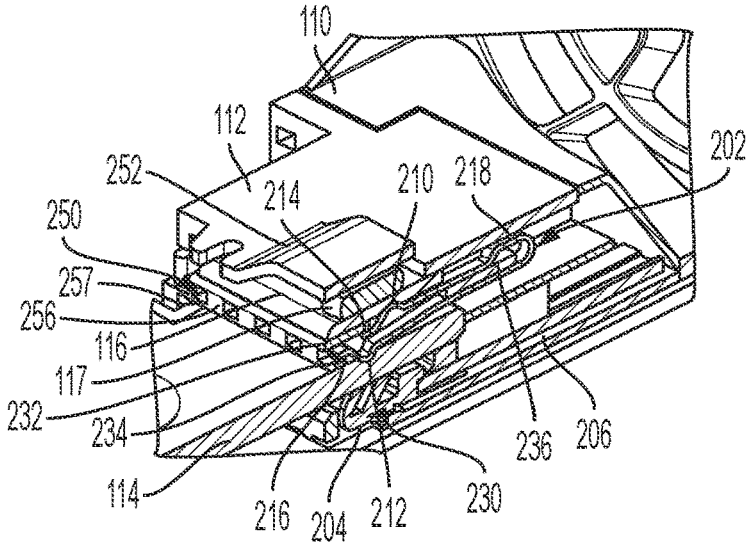


FIG. 2

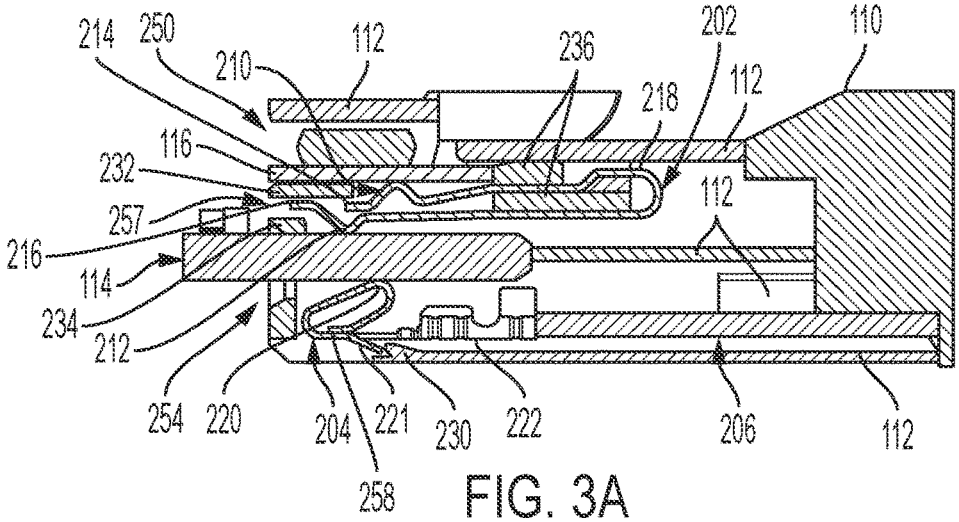


FIG. 3A

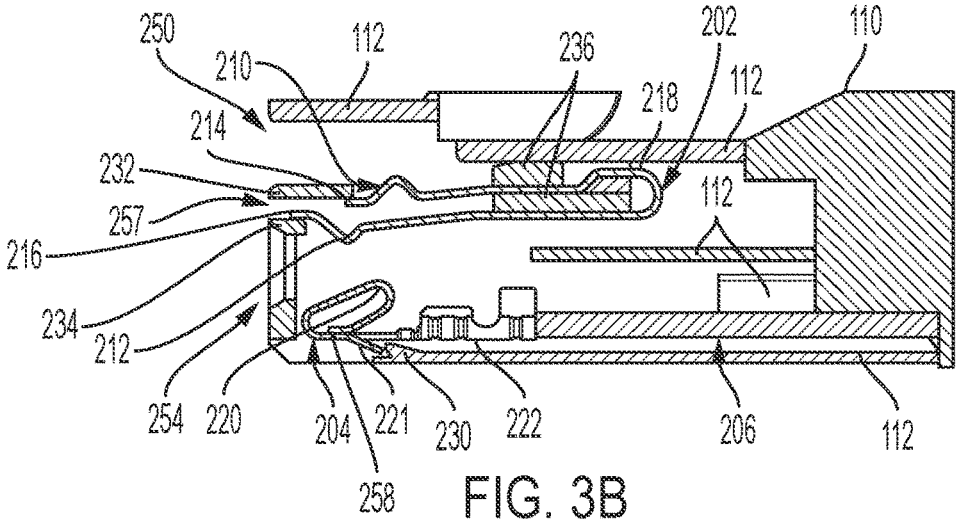


FIG. 3B

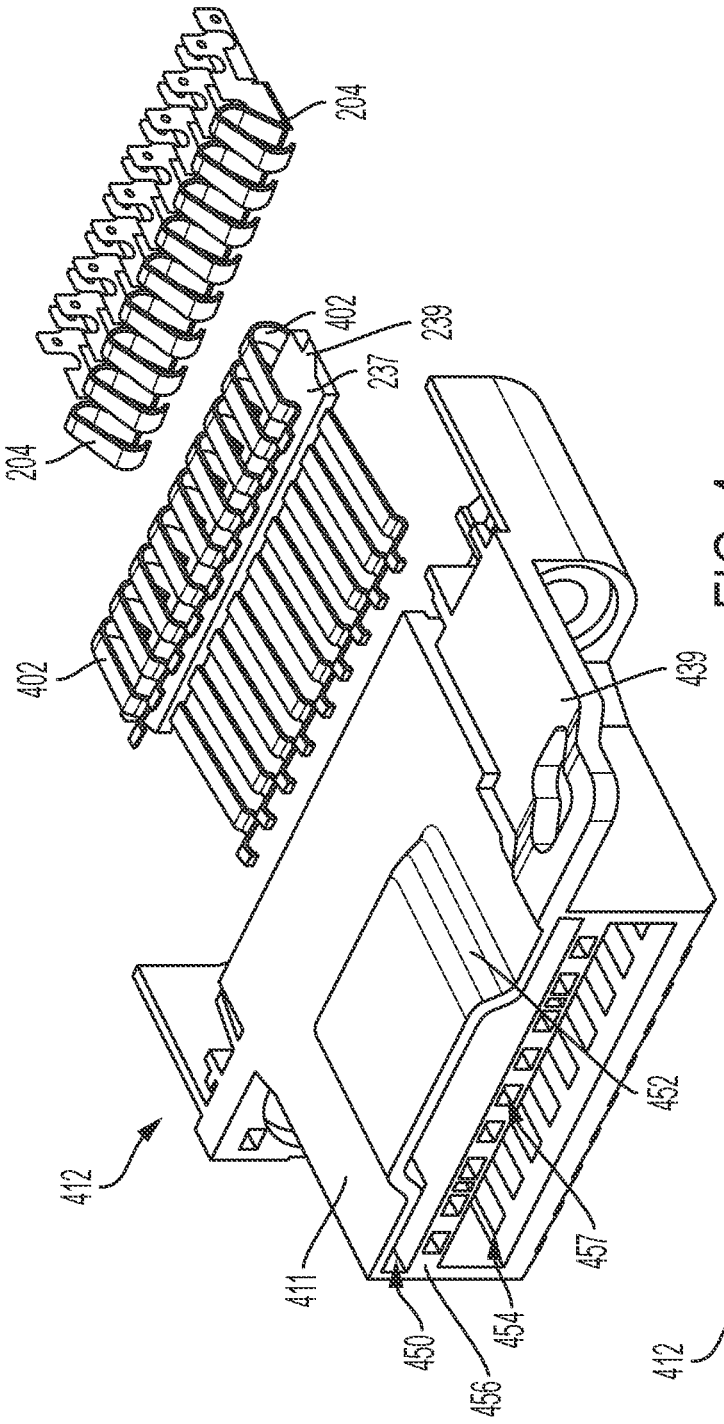

204
402
239
237
204
402
439
412
452
411
457
450
454
456

FIG. 4

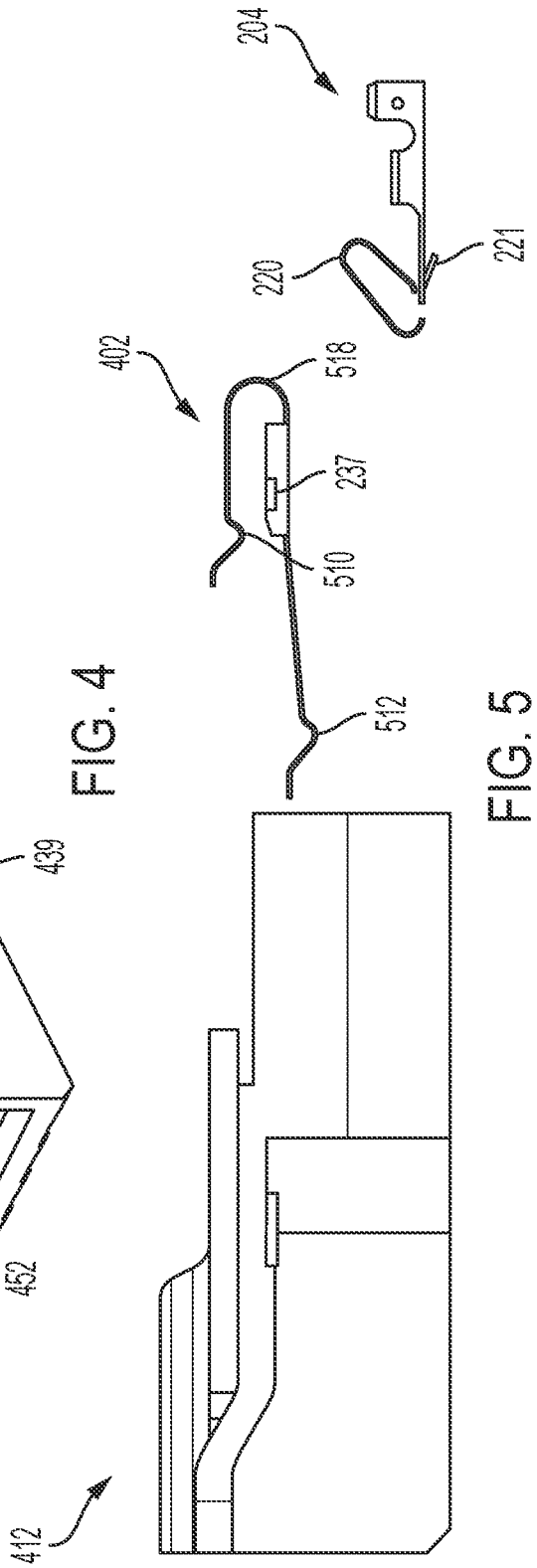

204
220
221
402
518
237
510
512
412

FIG. 5

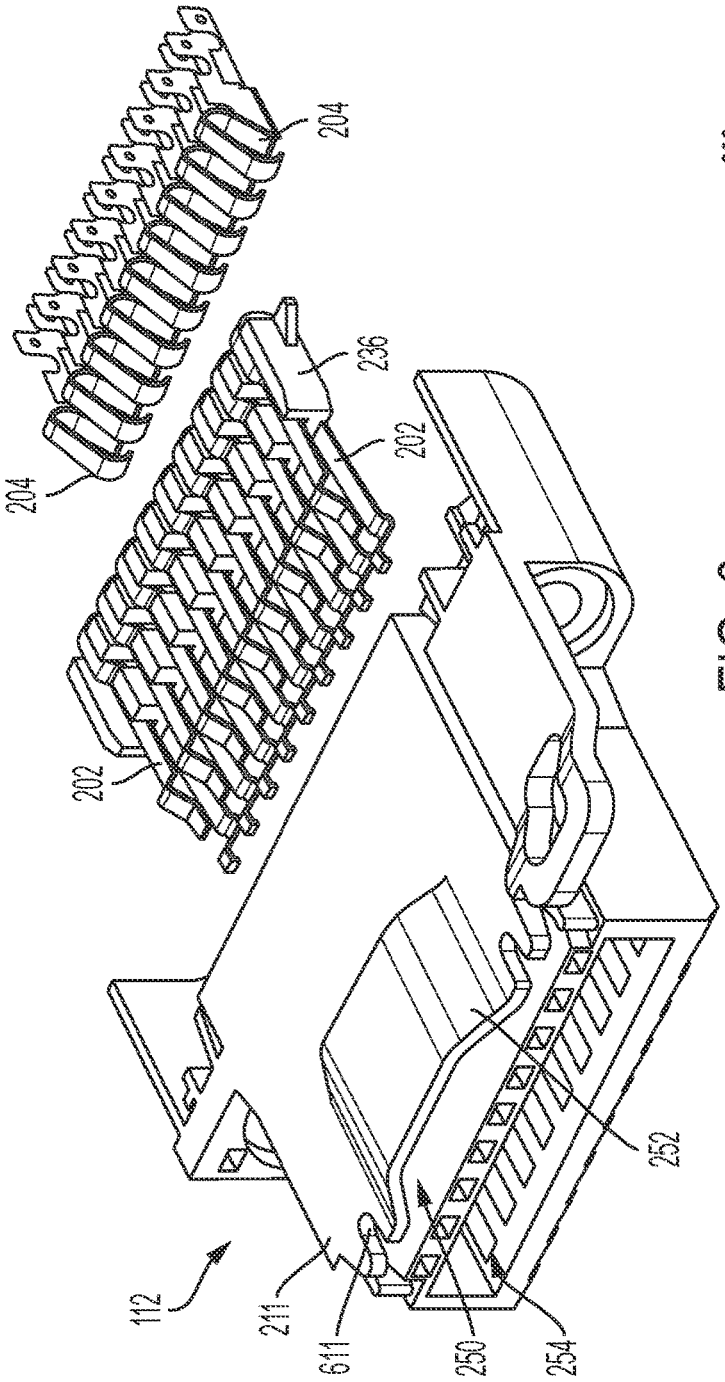

204
236
202
204
202
112
211
611
250
254
252

FIG. 6

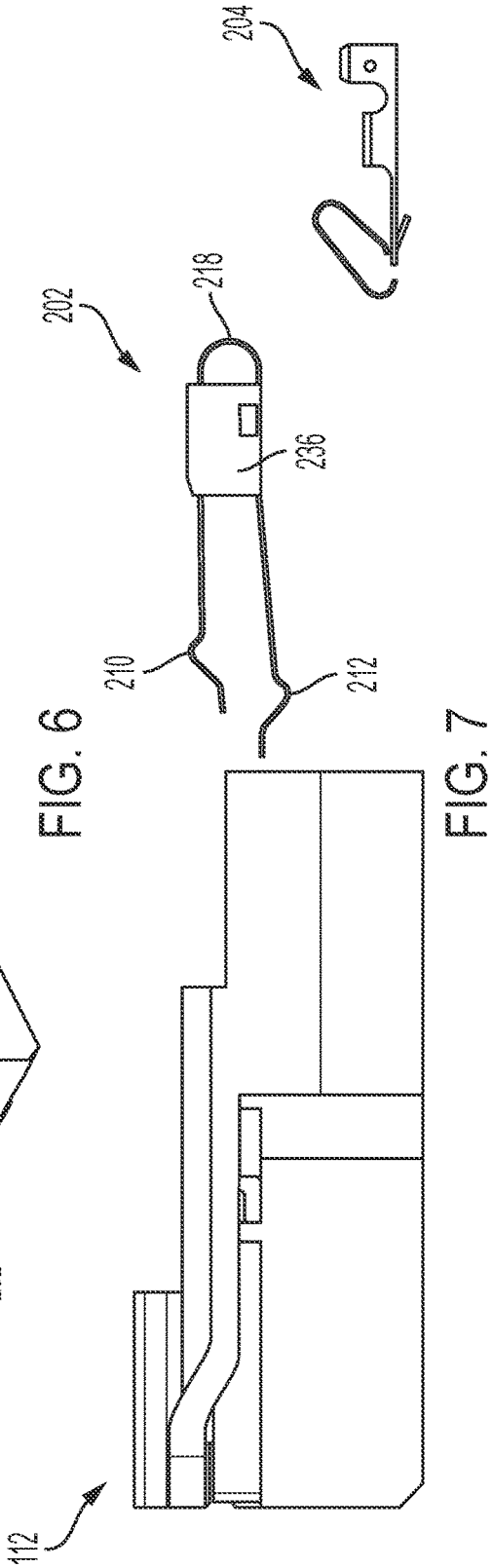

204
218
202
236
210
212
112

FIG. 7

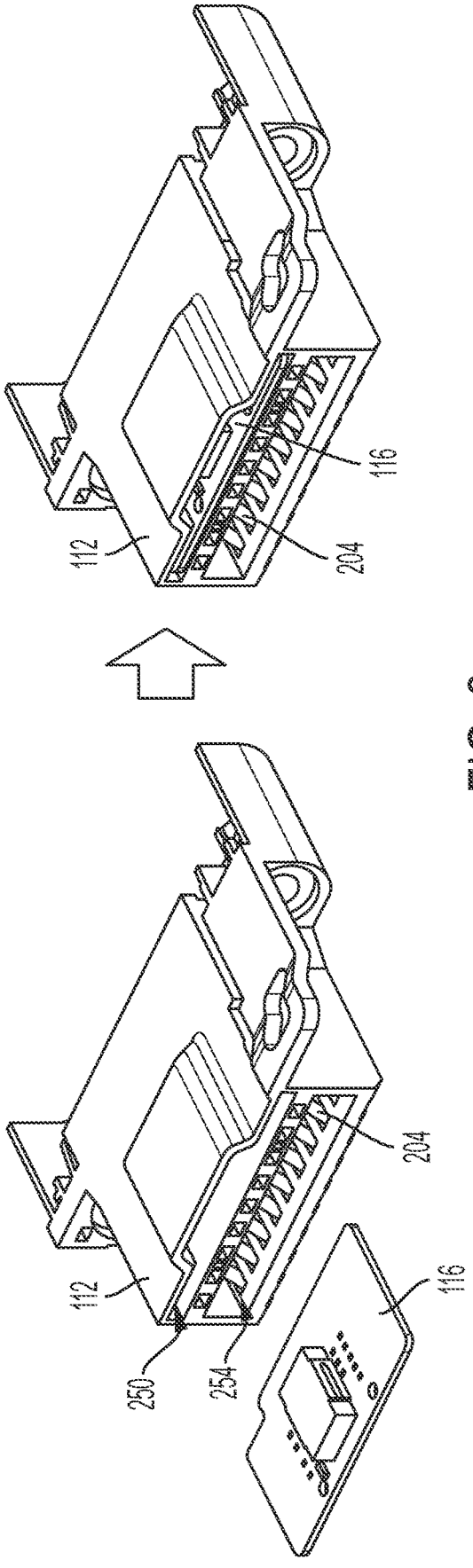


FIG. 8

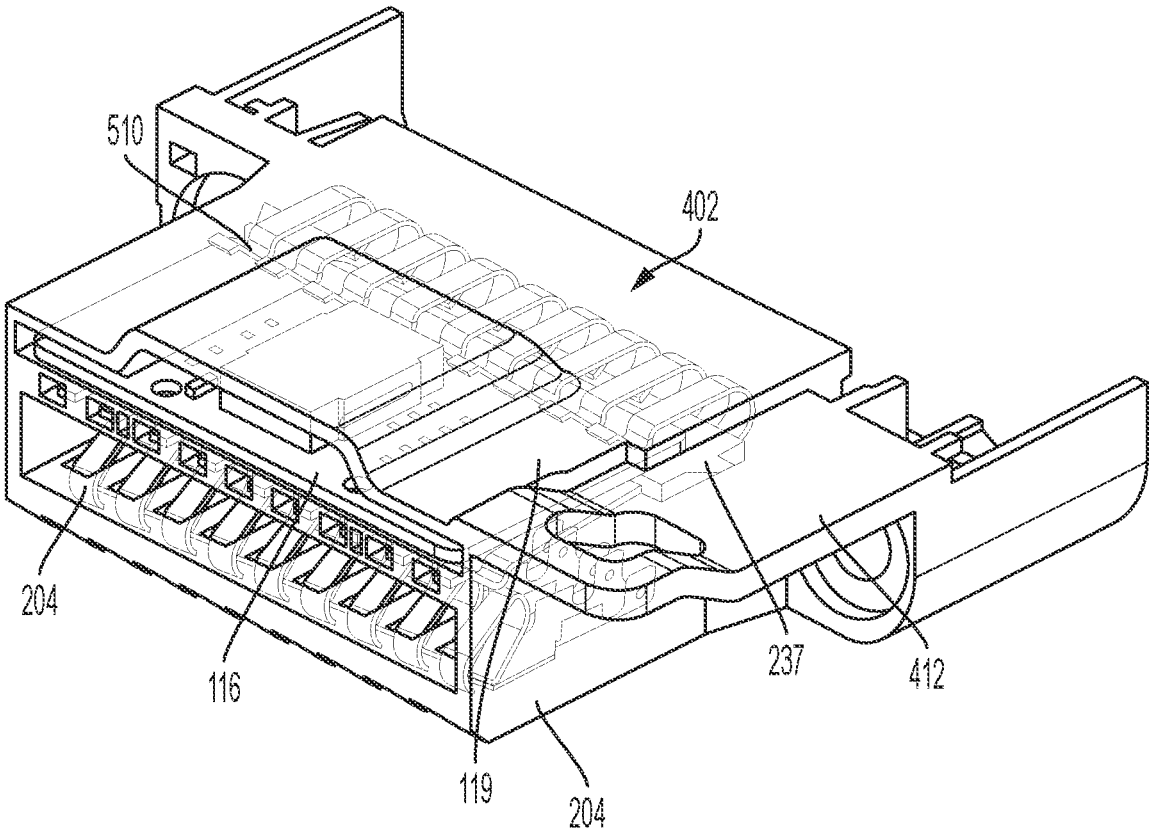


FIG. 9

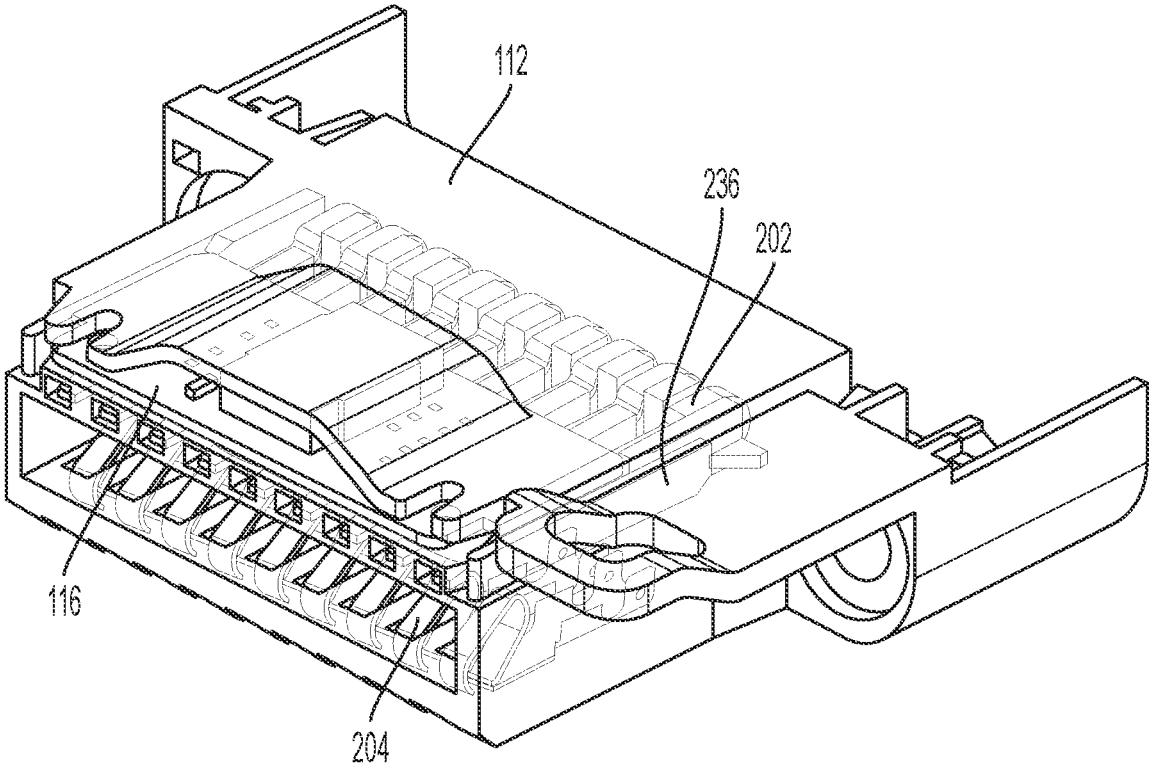


FIG. 10

CONNECTOR WITH A SLOT FOR A SMALL CIRCUIT BOARD

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims the benefit of U.S. Provisional Patent Application No. 63/034,803, filed Jun. 4, 2020. The contents of that application in its entirety are hereby incorporated by reference.

TECHNICAL FIELD

[0002] The present disclosure relates generally to systems and methods for adding expansion slots to electronic connectors.

BACKGROUND

[0003] Computing systems (e.g., desktop computers, blade servers, rack-mount servers, etc.) are employed in large numbers in various applications. Computing systems employ connectors of various types to ensure that components of the computing systems are able to communicate with each other or with other computing systems. The connectors can provide an interface between distinct components, thereby allowing power and/or communication signals to flow between the distinct components. In some cases, connectors are simple and not readily identifiable without looking for identifiable marks on the connector. In some cases, connectors are unable to both receive memory modules or other control cards, and facilitate communication with components of computing systems. Thus, the present disclosure is directed at solving problems related to providing expansion slots on connectors for various purposes.

SUMMARY

[0004] Some implementations of the present disclosure provide a connector that consists of a body, a first slot, a second slot, a first terminal, and a second terminal. The first slot is provided on the body for receiving a first printed circuit board (PCB). The second slot is provided on the body for receiving a second PCB. The first slot and the second slot are separate and distinct slots. When the first PCB and the second PCB are received in the first slot and the second slot, respectively, the first terminal electrically connects to the first PCB and the second PCB, and the second terminal connects to only the second PCB.

[0005] In an embodiment, the first terminal is configured to connect to a top surface of the first PCB. In an embodiment, the first terminal is configured to connect to a bottom surface of the first PCB. In an embodiment, the second terminal is connected to a cable via a wire connector. The cable is electrically connected to an electronic component separate from the first PCB and the second PCB.

[0006] In an embodiment, the first terminal includes a bend connected to a first leg and a second leg, such that the first leg connects to the first PCB and the second leg connects to the second PCB. In an embodiment, the first leg of the first terminal connects to the first PCB at a connection point on the first leg. The connection point is located between the bend and an end of the first leg. In an embodiment, the second leg of the first terminal connects to the second PCB at a connection point on the second leg. The connection point is located between the bend and an end of the second leg. In an embodiment, a connection point located on the first leg of the first terminal protrudes away from the second leg of the first terminal. In an embodiment, a connection point located on the first leg of the first terminal protrudes towards the second leg of the first terminal. In an embodiment, an end of the first leg of the first terminal is wedged on a first part of the body, and an end of the second leg of the first terminal is wedged on a second part of the body, such that the first terminal is held in place by a compression of the bend by the first part of the body and the second part of the body.

[0007] In an embodiment, when either the first PCB or the second PCB are received in the first slot or the second slot, respectively, the bend is further compressed, and the first leg of the first terminal and the second leg of the first terminal move towards each other. In an embodiment, the first leg of the first terminal and the second leg of the first terminal have different lengths. In an embodiment, the second terminal includes a contact point that connects to the second PCB. The contact point is provided on a loop-shaped conductor, an arc-shaped conductor, or an L-shaped conductor.

[0008] Some implementations of the present disclosure provide a pluggable component module for connecting to a printed circuit board (PCB) of a computing system. The pluggable module includes a computer component and a connector. The connector includes a body, a first slot, a second slot, a first terminal, and a second terminal. The first slot is provided on the body for receiving a control board. The second slot is provided on the body for receiving the PCB. The first slot and the second slot are separate and distinct slots. When the control board and the PCB are received in the first slot and the second slot, respectively, the first terminal electrically connects to the control board and the PCB, and the second terminal connects to only the PCB.

[0009] In an embodiment, the control board includes an electrically erasable programmable read-only memory (EEPROM). The PCB is a fan transfer board, and the computer component is a fan. In an embodiment, the first terminal provides an electrical connection between the EEPROM and the fan transfer board, and the second terminal provides an electrical connection between the fan transfer board and the fan. In an embodiment, the control board has a smaller surface area than that of the PCB, and the first slot is smaller than the second slot. In an embodiment, most of the control board fits completely within the first slot, and less than half of the surface area of the PCB is enclosed by the second slot. In an embodiment, when the control board and the PCB are received in the first slot and the second slot, respectively, the control board is parallel to the PCB.

[0010] Some implementations of the present disclosure provide a computing system that includes a chassis, a printed circuit board (PCB) attached to the chassis, and one or more pluggable components. Each of the pluggable components includes a body, a first slot, a second slot, a first terminal, and a second terminal. The first slot is provided on the body for receiving a control board. The second slot is provided on the body for receiving the PCB. The first slot and the second slot are separate and distinct slots. When the control board and the PCB are received in the first slot and the second slot, respectively, the first terminal electrically connects the control board and the PCB, and the second terminal connects to only the PCB.

[0011] The above summary is not intended to represent each embodiment or every aspect of the present disclosure.

Rather, the foregoing summary merely provides an example of some of the novel aspects and features set forth herein. The above features and advantages, and other features and advantages of the present disclosure, will be readily apparent from the following detailed description of representative embodiments and modes for carrying out the present invention, when taken in connection with the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The disclosure will be better understood from the following description of embodiments together with reference to the accompanying drawings.

[0013] FIG. **1** illustrates a portion of a computing system, according to some implementations of the present disclosure.

[0014] FIG. **2** illustrates an interior of an example connector, according to some implementations of the present disclosure.

[0015] FIG. **3**A illustrates a side cut of the example connector of FIG. **2**.

[0016] FIG. **3**B illustrates a side cut of the example connector of FIG. **2** when not connected to any boards.

[0017] FIG. **4** illustrates an exploded view of the elements of another example connector, according to some implementations of the present disclosure.

[0018] FIG. **5** illustrates a side view of the elements of the connector of FIG. **4**.

[0019] FIG. **6** illustrates an exploded view of the elements of another example connector, according to some implementations of the present disclosure.

[0020] FIG. **7** illustrates a side view of the elements of the connector of FIG. **6**.

[0021] FIG. **8** illustrates a circuit board being inserted in an example connector, according to some implementations of the present disclosure.

[0022] FIG. **9** illustrates a circuit board inserted in the connector of FIG. **4**, where the circuit board is in contact with terminals within the connector, according to some implementations of the present disclosure.

[0023] FIG. **10** illustrates a circuit board inserted in the connector of FIG. **6**, where the circuit board is in contact with terminals within the connector, according to some implementations of the present disclosure.

[0024] The present disclosure is susceptible to various modifications and alternative forms. Some representative embodiments have been shown by way of example in the drawings and will be described in detail herein. It should be understood, however, that the invention is not intended to be limited to the particular forms disclosed. Rather, the disclosure is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION

[0025] The present inventions can be embodied in many different forms. Representative embodiments are shown in the drawings, and will herein be described in detail. The present disclosure is an example or illustration of the principles of the present disclosure, and is not intended to limit the broad aspects of the disclosure to the embodiments illustrated. To that extent, elements and limitations that are disclosed, for example, in the Abstract, Summary, and Detailed Description sections, but not explicitly set forth in the claims, should not be incorporated into the claims, singly or collectively, by implication, inference, or otherwise. For purposes of the present detailed description, unless specifically disclaimed, the singular includes the plural and vice versa; and the word "including" means "including without limitation." Moreover, words of approximation, such as "about," "almost," "substantially," "approximately," and the like, can be used herein to mean "at," "near," or "nearly at," or "within 3-5% of," or "within acceptable manufacturing tolerances," or any logical combination thereof, for example.

[0026] In some implementations, a control card, an electrically erasable programmable read-only memory (EEPROM), or some other memory device is used to maintain an individual identity of a pluggable computer component. The control card can serve to monitor use of the pluggable computer component. For example, a computer board (e.g., a motherboard) may have controllers that collect usage statistics of different components of a computing system. In some cases, the computer board may collect statistics on the temperature of a central processing unit (CPU) or other processors of the computing system, a fan speed of one or more fans of the computing system, real-time memory capacity of the computing system, etc. In some computing systems, the computer board may be augmented with an external or an expansion card in order to perform at least some of the aforementioned monitoring tasks. Embodiments of the present disclosure provide a connector that can receive such an expansion card, thus saving space on the computer board. The connector will also extend the lifetime of the computer board by delaying replacing the computer board. In some implementations, the expansion card can be used to monitor activities of the connector. For example, the expansion card can hold an identity of or characteristics of the connector (e.g., a serial number of the connector, components being interfaced by the connector, whether or not the connector facilitates sharing of power, a type of connector, a communication protocol of the connector, etc.).

[0027] Embodiments of the present disclosure will be described with an example of a fan, and a fan transfer board, but the present disclosure is not limited to merely the fan and the fan transfer board. The fan is used as an example as a pluggable computer component so as to highlight some advantages of some implementations of the present disclosure. Although the fan is used as an example, other pluggable computer components, for example, a monitor card module (MCM), a port interface module (PIM), a switch controller module (SCM), etc., can benefit from the present disclosure. FIG. **1** illustrates a portion of a computing system **100**, according to some implementations of the present disclosure. The computing system **100** includes a chassis **102** having side walls and a bottom panel. The chassis **102** can include locations that allow installation of dividers **108** between different components. In this example, the locations may include slots that align the dividers **108** in parallel with the walls of the chassis **102**.

[0028] In the chassis **102**, a printed circuit board (PCB) is installed between the side walls and on the bottom panel. In some implementations, the PCB is a fan transfer board **106**. One or more fan modules **104***a*, **104***b*, **104***c*, etc., can be installed on the fan transfer board **106** via connectors **112***a*, **112***b*, **112***c*, etc., respectively. The connectors **112***a*, **112***b*, **112***c*, etc., receive fingers **114** of the fan transfer board **106**.

The fingers **114** include terminals that electrically and mechanically connect to terminals of the connectors **112***a*, **112***b*, **112***c*, etc. The fan modules **104***b* and **104***c* are shown already installed or connected to the fan transfer board **106**. The fan module **104***a* is shown unconnected to the fan transfer board **106**. The fan module **104***a* includes a fan **110***a* and a connector **112***a*. The other fan modules **104***b* and **104***c* also include identical fans similar to fan **110***a*.

[0029] In some implementations, the fan transfer board **106** lacks some functionality and should be augmented. For example, the fan modules **104***a*, **104***b*, **104***c*, etc., may include newer fan technology, and the fan transfer board **106** may be an older technology configuration. Hence, in order to take advantage of new features provided by the fan modules **104***a*, **104***b*, **104***c*, etc., control cards **116***a*, **116***b*, **116***c*, etc., can be used along with the fan transfer board **106**. For example, the control card **116***b* can send control signals to the fan transfer board **106** which can then relay those signals to the fan module **104***b*. Conversely, the fan module **104***b* can send signals to the fan transfer board **106** which can relay those signals to the control card **106***b*. The control card **116***b* in some implementations can instruct the fan module **104***b* to reduce fan speed in response to a level of ambient noise detected from the fan module **104***b*. The control card **116***b* can thus include a microphone or other sensors for determining the ambient noise for controlling fan speed of the fan module **104***b*.

[0030] The control cards **116***a*, **116***b*, **116***c*, etc., are PCBs with circuit components. The control cards **116***a*, **116***b*, **116***c*, etc., can include an EEPROM or some other programmable device. Each of the control cards **116***a*, **116***b*, **116***c*, etc., can have a smaller surface area than the fan transfer board **106**. In some cases, due to the fan transfer board **106** being of an older technology, there may not be any expansion slots on the fan transfer board **106** to receive the control cards **116***a*, **116***b*, **116***c*, etc. As such, connectors **112***a*, **112***b*, **112***c*, etc., include a slot for receiving the control cards **116***a*, **116***b*, **116***c*, etc.

[0031] The letters "a", "b", "c," etc., are used to differentiate between multiple items of a same or similar type in FIG. **1**. The remaining drawings (FIGS. **2-10**) only include one connector; hence, the letter labels are dropped. It is understood that the connector being described can be any one of the connectors illustrated in FIG. **1**. Referring to FIG. **2**, a cross-sectional cut of a connector **112** (e.g., any one of the connectors **112***a*, **112***b*, **112***c*, etc., of FIG. **1**) is provided. The connector **112** is attached to a fan **110** (e.g., the fan **110***a* of FIG. **1**). The connector **112** includes an already inserted or installed control board **116**. The connector **112** is shown to be shaped such that circuit components **117** of the control board **116** can fit within a slot **250** (FIG. **3**A) provided on the connector **112** when the control board **116** is inserted in the connector **112**. An elevated portion **252** of the connector **112** provides room such that the slot **250** accommodates the circuit components **117**. The connector **112** is also shown to receive the finger **114**. This configuration is similar to or the same as the fan module **104***b* being connected to the fan transfer board **106** in FIG. **1**.

[0032] FIG. **3**A illustrates a side view along the cross-sectional cut of the connector **112** shown in FIG. **2**. FIG. **3**B illustrates a view of FIG. **3**A without the finger **114** and the control board **116** installed. The following discussion refers to elements having reference numbers shown in either or both FIGS. **2** and **3**A. The connector **112** includes at least one upper terminal **202** and at least one lower terminal **204**. In this example, one upper terminal **202** and one matching lower terminal **204** are shown.

[0033] The upper terminal **202** is provided for connecting the control board **116** to the finger **114** at a contact point **212**. The upper terminal **202** is a single conductor that is bent over with two legs extending from the bend and in roughly parallel alignment with each other. Each of the two legs is not completely straight and includes deflections along the length of the leg. The deflections are around a location where the upper terminal **202** should contact a PCB, and a contact point of each of the two legs is located at the deflections. In some implementations, the upper terminal **202** includes a contact point **210** on one leg that touches the control board **116** at the bottom of the control board **116**. The contact point **212** is on the other arm of the upper terminal **202**. The contact points **210** and **212** are at areas where the upper terminal **202** is deflected, and therefore, the upper terminal **202** extends outward at the location of these contact points **210** and **212**.

[0034] The control board **116** and the finger **114** are parallel to each other when installed in the connector **112**. The control board **116** is received at the slot **250**, and the finger **114** is received at a different slot **254** of the connector. Instead of having a straight metal terminal connecting the control board **116** and the finger **114**, the connector **112** has the bent upper terminal **202**. The upper terminal **202** includes a bend **218** that can handle some compression or pinching together of the two legs of the upper terminal **202**. The upper terminal **202** has some elasticity such that the two legs of the upper terminal **202** try to move away from each other when pinched or compressed. The two legs moving apart causes two ends **214** and **216** of the legs of the upper terminal **202** to move toward a top wall **232** and a bottom wall **234** of an opening **257** provided on a panel **256** included in the body of the connector **112**. The upper terminal **202** resists a pinching force that brings both legs of the upper terminal **202** together. The top wall **232** and the bottom wall **234** of the opening **257** provide mechanical stability, such that the upper terminal **202** is held in place when the finger **114** or the control board **116** is not inserted in the connector **112** (as shown in FIG. **3**B). When either the finger **114** or the control board **116** is inserted in the connector **112**, the upper terminal **202** is compressed, thereby bringing both legs of the upper terminal **202** closer together such that the two ends **214** and **216** of the upper terminal **202** move vertically towards each other. In some implementations, when both the finger **114** and the control board **116** are inserted in the connector **112**, both legs of the upper terminal **202** are pinched towards each other, such that the two ends **214** and **216** of the upper terminal **202** are no longer in contact with the top wall **232** and the bottom wall **234** (as shown in FIG. **3**A). Although the top wall **232** and the bottom wall **234** are shown separately in FIGS. **3**A and **3**B, note that in FIG. **2**, the two walls **232** and **234** are connected to each other as they are both within a contiguous part of the panel **256** included in the connector **112**.

[0035] The upper terminal **202** can be shaped such that the contact point **212** orients downwards in order to touch a top surface of the finger **114**. In some implementations, the contact point **210** is oriented upwards in order to touch the bottom surface of the control board **116**. In some implementations, the locations of the contact points **212** and **210** are not aligned along a same vertical axis. As such, legs of the

bent upper terminal **202** can have different lengths. In the example of FIG. **3**A, the leg of the upper terminal **202** having the end **214** is shorter than the leg of the upper terminal **202** having the end **216**. A distance between the contact point **212** and the end **216** is comparable to a distance between the contact point **210** and the end **214**. A distance between the contact point **210** and the bend **218** is less than a distance between the contact point **212** and the bend **218**. As such, where the contact points **212** and **210** are located can dictate lengths of the two legs of the upper terminal **202**. The connector **112** can include a separator or holder **236** for electrically isolating or separating upper terminals, such as the upper terminal **202**, from each other.

[0036] The lower terminal **204** includes a contact **220** for connecting a bottom surface of the finger **114** to the lower terminal **204**. The lower terminal **204** can be connected to a cable **206** via a wire connector **222**. The cable **206** can be an electrical interface to the fan **110**. The electrical connection between the fan **110** and the control board **116** can thus be described as having the upper terminal **202**, the finger **114**, and the lower terminal **204** as intermediaries. The lower terminal **204** can include a loop with a contact point **212** for making contact to the bottom surface of the finger **114**. The loop can be mostly oval in shape. Although an oval shape is provided in FIGS. **3**A and **3**B, in some implementations, the loop can be an open loop, an arc, a circle, an L-shaped connector, etc. In FIG. **3**B, the loop of the lower terminal **204** is provided at an angle (e.g., a 30 degree angle, a 45 degree angle, etc.) from the cable **206**. The angle facilitates movement or further angling of the loop in response to the finger **114** being inserted in the connector **112**. When the finger **114** is inserted in the connector **112**, the angle from the cable **206** is reduced, since the finger **114** pushes down on the loop at the contact **220** (as shown in FIG. **3**A). The loop can include a free end **258** that facilitates the further movement or angling of the loop. Thus, the free end **258** prevents the loop from being a stiff, rigid, and unmoving part.

[0037] The lower terminal **204** can include a lip **221**. The connector **112** can include a catch **230** for catching the lip **221**, thus preventing the lower terminal **204** from moving laterally towards the fan **110**. The lip **221** prevents the lower terminal **204** from moving towards the fan **110** when the finger **114** is inserted in the slot **254**.

[0038] FIG. **4** illustrates elements of a connector **412**, according to some implementations of the present disclosure. The connector **412** can include a body **411** that receives a row of upper terminals **402** and a row of lower terminals **204**. The body **411** includes a horizontal panel **456** that separates a slot **450** and a slot **454**. The horizontal panel **456** is similar to or the same as the panel **256** (FIG. **2**). The slot **450** is similar to the slot **250** (FIG. **3**A), and the slot **454** is similar to the slot **254** (FIG. **3**A). The body **411** includes an elevated portion **452** that shapes the slot **450** to fit circuit components of a PCB that fits in the slot **450**. The horizontal panel **456** includes openings **457**, which are similar to the openings **257** (FIG. **2**). The body **411** includes a handle **439**. The handle **439** can span a side of the body **411**.

[0039] FIG. **5** illustrates a side view of the elements of the connector **412** of FIG. **4**. The lower terminals **204** in FIGS. **4** and **5** are similar to or the same as the lower terminal **204**, as described above with respect to FIGS. **2** **3**A, and **3**B. The upper terminals **402** of FIGS. **4** and **5** have a slightly different configuration than the upper terminals of FIGS. **2**, **3**A, and **3**B. Furthermore, a separator or holder **237** is provided to electrically separate the upper terminals **402**. The separator or holder **237** is a non-conductive member that includes slots that each hold one of the upper terminals **402**. The upper terminals **402** can be prevented from sliding laterally towards each other by the separator or holder **237**. The holder **237** can also include a handle **239**.

[0040] Each of the upper terminals **402** includes a bend **518**, similar to the bend **218** of FIGS. **2**, **3**A, and **3**B. One leg of the upper terminal **402** can be longer than the other leg. The upper terminal **402** includes contact points **510** and **512** on the respective legs. The contact point **510** makes contact with a control board (not shown) when the control board is inserted in the connector **412**. The contact point **512** makes contact with a finger similar to the finger **114** shown in FIG. **2** when the finger is inserted in the connector **412**. The contact point **510** makes contact with a top surface of the control board, and the contact point **512** makes contact with a top surface of the finger. This is different from the configuration of FIGS. **2**, **3**A, and **3**B where the upper terminal **202** has the contact point **210** for making connection with the bottom surface of the control board **116**. In contrast, since the contact point **510** of the upper terminal **402** makes contact with the top surface of the control board, the contact point **510** orients downward towards the other leg of the upper terminal **402**.

[0041] The separator or holder **237** is shown flush with the upper terminal **402** in FIGS. **4**-**5**. To achieve this flush configuration, the separator or holder **237** can include cut-outs such that each of the upper terminals **402** fits in a respective cutout.

[0042] FIG. **6** illustrates elements of the connector **112**, according to some implementations of the present disclosure. The connector **112** is similar to or the same as the connector **112**, as described above with respect to FIGS. **2**, **3**A, and **3**B. The connector **112** includes a row of the upper terminals **202** and a row of the lower terminals **204**. The connector **112** includes a body **211** with the elevated portion **252**. The body **211** can include one or more notches **611** that allow a person to quickly see whether a PCB board is inserted the slot **250**. The separator or holder **236** is provided to electrically isolate the upper terminals **202** from each other, and to mechanically prevent the upper terminals **202** from moving laterally towards each other. FIG. **7** illustrates a side view of the elements of the connector **112** of FIG. **6**. The upper terminal **202** contacts a bottom surface of a control card at the contact point **210** (see e.g., FIG. **2**) and a top surface of a finger at the contact point **212** (see e.g., FIG. **2**).

[0043] FIG. **8** illustrates the circuit board **116** being inserted in the connector **112**, according to some implementations of the present disclosure. The circuit board **116** is shown to be received at the upper slot **250** provided on the connector **112**. The lower slot **254** of the connector **112** is left empty such that the lower terminals **204** are visible. When inserted, the circuit board **116** can be connected to upper terminals in the connector **112**. FIGS. **9** and **10** illustrate different connections based on the upper terminals provided in the connector.

[0044] FIG. **9** illustrates the circuit board **116** inserted in the connector **412**. The circuit board **116** is in contact with upper terminals **402** within the connector **412**, according to some implementations of the present disclosure. The connector **412** is similar to or the same as the connector **412** discussed above in connection with FIGS. **4** and **5**. The

upper terminals **402** (at the contact points **510**) make contact with a top surface **119** of the circuit board **116**.

[0045] FIG. **10** illustrates the circuit board **116** inserted in the connector **112**. The circuit board **116** is in contact with the upper terminals **202** within the connector **112**, according to some implementations of the present disclosure. The upper terminals **202** make contact with a bottom surface of the circuit board **116**. The contact points are not shown since the perspective view is being blocked, but the configuration in FIG. **10** is similar to or the same as the configuration in FIGS. **2**, **3**A, and **3**B.

[0046] Although the fan module is used as an example, connectors designed according to some implementations of the present disclosure can used for any pluggable component (e.g., an MCM, a PIM, an SCM, etc.). Functionality of the pluggable component can be augmented with a connector that includes a slot for receiving a control card, according to some implementations of the present disclosure.

[0047] As used in this application, the terms "component," "module," "system," or the like, generally refer to a computer-related entity, either hardware (e.g., a circuit), a combination of hardware and software, software, or an entity related to an operational machine with one or more specific functionalities. For example, a component may be, but is not limited to being, a process running on a processor (e.g., digital signal processor), a processor, an object, an executable, a thread of execution, a program, and/or a computer. By way of illustration, both an application running on a controller, as well as the controller, can be a component. One or more components may reside within a process and/or thread of execution, and a component may be localized on one computer and/or distributed between two or more computers. Further, a "device" can come in the form of specially designed hardware; generalized hardware made specialized by the execution of software thereon that enables the hardware to perform specific function; software stored on a computer-readable medium; or a combination thereof.

[0048] The terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting of the invention. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. Furthermore, to the extent that the terms "including," "includes," "having," "has," "with," or variants thereof, are used in either the detailed description and/or the claims, such terms are intended to be inclusive in a manner similar to the term "comprising."

[0049] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art. Furthermore, terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art, and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0050] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Although the invention has been illustrated and described with respect to one or more implementations, equivalent alterations and modifications will occur or be known to others skilled in the art upon the reading and understanding of this specification and the annexed drawings. In addition, while a particular feature of the invention may have been disclosed with respect to only one of several implementations, such feature may be combined with one or more other features of the other implementations as may be desired and advantageous for any given or particular application. Thus, the breadth and scope of the present invention should not be limited by any of the above described embodiments. Rather, the scope of the invention should be defined in accordance with the following claims and their equivalents.

1-13. (canceled)

14. A pluggable component module for connecting to a printed circuit board (PCB) of a computing system, comprising:

a computer component; and

a connector, comprising:

a body;

a first slot provided on the body for receiving a control board;

a second slot provided on the body for receiving the PCB, the first slot and the second slot being separate and distinct slots;

a first terminal configured to connect to a top surface of the PCB; and

a second terminal, wherein when the control board and the PCB are received in the first slot and the second slot, respectively, the first terminal electrically connects to the control board and the PCB, and the second terminal connects to only the PCB.

15. The pluggable component module of claim **14**, wherein the control board includes an electrically erasable programmable read-only memory (EEPROM), and wherein the PCB is a fan transfer board, and the computer component is a fan.

16. The pluggable component of claim **15**, wherein the first terminal provides an electrical connection between the EEPROM and the fan transfer board, and the second terminal provides an electrical connection between the fan transfer board and the fan.

17. The pluggable component of claim **14**, wherein the control board has a smaller surface area than that of the PCB, and the first slot is smaller than the second slot.

18. The pluggable component of claim **17**, wherein most of the control board completely fits within the first slot and less than half of the surface area of the PCB is enclosed by the second slot.

19. The pluggable component of claim **14**, wherein when the control board and the PCB are received in the first slot and the second slot, respectively, the control board is parallel to the PCB.

20. A computing system, comprising:

a chassis;

a printed circuit board (PCB) attached to the chassis; and

one or more pluggable components, each of the pluggable components comprising:

a body;

a first slot provided on the body for receiving a control board;

a second slot provided on the body for receiving the PCB, the first slot and the second slot being separate and distinct slots;

a first terminal configured to connect to a top surface of the PCB; and

a second terminal, wherein when the control board and the PCB are received in the first slot and the second

slot, respectively, the first terminal electrically connects to the control board and the PCB, and the second terminal connects to only the PCB.

21. The computing system of claim **20**, wherein the second terminal is connected to a cable via a wire connector, the cable being electrically connected to an electronic component separate from the PCB.

22. The computing system of claim **20**, wherein the first terminal includes a bend connected to a first leg and a second leg, the first leg connecting to another PCB, the second leg connecting to the PCB.

23. The computing system of claim **22**, wherein the first leg of the first terminal connects to the another PCB at a connection point on the first leg, the connection point located between the bend and an end of the first leg.

24. The computing system of claim **22**, wherein the second leg of the first terminal connects to the another PCB at a connection point on the second leg, the connection point located between the bend and an end of the second leg.

25. The computing system of claim **22**, wherein a connection point located on the first leg of the first terminal protrudes away from the second leg of the first terminal.

26. The computing system of claim **22**, wherein a connection point located on the first leg of the first terminal protrudes towards the second leg of the first terminal.

27. The computing system of claim **22**, wherein an end of the first leg of the first terminal is wedged on a first part of the body and an end of the second leg of the first terminal is wedged on a second part of the body such that the first terminal is held in place by a compression of the bend by the first part of the body and the second part of the body.

28. The computing system of claim **27**, wherein when either the another PCB or the PCB are received in the first slot or the second slot, respectively, the bend is further compressed and the first leg of the first terminal and the second leg of the first terminal move towards each other.

29. The computing system of claim **22**, wherein the first leg of the first terminal and the second leg of the first terminal have different lengths.

30. The computing system of claim **20**, wherein the second terminal includes a contact point that connects to the PCB, the contact point being provided on a loop-shaped conductor, an arc-shaped conductor, or an L-shaped conductor.

31. A pluggable component module for connecting to a printed circuit board (PCB) of a computing system, the pluggable component module comprising:

a computer component; and

a connector, comprising:

a body;

a first slot provided on the body for receiving a control board;

a second slot provided on the body for receiving the PCB, the first slot and the second slot being separate and distinct slots;

a first terminal configured to connect to a bottom surface of the PCB; and

a second terminal, wherein when the control board and the PCB are received in the first slot and the second slot, respectively, the first terminal electrically connects to the control board and the PCB, and the second terminal connects to only the PCB.

32. The pluggable component module of claim **31**, wherein the first terminal includes a bend connected to a first leg and a second leg, an end of the first leg being wedged on a first part of the body and an end of the second leg being wedged on a second part of the body, the first terminal being held in place by a compression of the bend.

33. The pluggable component module of claim **32**, wherein when the PCB is received in the first slot or the second slot, respectively, the bend is further compressed and the first leg of the first terminal and the second leg of the first terminal move towards each other.

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