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Aldana et al.

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(54) **DOCK FOR A PORTABLE ELECTRONIC DEVICE**

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H01R 13/64 (2006.01)

(52) **U.S. Cl.**
USPC **439/248**; 439/929

(58) **Field of Classification Search**
USPC 439/246–248, 929
See application file for complete search history.

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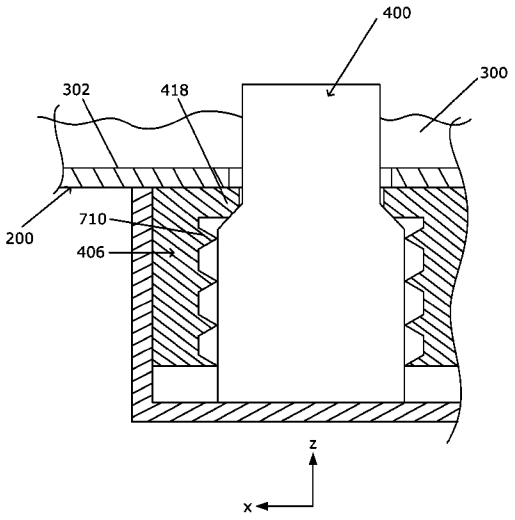
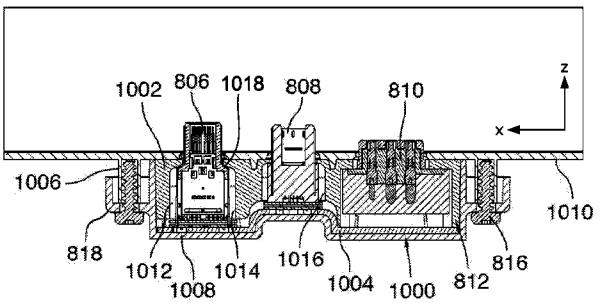
(57) **ABSTRACT**

A dock for receiving a portable electronic device, including a housing comprising an aperture; a support coupled to an inner wall of the housing, a portion of the support being elastically deformable; and a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data to an electronic device; wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.

19 Claims, 16 Drawing Sheets





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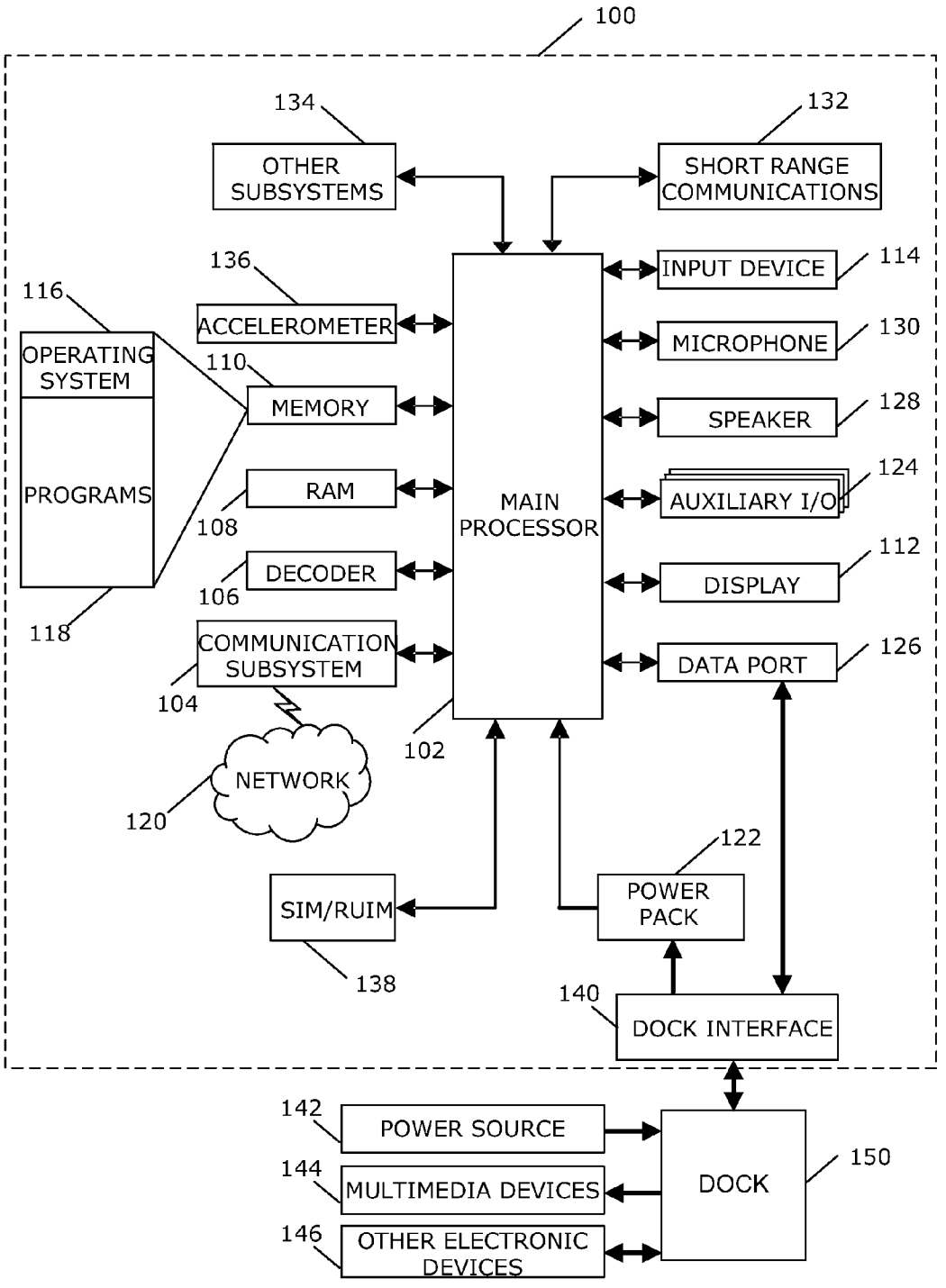
100
134
OTHER SUBSYSTEMS
132
SHORT RANGE COMMUNICATIONS
136
ACCELEROMETER
116
OPERATING SYSTEM
PROGRAMS
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MEMORY
RAM
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DECODER
106
118
COMMUNICATION SUBSYSTEM
104
NETWORK
120
MAIN PROCESSOR
102
INPUT DEVICE
114
MICROPHONE
130
SPEAKER
128
AUXILIARY I/O
124
DISPLAY
112
DATA PORT
126
SIM/RUIM
138
122
POWER PACK
140
DOCK INTERFACE
142
POWER SOURCE
144
MULTIMEDIA DEVICES
146
OTHER ELECTRONIC DEVICES
DOCK
150

FIG. 1

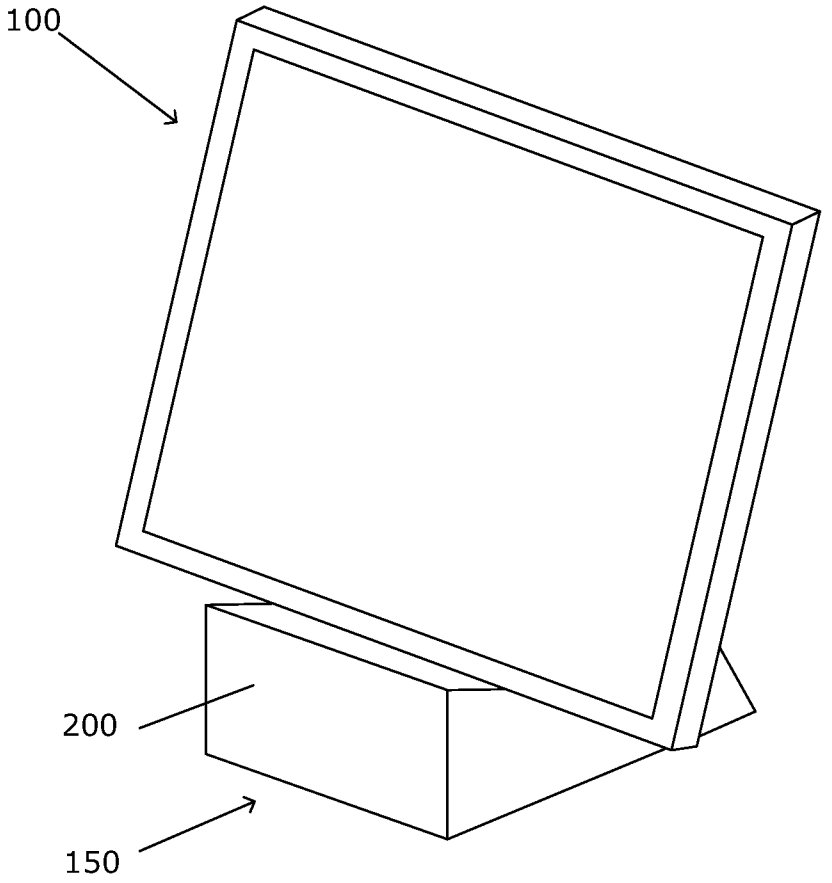

FIG. 2

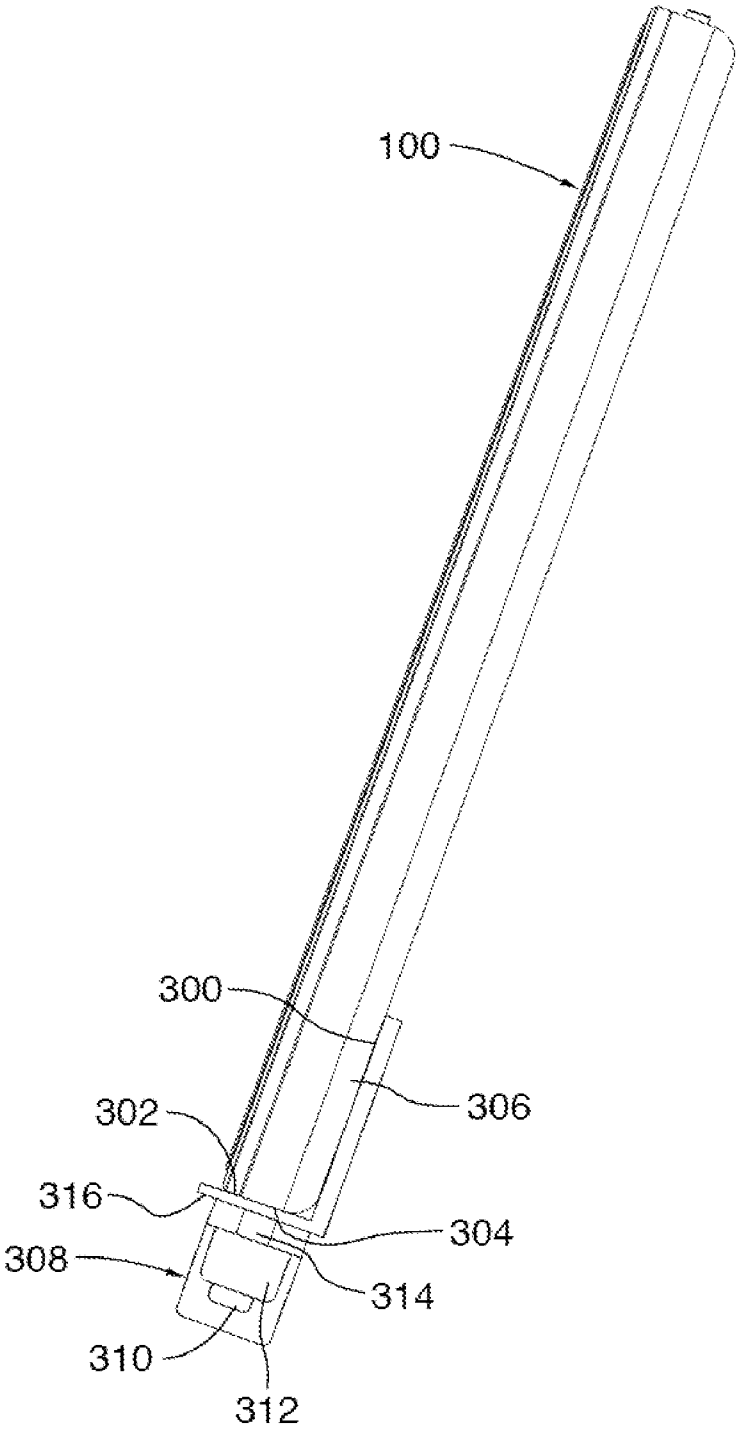

FIG. 3

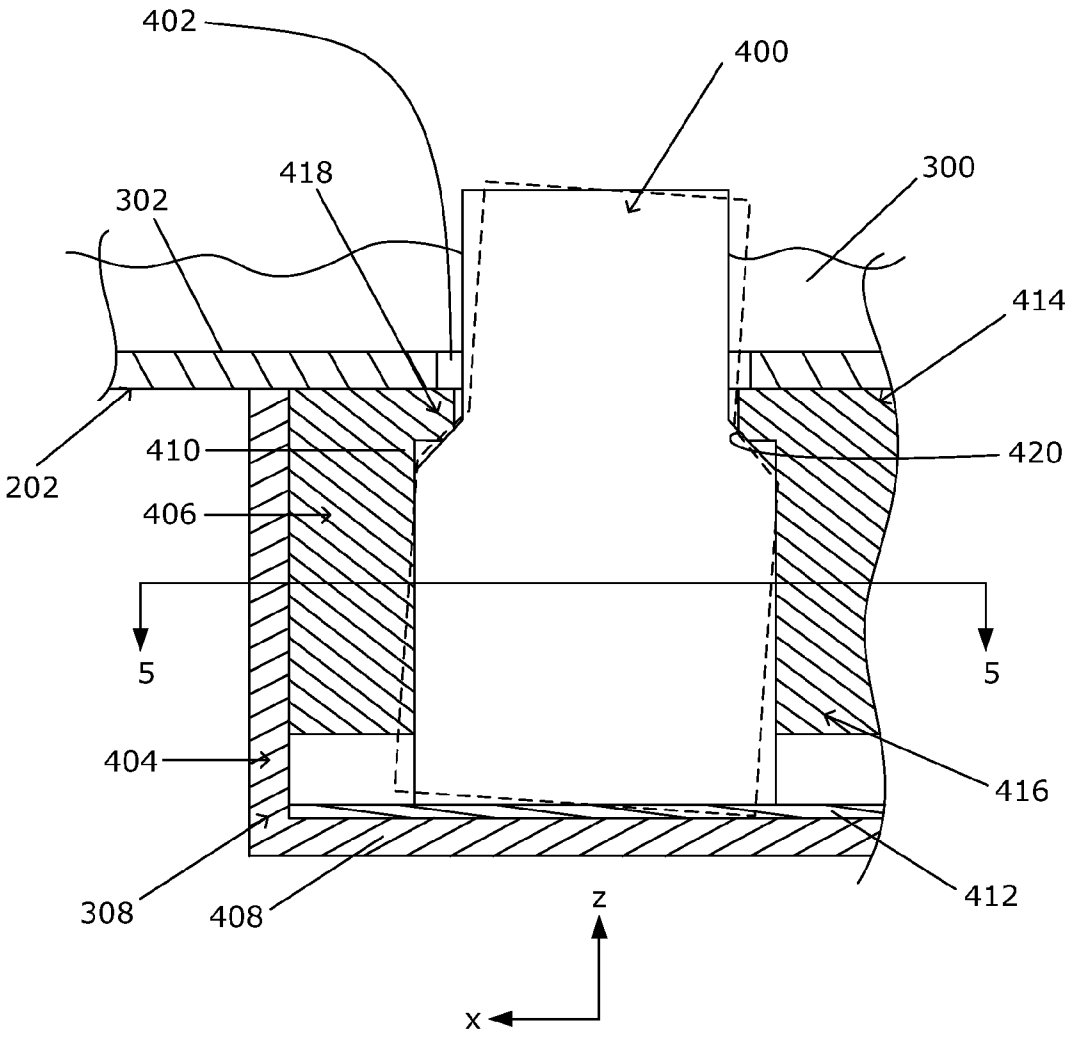

FIG. 4

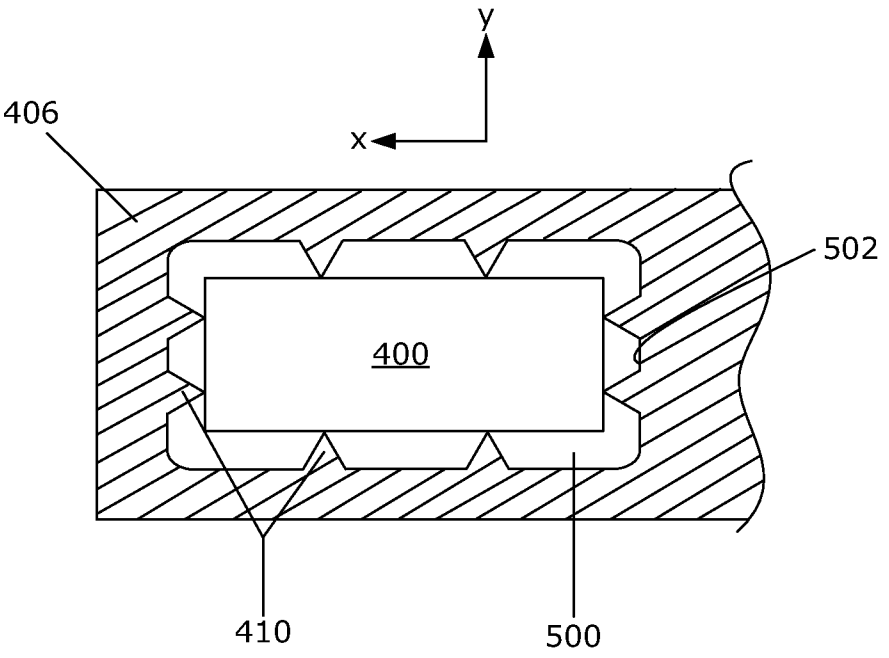

FIG. 5

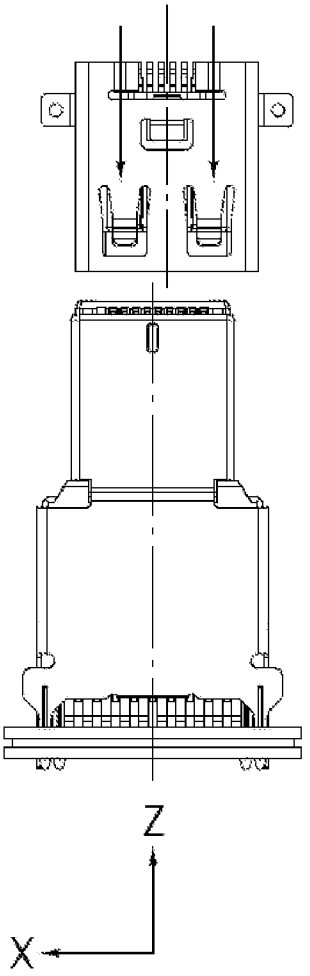

FIG. 6A

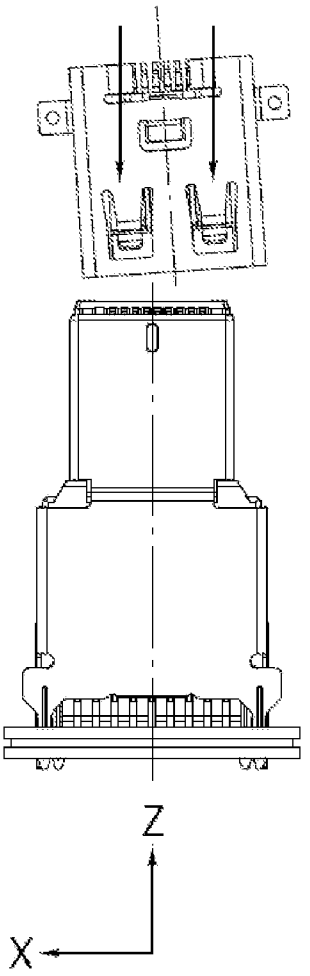

FIG. 6B

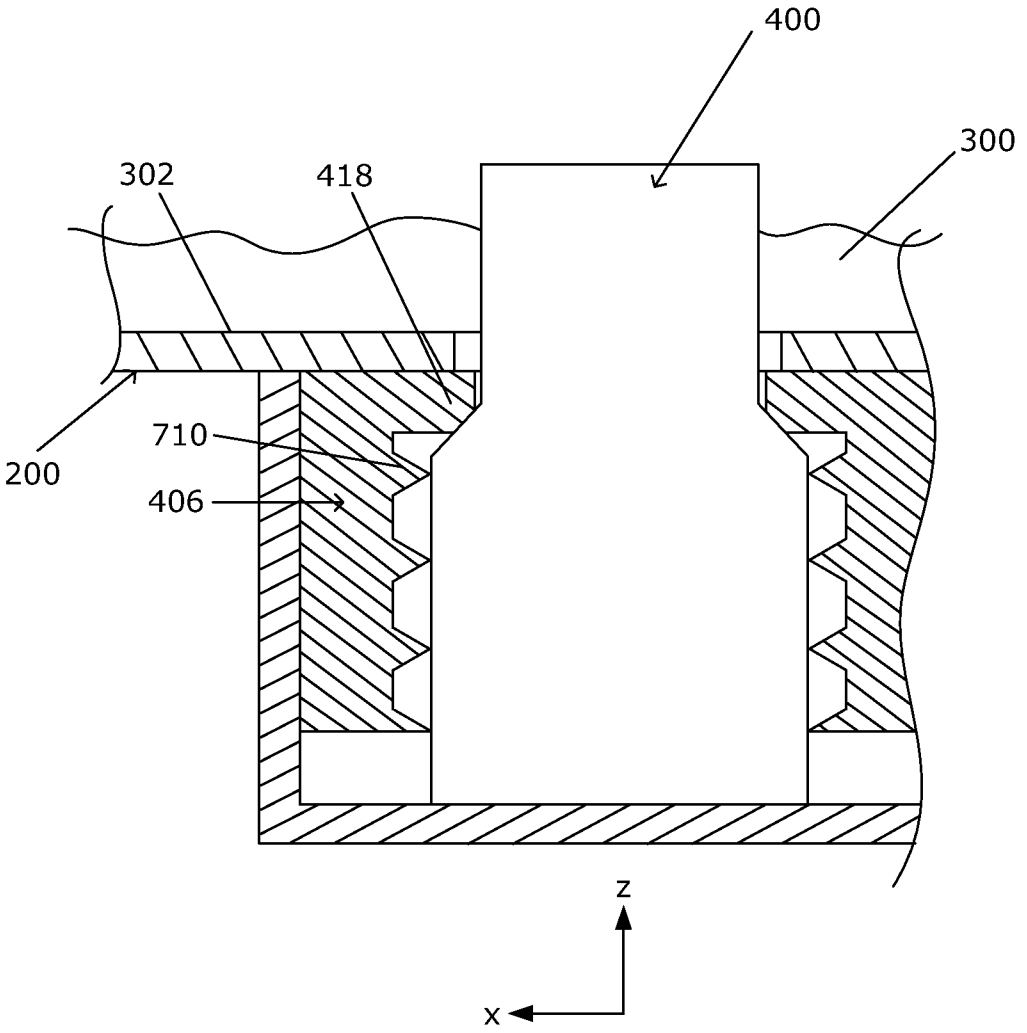

FIG. 7

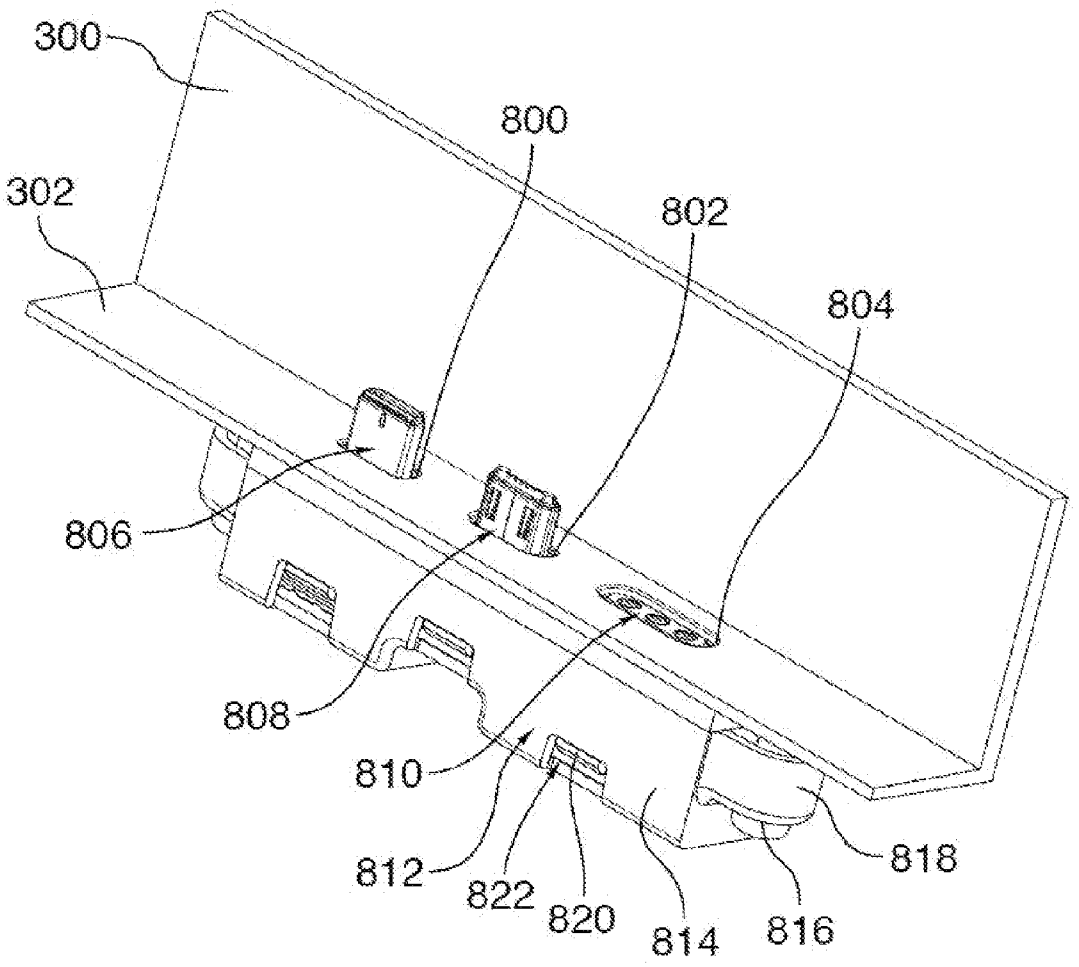

FIG. 8

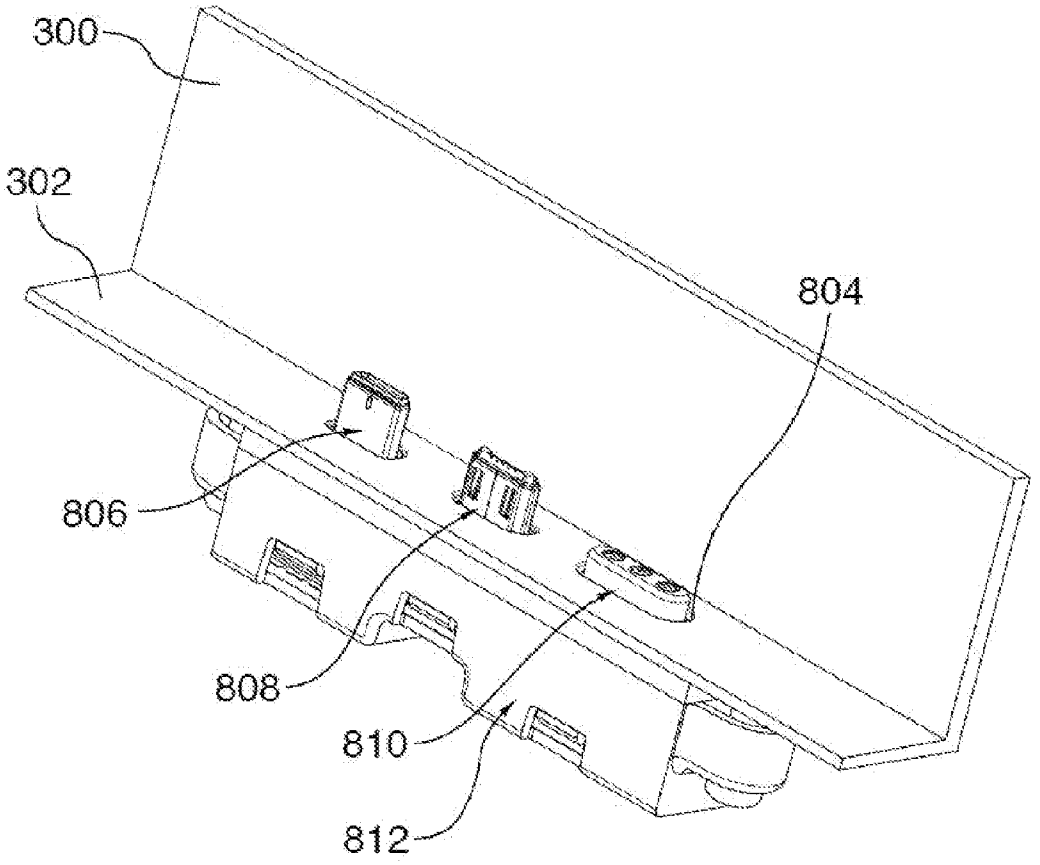

FIG. 9

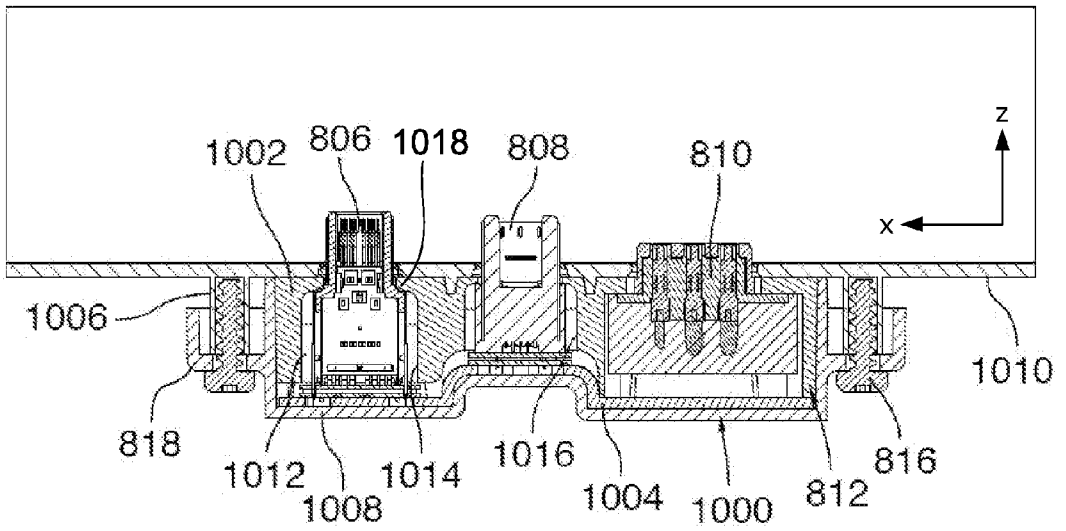
1002
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FIG. 10

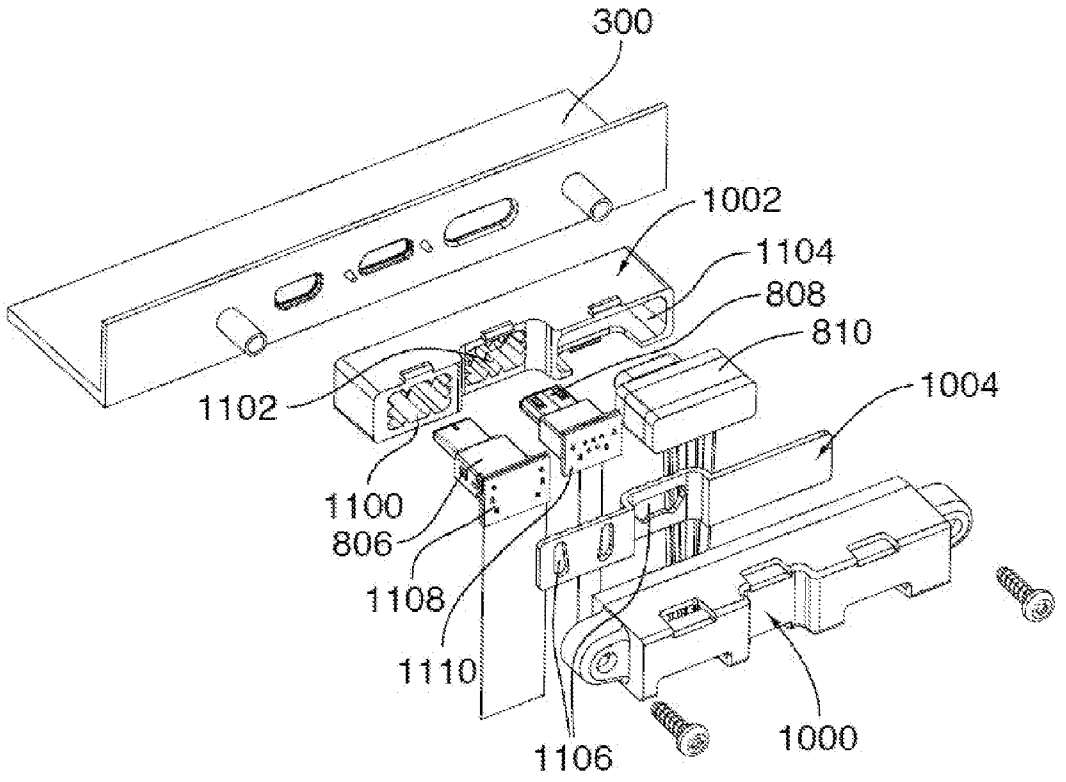

FIG. 11

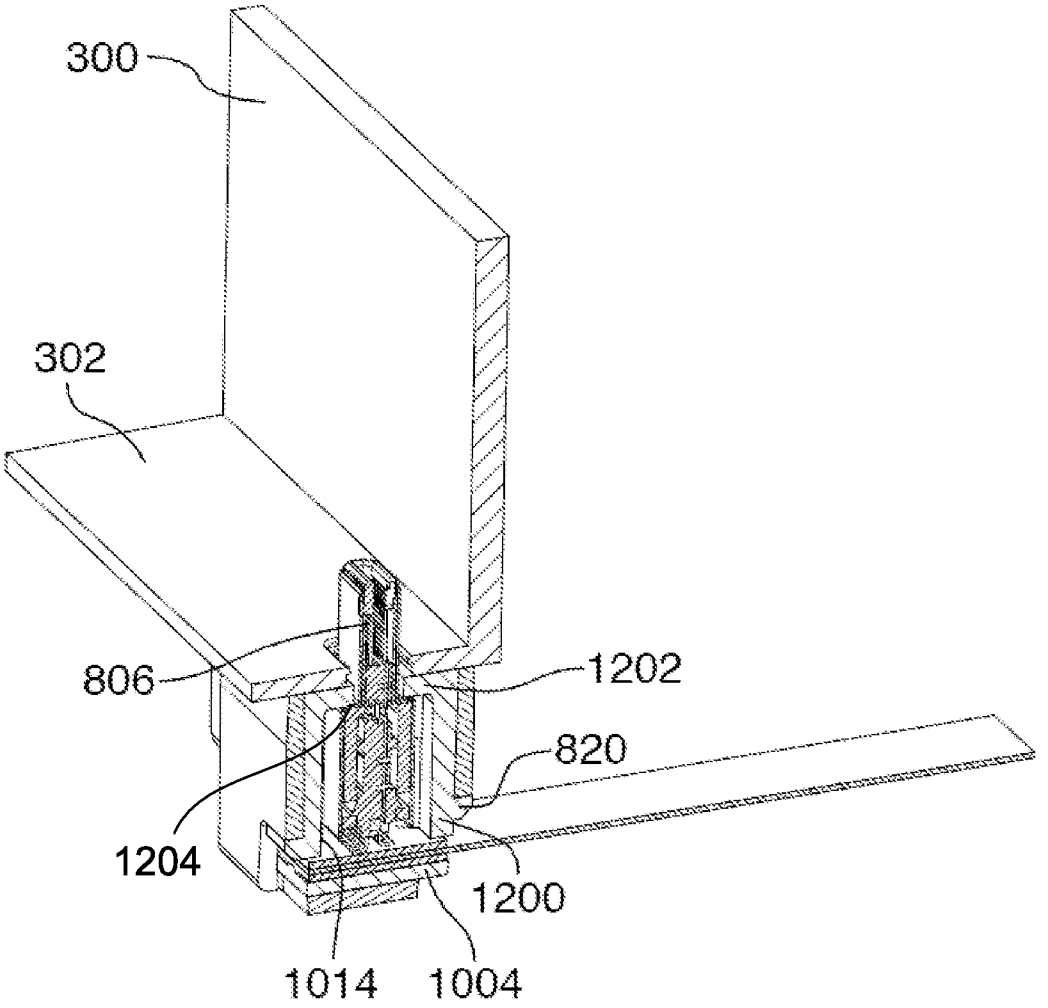

FIG. 12

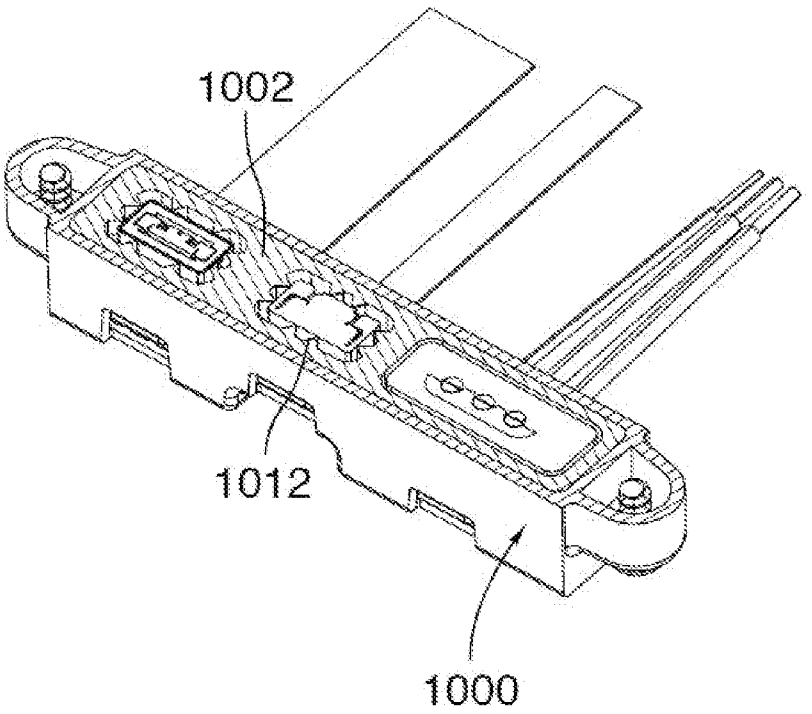

FIG. 13

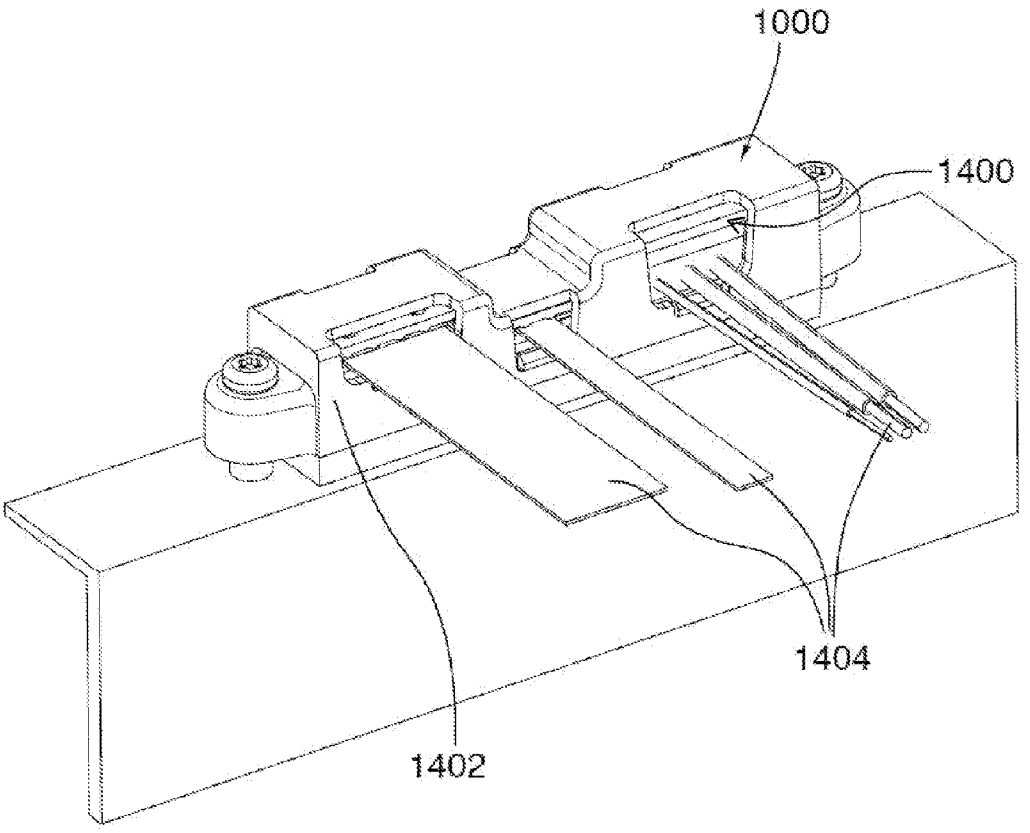

FIG. 14

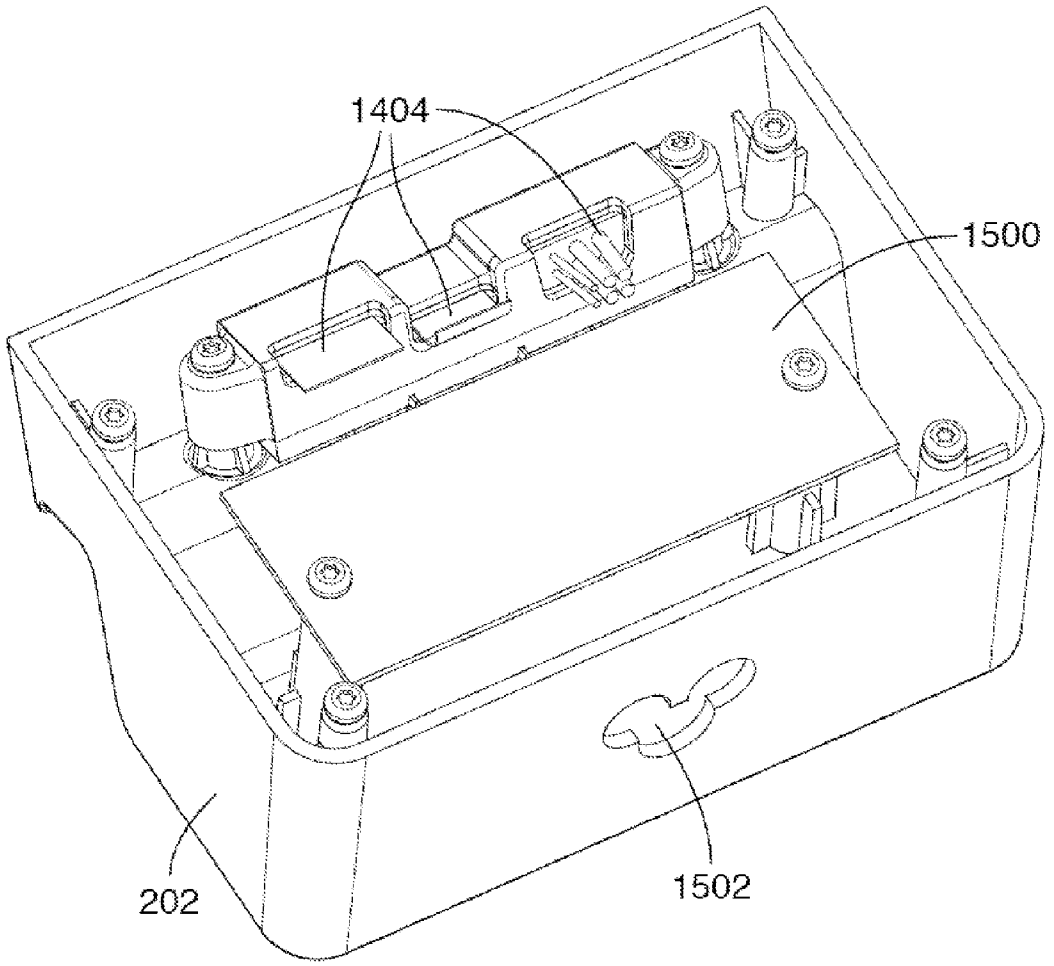

FIG. 15

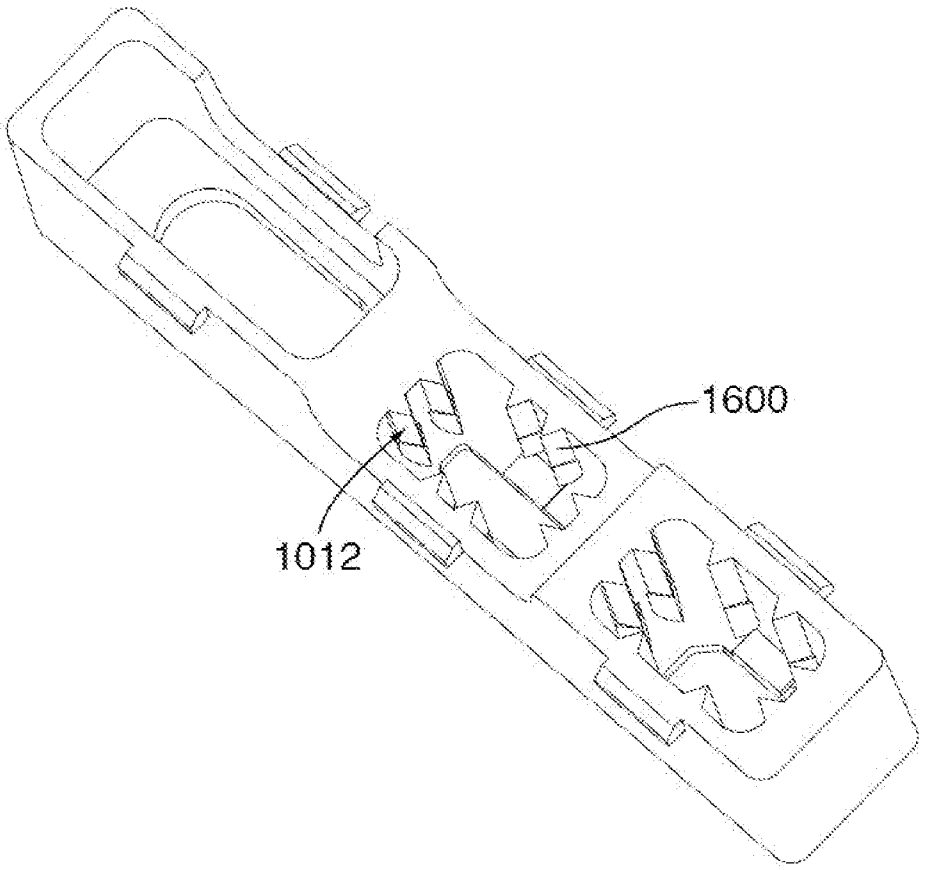

FIG. 16

DOCK FOR A PORTABLE ELECTRONIC DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of priority of U.S. Provisional Patent Application No. 61/503,451, filed on Jun. 30, 2011, which incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present application relates to charging and/or data transfer docks for portable electronic devices.

BACKGROUND DISCUSSION

Electronic devices, including portable electronic devices, have gained widespread use and may provide a variety of functions including, for example, telephonic, electronic messaging and other personal information manager (PIM) application functions. Portable electronic devices include, for example, several types of mobile stations such as simple cellular telephones, smart telephones, wireless personal digital assistants (PDAs), tablets and laptop computers with wireless 802.11 or Bluetooth capabilities.

Portable electronic devices such as PDAs or smart telephones are generally intended for handheld use (that is, the devices are sized and shaped to be held or carried in a human hand) and ease of portability. Portable electronic devices are often placed in docks for charging or data transfer including transfer of information in any form optically or electrically from dock to portable electronic device and vice versa. Some docks are capable of both charging and data transfer. Docks and portable electronic devices are susceptible to damage due to connection attempts when the portable electronic device and the dock are not properly aligned.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present application will now be described, by way of example only, with reference to the attached Figures, wherein:

FIG. **1** is a simplified block diagram of components including internal components of a portable electronic device;

FIG. **2** is an isometric view of a portable electronic device received in a dock according to an example;

FIG. **3** is a side view of a portable electronic device received in the dock of FIG. **2** with a portion of a housing of the dock removed;

FIG. **4** is a front sectional view of portions of the dock of FIG. **2**;

FIG. **5** is a top sectional view on **5-5** of FIG. **4** of portions of the dock of FIG. **2**;

FIGS. **6**A and **6**B are schematic front views of a mating connector of a portable electronic device misaligned with a connector of a dock;

FIG. **7** is a front sectional view of portions of a dock according to another example;

FIG. **8** is an isometric view of a dock according to another example with a charging connector in a stowed position;

FIG. **9** is an isometric view of the dock of FIG. **8** with a charging connector in an extended position;

FIG. **10** is a front sectional view of the dock of FIG. **8**;

FIG. **11** is an exploded view of the dock of FIG. **8**;

FIG. **12** is an isometric side sectional view of the dock of FIG. **8**;

FIG. **13** is an isometric top sectional view of the dock of FIG. **8**;

FIG. **14** is an isometric rear bottom view of the dock of FIG. **8**;

FIG. **15** is an isometric view similar to FIG. **14** including additional components of the dock; and

FIG. **16** is an isometric bottom sectional view of a spring component of a dock according to another example.

DETAILED DESCRIPTION

The following describes a dock for receiving a portable electronic device. The dock includes a support for a connector including an elastically deformable portion for allowing movement of the connector relative to the dock when a force is applied.

In an aspect of the present disclosure, there is provided a dock for receiving a portable electronic device, including: a housing comprising an aperture; a support coupled to an inner wall of the housing, a portion of the support being elastically deformable; and a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device; wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.

In another aspect of the present disclosure, there is provided a connector assembly for a dock, the connector assembly including: a support for coupling to an inner wall the dock, a portion of the support being elastically deformable; and a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device; wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.

For simplicity and clarity of illustration, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. Numerous details are set forth to provide an understanding of the embodiments described herein. The embodiments may be practiced without these details. In other instances, well-known methods, procedures, and components have not been described in detail to avoid obscuring the embodiments described. The description is not to be considered as limited to the scope of the embodiments described herein.

The disclosure generally relates to a dock for a portable electronic device in the embodiments described herein. The dock may receive portable electronic devices including: mobile, or handheld, wireless communication devices such as pagers, cellular phones, cellular smart-phones, wireless organizers, tablets, global positioning system devices and personal digital assistants, for example. The portable electronic device may also be a portable electronic device without wireless communication capabilities, such as a handheld electronic game device, digital photograph album, digital camera, or other device. The portable electronic device may be, but need not be, a handheld device.

A block diagram of an example of a portable electronic device **100** is shown in FIG. **1**. The portable electronic device **100** includes multiple components, such as a processor **102** that controls the overall operation of the portable electronic device **100**. Communication functions, including data and voice communications, are performed through a communica-

tion subsystem **104**. Data received by the portable electronic device **100** is decompressed and decrypted by a decoder **106**. The communication subsystem **104** receives messages from and sends messages to a wireless network **120**. The wireless network **120** may be any type of wireless network, including, but not limited to, data wireless networks, voice wireless networks, and networks that support both voice and data communications.

A power pack **122**, such as one or more rechargeable batteries or a port to an external power supply, powers the portable electronic device **100**. A dock interface **140** may electrically communicate with a dock **150** to charge the power pack **122** and/or provide a data connection to a data port **126** of the portable electronic device **100**. In general, components electrically communicate with one another when the electrical activity in one component affects an electrical activity in another. Electrical communication includes direct electrical contact that enables current flow. The dock interface **140** may include one or more mating connectors for electrically communicating with connectors of the dock **150**. The dock **150** may electrically communicate with one or more of a power source **142**, multimedia devices **144** such as televisions, monitors, projectors or other output devices, for example, and other electronic devices **146**. In some situations, communication may be electrical or optical or a combination of electrical and optical.

The processor **102** interacts with other components, such as Random Access Memory (RAM) **108**, memory **110**, a display **112**, an input device **114**, an auxiliary input/output (I/O) subsystem **124**, a data port **126**, a speaker **128**, a microphone **130**, short-range communications **132**, and other device subsystems **134**. The processor **102** may interact with an orientation sensor such as an accelerometer **136** that may be utilized to detect direction of gravitational forces or gravity-induced reaction forces.

To identify a subscriber for network access, the portable electronic device **100** uses a Subscriber Identity Module or a Removable User Identity Module (SIM/RUIM) card **138** for communication with a network, such as the wireless network **120**. Alternatively, user identification information may be programmed into memory **110**.

The portable electronic device **100** includes an operating system **116** and software programs or components **118** that are executed by the processor **102** and are typically stored in a persistent, updatable store such as the memory **110**. Additional applications or programs may be loaded onto the portable electronic device **100** through the wireless network **120**, the auxiliary I/O subsystem **124**, the data port **126**, the short-range communications subsystem **132**, or any other suitable subsystem **134**.

A received signal such as a text message, an e-mail message, or web page download is processed by the communication subsystem **104** and input to the processor **102**. The processor **102** processes the received signal for output to the display **112** and/or to the auxiliary I/O subsystem **124**. A subscriber may generate data items, for example e-mail messages, which may be transmitted over the wireless network **120** through the communication subsystem **104**. For voice communications, the overall operation of the portable electronic device **100** is similar. The speaker **128** outputs audible information converted from electrical signals, and the microphone **130** converts audible information into electrical signals for processing.

An example dock **150** for receiving a portable electronic device **100** is shown in FIGS. **2** and **3**. The dock **150** includes a housing **200** that is shaped to receive the portable electronic device **100**. In one example, the housing **200** includes a seat **302** and a support wall **300** for receiving the portable electronic device **100**. In general, the support wall **300** and the seat **302** support the weight of a received portable electronic device **100**, although in some of the embodiments depicted herein, the seat **302** may support more weight than the support wall **300**. As shown in FIG. **3**, an edge surface **304** of the portable electronic device **100** contacts the seat **302** of the housing **200** and a rear surface **306** of the portable electronic device **100** contacts the support wall **300** of the housing **200**. The size and shape of the seat **302** and the support wall **300** and the angle between the seat **302** and the support wall **300** may be selected to accommodate different sizes and types of portable electronic devices **100**.

The housing **200** may be molded plastic, machined metal or wood, for example. The housing may be a single part or may be an assembly of multiple parts.

The dock **150** includes a connector support assembly **308** that is coupled to an inner surface of the housing **200**. In general, components are coupled to one another when movement of one component affects movement in the other component. Coupling may be permanent, such as by welding for example, or may be reversible, such as connection by fasteners, for example. Coupling may include direct contact between the two components or the components may be spaced from one another with additional components being provided to achieve coupling between the two components. In one example, screws **310** couple lugs **312** of the support assembly **308** to screw-receiving components **314**, which extend from an underside surface **316** of the seat **302**, to couple the support assembly **308** to the housing **200**.

Referring also to FIG. **4**, the connector support assembly **308** receives a connector **400**. The connector **400** may be a charging connector, a data connector or a connector capable of both charging and data transfer. The connector **400** may support an electrical connection, an optical connection or a combination thereof. A connecting portion of the connector **400** extends through an aperture **402**, which is located in the seat **302**. When the portable electronic device **100** is received in the dock **150**, the connector **400** electrically or optically communicates with the portable electronic device **100** to charge the portable electronic device **100** and/or provide a data connection thereto. In general, the portable electronic device **100** is received in the dock **150** when the portable electronic device **100** is generally supported thereby. Similarly, a first component may be received in a second component when the first component is supported by the second component. The first component may or may not be coupled to the second component and may move relative to the second component.

The connector support assembly **308** includes a support **404**, a spring component **406**, which is received in the support **404**, and a flexible pad **412**, which is located on a base **408** of the support **404**. The base **408** of the support **404** limits movement of the connector **400** in a z-direction to facilitate coupling with a mating connector of the portable electronic device **100**. An opening (not shown) is provided in the support **404** to allow wiring (such as electrical conductors or optical cables, not shown) of the connector **400** to pass therethrough.

The spring component **406** includes a passage **500**, which is shown in FIG. **5**, for receiving the connector **400**. The passage **500** extends between a top end **414** of the spring component **406** and a bottom end **416** of the spring component **406**. A collar **418** is located at the top end **414** of the spring component **406** and ribs **410** extend from an inner wall **502** of the passage **500**. The collar **418** includes a contact surface **420**, which abuts the connector **400** to limit transla-

tion of the connector **400** in the x and y directions. The collar **418** may fully or partially surround the connector **400**.

The ribs **410** extend vertically relative to the passage **500** and are elastically deformable to accommodate movement of the connector **400**. The ribs **410** contact the connector **400** in order to maintain the connector **400** in a starting position within the passage **500**. The spring component **406** is biased toward the starting position, which is a non-deformed shape shown in FIG. **5**. Any non-axial movement of the connector **400** may cause the ribs **410** of the spring component **406** to elastically deform. An amount of movement of the connector **400** relative to the connector support assembly **308** may be determined by one of both of a rigidity of the ribs **410** and a size of the aperture **402**.

The pad **412** is elastically deformable to accommodate some movement of the connector **400** in the z direction. Movement may occur in response to a force applied in the z-axis or pivoting of the connector **400**. The pad **412** may be interference fit with the connector **400** to bias the connector **400** toward the mating connector of the portable electronic device **100** and absorb tolerances. The pad **412** is biased toward a non-deformed shape, as shown in FIG. **4**.

The spring component **406** is made from a flexible material such as silicone rubber, urethane rubber or cork, for example. A hard plastic having flexible fingers may alternatively be used. The spring component **406** may fully surround the connector **400**, as shown in FIG. **5**, or may partially surround the connector **400**. The spring component **406** may include a different number of ribs than shown in the figures. Further, the spring component may be any spring component that allows movement of the connector **400** relative to the connector support assembly **308** and biases the connector **400** to the starting position within aperture **402**.

In operation, a user visually and/or tactilely aligns a mating connector of the portable electronic device **100** with the connector **400** of the dock **150** and then moves the mating connector into engagement with the connector **400**. When the mating connector is misaligned with the connector **400** in the x and/or y directions, a force is imparted on the connector **400** by the portable electronic device **100**. The ribs **410** of the spring component **406** and the pad **412** elastically deform in order to accommodate pivoting of the connector **400** in response to the force. An example of a pivoted position of the connector **400** is shown in dashed lines in FIG. **4**. Multiple forces may be applied to the connector **400** in various different directions while the user attempts to join the connectors of the portable electronic device **100** and dock **150**. Because the example dock **150** of FIG. **2** includes a single connector **400**, the ribs **410** of the spring component **406** return the connector **400** and the portable electronic device **100** back to the starting position once the connection with the portable electronic device **100** is complete. For heavy portable electronic devices **100**, the ribs **410** may remain in a deformed position until the portable electronic device **100** is removed from the dock **150**.

Two examples of misalignment between mating connector of the portable electronic device **100** and the connector **400** are shown in FIGS. **6**A and **6**B. The dock **150** described herein generally avoids damage to the connector **400** because the force imparted by the mating connector of the portable electronic device **100** is absorbed by the spring component **406** rather than the connector **400**.

The connector support assembly **308** may be any support that is coupled to the housing **200** and includes a portion that elastically deforms in response to movement of the connector **400**. In addition, an alignment component may be provided to facilitate location of the mating connector of the portable electronic device **100** relative to the connector **400**. The alignment component may be a rail, pin or slot, for example, for guiding the portable electronic device **100** into position.

In another example, ribs **710**, which are shown in FIG. **7**, extend generally horizontally in the spring component **406**. The orientation of the ribs may alternatively be disposed at an angle that is between vertical and horizontal.

In another example, the connector extends through an aperture in the support wall or other location in order to accommodate different locations of portable electronic device mating connectors.

Although the collar **418** is shown as part of the spring component **406**, the collar **418** may alternatively form part of the seat **302**. In another example, the spring component **406** does not include a collar **418**. In this embodiment, both translation in the x and y directions and pivoting of the connector **400** relative to the housing **200** are possible.

Referring now to FIGS. **8** and **9**, another example of a dock **150** for a portable electronic device **100** is generally shown. In this example, the dock **150** includes apertures **800**, **802**, **804**, which extend through the seat **302** of the housing **200**. First and second data connectors **806** and **808** extend through apertures **800** and **802**, respectively. A charging connector **810** extends through the aperture **804**. When the portable electronic device **100** is received in the dock **150**, the connectors **806**, **808**, **810** electrically communicate with the portable electronic device **100** to provide data connections and charge the portable electronic device **100**. In one example, the first data connector **806** is a micro HDMI connector for transferring data to multimedia devices and the second data connector **808** is a micro USB connector for exchanging data with other electronic devices. Other types of data connectors are also possible. In addition, the charging connector **810** may also transfer data.

The connectors **806**, **808**, **810** are mounted in a connector support assembly **812**, which is coupled to an inner surface of the housing **200**. Referring also to FIG. **10**, screws **816** couple lugs **818** of the support assembly **812** to screw-receiving components **1006**, which extend from an underside surface **1010** of the seat **302**, to couple the support assembly **812** to the housing **200**. Other arrangements for coupling the connector support assembly to the housing **200** are also possible.

Referring still to FIGS. **8**, **9** and **10**, the connector support assembly **812** includes a support tray **1000**, a spring component **1002**, which is located in the support tray **1000**, and a pad **1004**, which is disposed between a base **1008** of the support tray **1000** and the spring component **1002**. The spring component **1002** includes tabs **820**, which mate with openings **822** in a front wall **824** of the support tray **1000** to generally fix the spring component **1002** relative to the support tray **1000**. Alternative arrangements for fixing the spring component **1002** in the support tray **1000** are possible including fasteners, such as screws, rivets or staples, glue, or other snap-in fastening arrangements. In addition, the spring component **1002** may be sized so that an interference fit is provided between the spring component **1002** and the connectors **806**, **808**.

The spring component **1002** includes passages **1100**, **1102** and **1104**, which are shown in FIG. **11**. The passages **1100**, **1102**, **1104** extend between a bottom end **1200** of the spring component **1002** to a top end **1202**. The passages **1100**, **1102** and **1104** receive first and second data connectors **806**, **808** and charging connector **810**, respectively. The charging connector **810** is movable in the z direction through the passage **1104** between a stowed position, which is shown in FIG. **8**, and an extended position, which is shown in FIG. **9**. The charging connector **810** is generally a floating connector that is biased toward the stowed position and moveable under a magnetic force to the extended position. Passage **1104**, which

receives the charging connector **810** and allows the charging connector **810** to slide relative thereto.

Collars **1018** are located at the top end **1202** of the spring component **1002** to surround the passages **1100**, **1102** and ribs **1012** extend from inner walls **1014** of the passages **1100**, **1102**. Contact surfaces **1204** of the collars **1018** abut the connectors **806**, **808** to limit translation of the connectors **806**, **808** in the x and y directions. The collars **1018** may fully or partially surround the connectors **806**, **808**.

Ribs **1012** extend from inner walls **1014** and **1016** of passages **1100** and **1102** of the spring component **1002**, respectively. The ribs **1012** contact the first and second data connectors **806**, **808** in order to maintain the connectors **806**, **808** in a starting position within the respective passages **1100**, **1102**. The spring component **1002** is biased toward a non-deformed shape, which is shown in FIG. **13**, or a slightly deformed state in which some deformation may occur in response to interference with the connectors **806**, **808**. An amount of movement of the connectors **806**, **808** relative to the connector support assembly **812** may be determined by one of both of a rigidity of the spring component **1002** and a size of the apertures **800** and **802**, respectively. The spring component **1002** facilitates independent movement of the connectors **806**, **808**, **810**. Elastic deformation due to a force being applied to one of the connectors is not transferred to the other connectors through the spring component **1002**.

The spring component **406** is made from a flexible material such as silicone rubber, urethane rubber or cork, for example. A hard plastic having flexible fingers may alternatively be used.

Because the mating connectors of the portable electronic device **100** are fixed relative to one another, additive tolerances may result in displacements in mating connector locations when compared to manufacturing specifications of the portable electronic device **100**. Additive tolerances are generally the sum of internal tolerances of each mating connector component, tolerances of components coupled the mating connector components and assembly process tolerances. The connector support assembly **812** compensates for the additive tolerances of the mating connectors of the portable electronic device **100** by providing a spring component **1002** that allows connectors **806**, **808** of the dock **150** to pivot in order to align with the mating connectors of the portable electronic device **100**. Because the connectors **806**, **808** are not fixed relative to the dock **150**, manufacturing of the dock **150** may be simplified because tolerances relating to connector location within the dock **150** may be relaxed compared to fixed connector docks.

The base **1008** of the support tray **1000** limits movement of the connectors **806**, **808** in the z-direction to facilitate coupling with mating connectors of the portable electronic device **100**. The pad **1004** is elastically deformable to accommodate some movement of the connectors **806** and **808** in the z direction. The pad **1004** may be interference fit with the connectors **806**, **808** to bias the connectors **806**, **808** toward the mating connectors of the portable electronic device **100** and absorb tolerances. The pad **1004** is biased toward a non-deformed shape, which is shown in FIG. **10**, and is compressible in response to a downward, or axial, force on the connector **806**, **808**. In one example, the pad **804** is two-shot or overmolded onto the support tray **1000** to reduce the part count of the dock **150**.

As shown in FIG. **11**, apertures **1106** extend through the pad **1004**. Referring also to FIG. **10**, the apertures **1106** are aligned with the through-hole leads of the connectors **806**, **808**, which protrude through an opposite surface of printed circuit boards (PCB), **1108**, **1110** of the first and second data connectors **806**, **808**, respectively. The apertures **1106** generally protect the leads and solder joints of the PCB **1108**, **1110** from stress during assembly and use when the portable electronic device **100** is inserted into and removed from the dock **150**.

Referring also to FIG. **14**, the support tray **1000** includes openings **1400**, which extend through a rear wall **1402** of the support tray **1000** to allow wiring **1404** of the connectors **806**, **808**, **810** to extend therethrough. The wiring **1404** may be flexible cables coupled between the connectors **606**, **608**, **610** and an electronic device (not shown), a multimedia device (not shown) and a power source (not shown), respectively. In one example, the flexible cables are coupled to a connector (not shown) that is mounted on a main PCB **1500** coupled inside the housing **200**, as shown in FIG. **15**. The flexible cables may alternatively be soldered to the main PCB **1500**. When a main PCB is not included, the flexible cables may be soldered, crimped or inserted into mating pins of one or more connectors. Cables for electrically communicating with the electronic device, multimedia device and power source may extend through opening **1502**.

In operation, a user visually and/or tactilely aligns mating connectors of the portable electronic device **100** with the connectors **806**, **808** and **810** of the dock **150** and then moves the mating connectors into engagement with the connectors **806**, **808**, **810**. When the mating connectors are not aligned with the connectors **806**, **808** in the x and/or y directions, a force is imparted on one or both of the connectors **806**, **808** by the portable electronic device **100**. The ribs **1012** of the spring component **1002** and the pad **1004** elastically deform in order to accommodate pivoting of the one or both of the connectors **806**, **808** in response to the force. Multiple forces may be applied to the connectors **806**, **808** in various different directions while the user attempts to join the connectors of the portable electronic device **100** and dock **150**. The charging connector **810** moves toward the mating charging connector of the portable electronic device **100** when the magnet of the mating charging connector is near the charging connector **810**. Once connected, the connectors **806**, **808** may return to the their starting positions or one or both of the connectors **806**, **808** may remain out of alignment with the starting position due to additive tolerances of the mating connectors of the portable electronic device **100**. Because the connectors **806**, **808** are able to pivot in order to align with the mating connectors, additive tolerance issues relating to more than one fixed mating connector are avoided.

Referring to FIG. **16**, in another example, the ribs **1012** include steps **1600**. Two or more steps **1600** are spaced along the length of the ribs **1012** to decrease a rib cross-sectional area between the top end **1202** and a bottom end **1200** of the spring component **1002**. When a mating connector of a portable electronic device **100** exerts a force on the connector **806**, **808**, in the x and/or y direction, a maximum compressive force is applied near the top end **1202** of the spring component **1002**. By providing a larger rib cross-sectional area near the top end **1202**, the amount of force that is transferred to the bottom end **1200** of the spring component **1002** is reduced. Therefore, damage to solder joints, for example, between the PCBs **1108**, **1110** and the connectors **806**, **808**, respectively, is less likely to occur. Similarly, stress resulting from any shifting, tilting or other alignment forces exerted by the mating connectors of the portable electronic device **100** is reduced.

The charging connector **810** may be replaced with a fixed connector that is mounted within the connector support assembly **812** in a similar manner as data connectors **806** and

808. Further, although three connectors are shown in the example of FIGS. 9 to 15, any number of connectors may be possible.

The connector support assembly and connector(s) may be provided as a single connector assembly that may be mounted in any dock. The connector support assembly may be manufactured to meet specifications associated with docks of different portable electronic devices.

Although the collar 1018 is shown as part of the spring component 1002, the collar 1018 may alternatively form part of the seat 302. In another example, the spring component 1002 does not include a collar 1018. In this example, both translation in the x and y directions and pivoting of the connectors 806, 808 relative to the housing 200 are possible.

The dock 150 described herein may realize one or more advantages, some of which have already been described. The dock 150 facilitates quick and easy connection of a portable electronic device thereto. By compensating for some misalignment between connectors of the dock 150 and mating connectors of the portable electronic device, damage resulting from stress on both the portable electronic device 100 and the dock 150 normally associated with connection and removal operations, may be avoided. Further, the life of the dock 150 may be extended because entry of dust and dirt into the dock 150 is limited by the collar, which may act as a seal.

The above-described embodiments are intended to be examples only. Alterations, modifications and variations can be effected to the particular embodiments by those of skill in the art without departing from the scope of the present application, which is defined solely by the claims appended hereto.

What is claimed is:

1. A dock for receiving a portable electronic device, comprising:
- a housing comprising an aperture;
- a support coupled to an inner wall of the housing, a portion of the support being elastically deformable;
- a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device; and
- a collar abutting the connector within the housing to limit translation of the connector, the connector being pivotable relative to the collar;
- wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.

2. A dock as claimed in claim 1, wherein the support includes a spring component received in a support tray, the spring component being elastically deformable.

3. A dock as claimed in claim 2, wherein the spring component comprises a passage for receiving the connector, the passage comprising ribs for contacting the connector.

4. A dock as claimed in claim 2, wherein the spring component biases the connector to a starting position within the passage.

5. A dock as claimed in claim 2, wherein the spring component comprises three passages for receiving a first data connector, a second data connector and a charging connector.

6. A dock as claimed in claim 1, wherein the collar surrounds the connector at a location adjacent the aperture.

7. A dock as claimed in claim 1, comprising more than one connector, each connector being independently movable relative to the housing.

8. A dock as claimed in claim 1, wherein the housing comprises a seat for receiving the portable electronic device and the aperture extends through the seat.

9. A dock as claimed in claim 1, wherein the connector is a micro HDMI connector.

10. A dock as claimed in claim 1, wherein the connector is a micro USB connector and the wiring receives data from an electronic device.

11. A dock as claimed in claim 1, wherein the connector is a charging connector.

12. A dock for receiving a portable electronic device, comprising:
- a housing comprising an aperture;
- a support coupled to an inner wall of the housing, the support comprising a spring component received in a support tray, the spring component comprising a passage for receiving the connector, the passage comprising ribs for contacting the connector, the spring component being elastically deformable in response to non-axial movement of at least a portion of the connector; and
- a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device;
- wherein a cross-sectional area of the ribs is reduced between a top end of the spring component and a bottom end of the spring component, the top end being located adjacent the aperture of the housing.

13. A dock for receiving a portable electronic device, comprising:
- a housing comprising an aperture;
- a support coupled to an inner wall of the housing, a portion of the support being elastically deformable;
- a pad disposed in the support and elastically deformable in response to axial movement of the connector; and
- a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device;
- wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.

14. A connector assembly for a dock, the connector assembly comprising:
- a support for coupling to an inner wall the dock, the support comprising a spring component received in a support tray, the spring component comprising a passage, the spring component being elastically deformable; and
- a connector received in the support and extending through the passage for electrically communicating with a portable electronic device received by the dock, wiring of the connector for transferring data from the portable electronic device;
- wherein the passage comprises ribs for contacting the connector and a cross-sectional area of the ribs is reduced between a top end of the spring component and a bottom end of the spring component, the top end being located adjacent the aperture of the housing.

15. A connector assembly for a dock, the connector assembly comprising:
- a support for coupling to an inner wall the dock, the support comprising a collar, a portion of the support being elastically deformable; and
- a connector received in the support for electrically communicating with a portable electronic device received by the dock, wiring of the connector for transferring data from the portable electronic device;
- wherein the portion of the support elastically deforms in response to non-axial translation and pivoting relative to the collar of at least a portion of the connector.

16. A connector assembly as claimed in claim 15, wherein the support includes a spring component received in a support tray, the spring component being elastically deformable.

17. A connector assembly as claimed in claim 16, wherein the spring component comprises a passage for receiving the connector, the passage comprising ribs for contacting the connector.

18. A connector assembly as claimed in claim 15, wherein the spring component biases the connector to a starting position within the passage.

19. A connector assembly as claimed in claim 15, comprising a collar abutting the connector within the housing to limit translation of the connector.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,545,247 B2
APPLICATION NO. : 13/397486
DATED : October 1, 2013
INVENTOR(S) : Leonardo Aldana et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

Column 9, line 54, claim 4, delete "claim 2" and insert therefor -- claim 3 --.

Signed and Sealed this
Third Day of June, 2014

Michelle K. Lee

Michelle K. Lee
Deputy Director of the United States Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE

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DATED : October 1, 2013
INVENTOR(S) : Leonardo Aldana et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

Column 11, line 8, claim 18, delete "claim 15" and insert therefor -- claim 17 --

Signed and Sealed this
Twelfth Day of August, 2014

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