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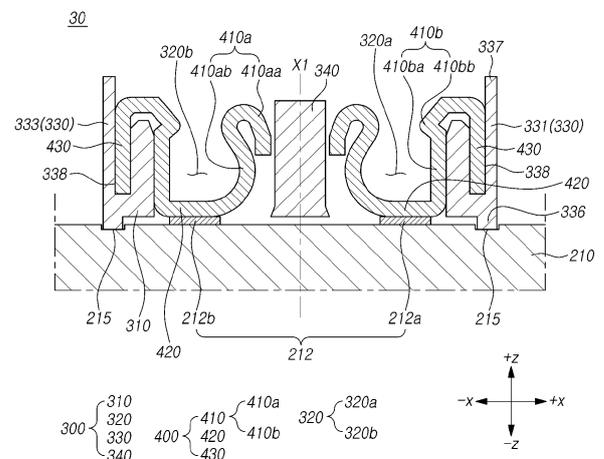
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(54) **CONNECTOR SOCKET AND ELECTRONIC DEVICE INCLUDING SAME**

(57) An electronic device according to an embodiment of the disclosure may comprise a circuit board on which a plurality of conductive pads are formed and a connector socket disposed on the circuit board. The connector socket may include a connector housing including a plurality of openings and a side wall configured to surround at least a portion of each of the plurality of openings, and a plurality of conductive pins disposed to penetrate the plurality of openings of the connector housing, and including a first portion exposed toward a front side, and a second portion exposed toward a rear side to be electrically connected to the plurality of conductive pads. The side wall of the connector housing may include a protruding portion protruding toward the rear side, and the second portion of the plurality of conductive pins may be surrounded by the protruding portion and be positioned so as not to be exposed to an outside.

FIG. 5



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Description**[Technical Field]**

[0001] An embodiment of the disclosure relates to a connector socket and an electronic device including the same.

[Background Art]

[0002] Development of technologies in the areas of electronics, information, and communication technologies has fueled integration of various functionalities into a single electronic device or portable communication device. For example, smartphones pack the functionalities of a music player, photographing device, and scheduler, as well as the communication functionality and, on top of that, may implement more various functions by having applications installed thereon.

[0003] A portable device, such as a notebook computer, a tablet PC, or a smartphone, may include various input/output structures or interfaces for electrical connection between internal components of the device or electrical connection with an external device. For example, the portable device may include a connector structure for connecting between a main circuit board and at least one sub-circuit boards electrically connected to the main circuit board.

[0004] The connector structure is a structure for electrically connecting between circuit boards (e.g., the main circuit board and the sub-circuit board) and may be provided so that a connector (e.g., a female connector or a male connector), mounted on the main circuit board, and another connector (e.g., a male connector or a female connector), mounted on the sub circuit board, for electrical connection with the main circuit board are electrically connected to each other.

[0005] The above-described information may be provided as related art for the purpose of helping understanding of the disclosure. No claim or determination is made as to whether any of the foregoing is applicable as background art in relation to the disclosure.

[Disclosure of Invention]**[Solution to Problems]**

[0006] The present invention is defined by the appended set of claims.

[0007] An electronic device, according to an embodiment of the disclosure, may comprise a circuit board on which a plurality of conductive pads are formed and a connector socket disposed on the circuit board. The connector socket may include a connector housing including a plurality of openings and a side wall configured to surround at least a portion of each of the plurality of openings, and a plurality of conductive pins disposed to penetrate the plurality of openings of the connector hous-

ing, and including a first portion exposed toward a front side, and a second portion exposed toward a rear side to be electrically connected to the plurality of conductive pads. The side wall of the connector housing may include a protruding portion protruding (e.g., extending) toward the rear side, and the second portion of the plurality of conductive pins may be surrounded by the protruding portion and positioned so as not to be exposed to an outside.

[0008] A connector socket, according to an embodiment of the disclosure, may comprise a connector housing including a plurality of openings and a side wall configured to surround at least a portion of each of the plurality of openings, and a plurality of conductive pins disposed to penetrate the plurality of openings of the connector housing, and including a first portion exposed toward a front side, and a second portion exposed toward a rear side to form an electrical contact with the circuit board. The side wall of the connector housing may include a protruding portion protruding toward the rear side, and the second portion of the plurality of conductive pins may be surrounded by the protruding portion.

[0009] The disclosure is not limited to the foregoing one or more embodiments but various modifications or changes may rather be made thereto without departing from the spirit and scope of the disclosure.

[Brief Description of Drawings]

[0010]

FIG. 1 is a block diagram illustrating an electronic device in a network environment according to an embodiment of the disclosure;

FIG. 2 is a front perspective view illustrating a connector socket 30 according to an embodiment of the disclosure;

FIG. 3 is a rear perspective view illustrating a connector socket 30 according to an embodiment of the disclosure;

FIG. 4 is a rear perspective view illustrating a cross-sectional view taken along line A-A' of the connector socket 30 of FIG. 2 according to an embodiment of the disclosure;

FIG. 5 is a cross-sectional view taken along line A-A' of the connector socket 30 of FIG. 2 disposed on a circuit board according to an embodiment of the disclosure;

FIG. 6 is a cross-sectional view illustrating a coupled state between a connector socket and a connector plug according to an embodiment of the disclosure; FIG. 7A is a cross-sectional view illustrating a structure of a general connector socket 20;

FIG. 7B is a cross-sectional view illustrating a structure of a connector socket 30 according to an embodiment of the disclosure;

FIG. 8A is a cross-sectional view illustrating conductive connection pads 21a of a circuit board 21 for

electrical connection with a general connector socket 20;

FIG. 8B is a cross-sectional view illustrating conductive pads 212 of a circuit board 210 for electrical connection with a connector socket 30 according to an embodiment of the disclosure;

FIG. 9A is a rear perspective view illustrating a connector socket 30a according to an embodiment of the disclosure;

FIG. 9B is a rear perspective view illustrating a cross-sectional view taken along line B-B' of the connector socket 30a of FIG. 9A according to an embodiment of the disclosure;

FIG. 10 is a cross-sectional view taken along line B-B' of the connector socket 30a of FIG. 9A disposed on a circuit board 210a according to an embodiment of the disclosure;

FIG. 11A is a rear perspective view illustrating a connector socket 30b according to an embodiment of the disclosure;

FIG. 11B is a rear perspective view illustrating a cross-sectional view taken along line C-C' of the connector socket 30b of FIG. 11A according to an embodiment of the disclosure;

FIG. 12 is a cross-sectional view taken along line C-C' of the connector socket 30b of FIG. 11A disposed on a circuit board 210 according to an embodiment of the disclosure;

FIG. 13A is a rear perspective view illustrating a connector socket 30c according to an embodiment of the disclosure;

FIG. 13B is a rear perspective view illustrating a cross-sectional view taken along line D-D' of the connector socket 30c of FIG. 13A according to an embodiment of the disclosure; and

FIG. 14 is a cross-sectional view taken along line D-D' of the connector socket 30c of FIG. 13A disposed on a circuit board 210a according to an embodiment of the disclosure.

[Mode for the Invention]

[0011] The electronic device according to embodiments of the disclosure may be one of various types of electronic devices. The electronic devices may include, for example, a portable communication device (e.g., a smartphone), a computer device, a portable multimedia device, a portable medical device, a camera, a wearable device, or a home appliance. According to an embodiment of the disclosure, the electronic devices are not limited to those described above.

[0012] An embodiment of the disclosure and terms used therein are not intended to limit the technical features described in the disclosure to specific embodiments, and should be understood to include various modifications, equivalents, or substitutes of the embodiment. With regard to the description of the drawings, similar reference numerals may be used to refer to similar

or related elements. It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise. As used herein, each of such phrases as "A or B," "at least one of A and B," "at least one of A or B," "A, B, or C," "at least one of A, B, and C," and "at least one of A, B, or C," may include all possible combinations of the items enumerated together in a corresponding one of the phrases. As used herein, such terms as "1st" and "2nd," or "first" and "second" may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (e.g., importance or order). It is to be understood that if an element (e.g., a first element) is referred to, with or without the term "operatively" or "communicatively", as "coupled with," "coupled to," "connected with," or "connected to" another element (e.g., a second element), it means that the element may be coupled with the other element directly (e.g., wiredly), wirelessly, or via a third element.

[0013] As used herein, the term "module" may include a unit implemented in hardware, software, or firmware, and may interchangeably be used with other terms, for example, "logic," "logic block," "part," or "circuitry". A module may be a single integral component, or a minimum unit or part thereof, adapted to perform one or more functions. For example, according to an embodiment, the module may be implemented in a form of an application-specific integrated circuit (ASIC).

[0014] According to an embodiment, each component (e.g., a module or a program) of the above-described components may include a single entity or multiple entities. Some of the plurality of entities may be separately disposed in different components. According to an embodiment, one or more of the above-described components may be omitted, or one or more other components may be added. Alternatively or additionally, a plurality of components (e.g., modules or programs) may be integrated into a single component. In such a case, according to various embodiments, the integrated component may still perform one or more functions of each of the plurality of components in the same or similar manner as they are performed by a corresponding one of the plurality of components before the integration. According to various embodiments, operations performed by the module, the program, or another component may be carried out sequentially, in parallel, repeatedly, or heuristically, or one or more of the operations may be executed in a different order or omitted, or one or more other operations may be added.

[0015] FIG. 1 is a block diagram illustrating an electronic device in a network environment according to an embodiment of the disclosure.

[0016] Referring to FIG. 1, the electronic device 101 in the network environment 100 may communicate with an electronic device 102 via a first network 198 (e.g., a short-range wireless communication network), or an electronic device 104 or a server 108 via a second network 199

(e.g., a long-range wireless communication network). According to an embodiment, the electronic device 101 may communicate with the electronic device 104 via the server 108. According to an embodiment, the electronic device 101 may include a processor 120, memory 130, an input module 150, a sound output module 155, a display module 160, an audio module 170, a sensor module 176, an interface 177, a connecting terminal 178, a haptic module 179, a camera module 180, a power management module 188, a battery 189, a communication module 190, a subscriber identification module (SIM) 196, or an antenna module 197. In an embodiment, at least one (e.g., the connecting terminal 178) of the components may be omitted from the electronic device 101, or one or more other components may be added in the electronic device 101. In an embodiment, some (e.g., the sensor module 176, the camera module 180, or the antenna module 197) of the components may be integrated into a single component (e.g., the display module 160).

[0017] The processor 120 may execute, for example, software (e.g., a program 140) to control at least one other component (e.g., a hardware or software component) of the electronic device 101 coupled with the processor 120, and may perform various data processing or computation. According to one embodiment, as at least part of the data processing or computation, the processor 120 may store a command or data received from another component (e.g., the sensor module 176 or the communication module 190) in volatile memory 132, process the command or the data stored in the volatile memory 132, and store resulting data in non-volatile memory 134. According to an embodiment, the processor 120 may include a main processor 121 (e.g., a central processing unit (CPU) or an application processor (AP)), or an auxiliary processor 123 (e.g., a graphics processing unit (GPU), a neural processing unit (NPU), an image signal processor (ISP), a sensor hub processor, or a communication processor (CP)) that is operable independently from, or in conjunction with, the main processor 121. For example, when the electronic device 101 includes the main processor 121 and the auxiliary processor 123, the auxiliary processor 123 may be configured to use lower power than the main processor 121 or to be specified for a designated function. The auxiliary processor 123 may be implemented as separate from, or as part of the main processor 121.

[0018] The auxiliary processor 123 may control at least some of functions or states related to at least one component (e.g., the display module 160, the sensor module 176, or the communication module 190) among the components of the electronic device 101, instead of the main processor 121 while the main processor 121 is in an inactive (e.g., sleep) state, or together with the main processor 121 while the main processor 121 is in an active state (e.g., executing an application). According to an embodiment, the auxiliary processor 123 (e.g., an image signal processor or a communication processor)

may be implemented as part of another component (e.g., the camera module 180 or the communication module 190) functionally related to the auxiliary processor 123. According to an embodiment, the auxiliary processor 123 (e.g., the neural processing unit) may include a hardware structure specified for artificial intelligence model processing. The artificial intelligence model may be generated via machine learning. Such learning may be performed, e.g., by the electronic device 101 where the artificial intelligence is performed or via a separate server (e.g., the server 108). Learning algorithms may include, but are not limited to, e.g., supervised learning, unsupervised learning, semi-supervised learning, or reinforcement learning. The artificial intelligence model may include a plurality of artificial neural network layers. The artificial neural network may be a deep neural network (DNN), a convolutional neural network (CNN), a recurrent neural network (RNN), a restricted Boltzmann machine (RBM), a deep belief network (DBN), a bidirectional recurrent deep neural network (BRDNN), deep Q-network or a combination of two or more thereof but is not limited thereto. The artificial intelligence model may, additionally or alternatively, include a software structure other than the hardware structure.

[0019] The memory 130 may store various data used by at least one component (e.g., the processor 120 or the sensor module 176) of the electronic device 101. The various data may include, for example, software (e.g., the program 140) and input data or output data for a command related thereto. The memory 130 may include the volatile memory 132 or the non-volatile memory 134.

[0020] The program 140 may be stored in the memory 130 as software, and may include, for example, an operating system (OS) 142, middleware 144, or an application 146.

[0021] The input module 150 may receive a command or data to be used by other component (e.g., the processor 120) of the electronic device 101, from the outside (e.g., a user) of the electronic device 101. The input module 150 may include, for example, a microphone, a mouse, a keyboard, keys (e.g., buttons), or a digital pen (e.g., a stylus pen).

[0022] The sound output module 155 may output sound signals to the outside of the electronic device 101. The sound output module 155 may include, for example, a speaker or a receiver. The speaker may be used for general purposes, such as playing multimedia or playing record. The receiver may be used for receiving incoming calls. According to an embodiment, the receiver may be implemented as separate from, or as part of the speaker.

[0023] The display module 160 may visually provide information to the outside (e.g., a user) of the electronic device 101. The display 160 may include, for example, a display, a hologram device, or a projector and control circuitry to control a corresponding one of the display, hologram device, and projector. According to an embodiment, the display 160 may include a touch sensor con-

figured to detect a touch, or a pressure sensor configured to measure the intensity of a force generated by the touch.

[0024] The audio module 170 may convert a sound into an electrical signal and vice versa. According to an embodiment, the audio module 170 may obtain the sound via the input module 150, or output the sound via the sound output module 155 or a headphone of an external electronic device (e.g., an electronic device 102) directly (e.g., wiredly) or wirelessly coupled with the electronic device 101.

[0025] The sensor module 176 may detect an operational state (e.g., power or temperature) of the electronic device 101 or an environmental state (e.g., a state of a user) external to the electronic device 101, and then generate an electrical signal or data value corresponding to the detected state. According to an embodiment, the sensor module 176 may include, for example, a gesture sensor, a gyro sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a grip sensor, a proximity sensor, a color sensor, an infrared (IR) sensor, a biometric sensor, a temperature sensor, a humidity sensor, or an illuminance sensor.

[0026] The interface 177 may support one or more specified protocols to be used for the electronic device 101 to be coupled with the external electronic device (e.g., the electronic device 102) directly (e.g., wiredly) or wirelessly. According to an embodiment, the interface 177 may include, for example, a high definition multimedia interface (HDMI), a universal serial bus (USB) interface, a secure digital (SD) card interface, or an audio interface.

[0027] A connecting terminal 178 may include a connector via which the electronic device 101 may be physically connected with the external electronic device (e.g., the electronic device 102). According to an embodiment, the connecting terminal 178 may include, for example, a HDMI connector, a USB connector, a SD card connector, or an audio connector (e.g., a headphone connector).

[0028] The haptic module 179 may convert an electrical signal into a mechanical stimulus (e.g., a vibration or motion) or electrical stimulus which may be recognized by a user via his tactile sensation or kinesthetic sensation. According to an embodiment, the haptic module 179 may include, for example, a motor, a piezoelectric element, or an electric stimulator.

[0029] The camera module 180 may capture a still image or moving images. According to an embodiment, the camera module 180 may include one or more lenses, image sensors, image signal processors, or flashes.

[0030] The power management module 188 may manage power supplied to the electronic device 101. According to an embodiment, the power management module 188 may be implemented as at least part of, for example, a power management integrated circuit (PMIC).

[0031] The battery 189 may supply power to at least one component of the electronic device 101. According to

an embodiment, the battery 189 may include, for example, a primary cell which is not rechargeable, a secondary cell which is rechargeable, or a fuel cell.

[0032] The communication module 190 may support establishing a direct (e.g., wired) communication channel or a wireless communication channel between the electronic device 101 and the external electronic device (e.g., the electronic device 102, the electronic device 104, or the server 108) and performing communication via the established communication channel. The communication module 190 may include one or more communication processors that are operable independently from the processor 120 (e.g., the application processor (AP)) and supports a direct (e.g., wired) communication or a wireless communication. According to an embodiment, the communication module 190 may include a wireless communication module 192 (e.g., a cellular communication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module) or a wired communication module 194 (e.g., a local area network (LAN) communication module or a power line communication (PLC) module). A corresponding one of these communication modules may communicate with the external electronic device 104 via a first network 198 (e.g., a short-range communication network, such as Bluetooth™, wireless-fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or a second network 199 (e.g., a long-range communication network, such as a legacy cellular network, a 5G network, a next-generation communication network, the Internet, or a computer network (e.g., local area network (LAN) or wide area network (WAN))). These various types of communication modules may be implemented as a single component (e.g., a single chip), or may be implemented as multi components (e.g., multi chips) separate from each other. The wireless communication module 192 may identify or authenticate the electronic device 101 in a communication network, such as the first network 198 or the second network 199, using subscriber information (e.g., international mobile subscriber identity (IMSI)) stored in the subscriber identification module 196.

[0033] The wireless communication module 192 may support a 5G network, after a 4G network, and next-generation communication technology, e.g., new radio (NR) access technology. The NR access technology may support enhanced mobile broadband (eMBB), massive machine type communications (mMTC), or ultra-reliable and low-latency communications (URLLC). The wireless communication module 192 may support a high-frequency band (e.g., the mmWave band) to achieve, e.g., a high data transmission rate. The wireless communication module 192 may support various technologies for securing performance on a high-frequency band, such as, e.g., beamforming, massive multiple-input and multiple-output (massive MIMO), full dimensional MIMO (FD-MIMO), array antenna, analog beam-forming, or large scale antenna. The wireless communication module 192 may support various requirements specified in

the electronic device 101, an external electronic device (e.g., the electronic device 104), or a network system (e.g., the second network 199). According to an embodiment, the wireless communication module 192 may support a peak data rate (e.g., 20Gbps or more) for implementing eMBB, loss coverage (e.g., 164dB or less) for implementing mMTC, or U-plane latency (e.g., 0.5ms or less for each of downlink (DL) and uplink (UL), or a round trip of 1ms or less) for implementing URLLC.

[0034] The antenna module 197 may transmit or receive a signal or power to or from the outside (e.g., the external electronic device). According to an embodiment, the antenna module 197 may include one antenna including a radiator formed of a conductor or conductive pattern formed on a substrate (e.g., a printed circuit board (PCB)). According to an embodiment, the antenna module 197 may include a plurality of antennas (e.g., an antenna array). In this case, at least one antenna appropriate for a communication scheme used in a communication network, such as the first network 198 or the second network 199, may be selected from the plurality of antennas by, e.g., the communication module 190. The signal or the power may then be transmitted or received between the communication module 190 and the external electronic device via the selected at least one antenna. According to an embodiment, other parts (e.g., radio frequency integrated circuit (RFIC)) than the radiator may be further formed as part of the antenna module 197.

[0035] According to an embodiment, the antenna module 197 may form a mmWave antenna module. According to an embodiment, the mmWave antenna module may include a printed circuit board, a RFIC disposed on a first surface (e.g., the bottom surface) of the printed circuit board, or adjacent to the first surface and capable of supporting a designated high-frequency band (e.g., the mmWave band), and a plurality of antennas (e.g., array antennas) disposed on a second surface (e.g., the top or a side surface) of the printed circuit board, or adjacent to the second surface and capable of transmitting or receiving signals of the designated high-frequency band.

[0036] At least some of the above-described components may be coupled mutually and communicate signals (e.g., commands or data) therebetween via an inter-peripheral communication scheme (e.g., a bus, general purpose input and output (GPIO), serial peripheral interface (SPI), or mobile industry processor interface (MIPI)).

[0037] According to an embodiment, commands or data may be transmitted or received between the electronic device 101 and the external electronic device 104 via the server 108 coupled with the second network 199. The external electronic devices 102 or 104 each may be a device of the same or a different type from the electronic device 101. According to an embodiment, all or some of operations to be executed at the electronic device 101 may be executed at one or more of the external electronic devices 102, 104, or 108. For example, if the electronic device 101 should perform a function or a service automatically, or in response to a request from a user or

another device, the electronic device 101, instead of, or in addition to, executing the function or the service, may request the one or more external electronic devices to perform at least part of the function or the service. The one or more external electronic devices receiving the request may perform the at least part of the function or the service requested, or an additional function or an additional service related to the request, and transfer an outcome of the performing to the electronic device 101.

The electronic device 101 may provide the outcome, with or without further processing of the outcome, as at least part of a reply to the request. To that end, a cloud computing, distributed computing, mobile edge computing (MEC), or client-server computing technology may be used, for example. The electronic device 101 may provide ultra low-latency services using, e.g., distributed computing or mobile edge computing. In an embodiment, the external electronic device 104 may include an internet-of-things (IoT) device. The server 108 may be an intelligent server using machine learning and/or a neural network. According to an embodiment, the external electronic device 104 or the server 108 may be included in the second network 199. The electronic device 101 may be applied to intelligent services (e.g., smart home, smart city, smart car, or health-care) based on 5G communication technology or IoT-related technology.

[0038] FIG. 2 is a front perspective view illustrating a connector socket 30 according to an embodiment of the disclosure.

[0039] FIG. 3 is a rear perspective view illustrating a connector socket 30 according to an embodiment of the disclosure.

[0040] According to an embodiment, an electronic device (e.g., the electronic device 101 of FIG. 1) may include a circuit board (e.g., the circuit board 210 of FIG. 5) and a connector socket 30 disposed on the circuit board 210. The connector socket 30 may be an electrical component that is male/female coupled to a connector plug (e.g., the connector plug 40 of FIG. 6) to form an electrically connected circuit. The connector socket 30 may be referred to as, e.g., a connector receptacle, a connector female, or an outlet.

[0041] The configuration of the connector socket 30 of FIGS. 2 and 3 may be identical, in whole or part, to the configuration of the connecting terminal 178 of FIG. 1. The embodiments of FIGS. 2 and 3 may be selectively combined with the embodiments of FIGS. 4 to 14.

[0042] According to an embodiment, the connector socket 30 may be disposed inside the electronic device 101 and may provide a physical or electrical connection between other electric components disposed inside the electronic device 101. According to an embodiment, at least a portion of the connector socket 30 may be exposed from one end of the electronic device 101 to provide a physical or electrical connection with an external electronic device (e.g., the electronic device 102 of FIG. 1).

[0043] According to an embodiment, the connector

socket 30 may include a connector housing 300 and a plurality of conductive pins 400 disposed in the connector housing 300. The connector housing 300 may include a bottom side part designed to be coupled to one side (e.g., surface) of the circuit board 210, and a top side part designed to allow at least a portion of the connector plug 40 to be inserted thereinto.

[0044] According to an embodiment, the connector housing 300 may include a supporting frame 310, a plurality of openings 320, a side wall 330 formed to surround at least some of the plurality of openings 320, a central wall 340 partially partitioning an inner space, and/or a coupling portion 350 for coupling with the circuit board 210. The components (e.g., the supporting frame 310, the plurality of openings 320, the side wall 330, the central wall 340, and/or the coupling portion 350) of the connector housing 300 may be selectively coupled.

[0045] According to an embodiment, the supporting frame 310 may form a lower side (e.g., one surface facing in the -Z-axis) of the connector housing 300 and may support the side wall 330, the central wall 340, and/or the coupling portions 350 of the connector housing 300. The supporting frame 310 may be disposed to face the circuit board 210.

[0046] According to an embodiment, the side wall 330 may constitute a portion of the exterior of the connector housing 300. The side wall 330 may be disposed to surround the inner space S of the connector housing 300. The side wall 330 may include a first side wall portion 331, a second side wall portion 332, a third side wall portion 333, and/or a fourth side wall portion 334. The first side wall portion 331, the second side wall portion 332, the third side wall portion 333, and/or the fourth side wall portion 334 may have a rectangular loop shape when viewed from the front side (e.g., surface) of the connector housing 300.

[0047] According to an embodiment, the first side wall portion 331 may have a first length along a first length direction (e.g., the Y-axis direction). The second side wall portion 332 may extend in a second length direction (e.g., the X-axis direction) substantially perpendicular to the first side wall portion 331. The second side wall portion 332 may extend to have a length shorter than the first length. The third side wall portion 333 may extend from the second side wall portion 332 in a direction (e.g., the Y-axis direction) substantially perpendicular to the second side wall portion 332. The third side wall portion 333 may extend in a direction substantially parallel to the first side wall portion 331. The third side wall portion 333 may have the first length along the first length direction. The fourth side wall portion 334 may extend in a direction (e.g., the Y-axis direction) substantially perpendicular to the third side wall portion 333 (or the first side wall portion 331). The fourth side wall portion 334 may extend in a direction substantially parallel to the second side wall portion 332. The fourth side wall portion 334 may have a second length along a second length direction.

[0048] According to an embodiment, at least a portion

of the first side wall portion 331, the second side wall portion 332, the third side wall portion 333, and/or the fourth side wall portion 334 may be formed of a curved side (e.g., surface). The first side wall portion 331, the second side wall portion 332, the third side wall portion 333, and/or the fourth side wall portion 334 may have a rectangular (e.g., square or rectangle) shape. The first side wall portion 331, the second side wall portion 332, the third side wall portion 333, and/or the fourth side wall portion 334 may be integrally formed but are not limited thereto.

[0049] According to an embodiment, the side wall 330 may include a plurality of first grooves 335. Each of the plurality of first grooves 335 of the side wall 330 may be formed to be concave or curved so that at least a portion of each of the plurality of conductive pins 400 may be positioned therein (e.g., inserted).

[0050] According to an embodiment, the plurality of first grooves 335 of the side wall 330 may correspond to the plurality of second grooves 345 formed in the central wall 340. For example, a plurality of 1-1th grooves 335a arranged side by side along the first length direction (e.g., the Y-axis direction) of the first side wall portion 331 may be formed to correspond to (e.g., face) a plurality of 2-1th grooves 345a arranged on one side of the central wall 340. For example, the plurality of 1-2th grooves 335b arranged side by side along the first length direction (e.g., the Y-axis direction) of the third side wall portion 333 may be formed to correspond to (e.g., face) a plurality of 2-2th grooves 345b arranged on the other side of the central wall 340. The plurality of 1-1th grooves 335a of the first side wall portion 331 and the plurality of 1-2th grooves 335b of the third side wall portion 333 may be opened toward the inner space and may be referred to as at least one of a slit, a recess, or a space in which one side is open.

[0051] According to an embodiment, a portion of each of the plurality of conductive pins 400 may be positioned in the first groove 335, and another portion thereof may be positioned in the second groove 345. For example, a portion (e.g., the 1-1th portion 410a of FIG. 5) of the conductive pin 400 may be inserted into the first groove 335 of the side wall 330, and another portion (e.g., the 1-2th portion 410b of FIG. 5) may be inserted into the second groove 345 of the central wall 340. According to an embodiment, since the first groove 335 and the second groove 345 have a shape open in the front direction (e.g., the +Z-axis direction), a portion (e.g., the first portion 410) of the conductive pin 400 may be exposed when viewed from the front side (e.g., surface) of the connector housing 300.

[0052] According to an embodiment, the side wall 330 may include a protruding portion 336 protruding toward the rear side (e.g., surface) (e.g., in the -Z-axis direction) and disposed in contact with the circuit board 210 and disposed to surround the plurality of conductive pins 400 so as not to be exposed to the outside. For example, the protruding portion 336 may protrude from one side (e.g.,

one surface facing in the -Z-axis) of the supporting frame 310. For example, the protruding portion 336 may have a shape of protruding from a portion (e.g., the second portion 420) of the plurality of conductive pins 400 exposed from one side (e.g., one surface facing in the -Z-axis) of the supporting frame 310. The protruding portion 336 may be referred to as at least one of an extension portion, a convex portion, a bump portion, a lump portion, or a dam.

[0053] According to an embodiment, the protruding portion 336 may be an end portion of the side wall 330 facing in the -Z-axis direction. The end portion may be defined as an edge of the side wall 330 facing in the -Z-axis direction and a portion adjacent thereto. When viewed from the rear side (e.g., surface) of the connector housing 300, the protruding portion 336 may have a closed loop shape. For example, the protruding portion 336 may be formed of a first side wall portion 331, one end of a third side wall portion 333, and a portion extending from the one end and may have a rectangular (e.g., square or rectangular) loop shape. For example, the protruding portion 336 may include a first protruding portion 336a that is an end portion of the first side wall portion 331, a third protruding portion 336c that is an end portion of the third side wall portion 333, a second protruding portion 336b that extends from the first protruding portion 336a to the third protruding portion 336c and is adjacent to the second side wall portion 332, and a fourth protruding portion 336d that extends from the first protruding portion 336a to the third protruding portion 336c and is adjacent to the fourth side wall portion 334.

[0054] According to an embodiment, the protruding portion 336 may have a stepwise shape from one side (e.g., one surface facing in the -Z-axis) of the supporting frame 310. A portion of the protruding portion 336 may have a stepwise shape of from an end portion of the second side wall portion 332 and/or the fourth side wall portion 334.

[0055] According to an embodiment, the thickness of the protruding portion 336 may be different from the thickness of other portions of the side wall 330. For example, when viewed from the front side (e.g., surface) of the connector housing 300, the thickness of the side wall 330 formed to surround the inner space S may have a first thickness, and when viewed from the rear side (e.g., surface) of the connector housing 300, the thickness of the side wall (e.g., the protruding portion 336) protruding in the -Z-axis direction may have a second thickness less than or equal to the first thickness. For example, the second thickness may be substantially less than half of the first thickness.

[0056] According to an embodiment, the central wall 340 may have a shape protruding from the central area of the supporting frame 310 toward the front side (e.g., surface) (e.g., the +Z-axis direction) and partially partition the inner space S. The central wall 340 may have a shape elongated along the first length direction (e.g., the Y-axis direction) and may have a shape (e.g., a rectangular

shape (e.g., a square or a rectangle)) corresponding to at least a portion of the side wall 330.

[0057] According to an embodiment, the central wall 340 may be spaced apart from the side wall 330. For example, each side (e.g., surface) of the central wall 340 may be disposed to face the first side wall portion 331, the second side wall portion 332, the third side wall portion 333, and/or the fourth side wall portion 334 while being spaced apart therefrom. For example, when viewed from the front side (e.g., surface) of the connector housing 300, the central wall 340 may have an island shape spaced apart from the side wall 330.

[0058] According to an embodiment, the central wall 340 may include a plurality of second grooves 345. Each of the plurality of second grooves 345 of the central wall 340 may be formed to be concave (e.g., curved) so that at least a portion of each of the plurality of conductive pins 400 is positioned (e.g., inserted) thereinto. The plurality of second grooves 345 of the central wall 340 may correspond to the plurality of first grooves 335 formed in the side wall 330. For example, the plurality of 2-1th grooves 345a arranged side by side along the first length direction (e.g., the Y-axis direction) in one side portion (e.g., a portion facing the +X-axis direction) of the central wall 340 may be formed to correspond to the plurality of first grooves 335 arranged in the first side wall portion 331. For example, the plurality of 2-2th grooves 345b arranged side by side along the first length direction (e.g., the Y-axis direction) in the other side portion (e.g., the portion facing in the -X-axis direction) of the central wall 340 may be formed to correspond to the plurality of first grooves 335 arranged in the third side wall portion 333. The plurality of 2-1th grooves 345a and the 2-2th grooves 345b of the central wall 340 may have a shape of being open toward the inner space S, and may be referred to as at least one of a slit, a recess, or a space in which one side is open.

[0059] According to an embodiment, a portion of each of the plurality of conductive pins 400 may be positioned in the first groove 335, and another portion thereof may be positioned in the second groove 345. For example, a portion (e.g., the 1-1th portion 410a) of the conductive pin 400 may be inserted into the second groove 345 of the central wall 340, and another portion (e.g., the 1-2th portion 410b) may be inserted into the first groove 335 of the side wall 330. According to an embodiment, as the first groove 335 and the second groove 345 have a shape of being open in the front direction, a portion (e.g., the first portion 410) of the conductive pin 400 may be exposed when viewed from the front side (e.g., surface) of the connector housing 300.

[0060] According to an embodiment, the plurality of openings 320 are spaces (e.g., gaps) in which the plurality of conductive pins 400 are positioned or formed to be exposed to the outside of the connector housing 300 and may be disposed to pass through the connector housing 300.

[0061] According to an embodiment, the plurality of

openings 320 may be arranged side by side with respect to the central wall 340. The plurality of openings 320 may include first openings 320a formed between the central wall 340 and the first side wall portion 331 and second openings 320b formed between the central wall 340 and the third side wall portion 333. The first openings 320a and the second openings 320b may be formed in substantially the same number and may be arranged side by side to correspond to each other. A plurality of conductive pins 400 may be at least partially inserted into the first openings 320a and the second openings 320b, respectively.

[0062] According to an embodiment, at least a portion of spaces of each of the plurality of openings 320 may be formed to pass through the supporting frame 310, and when viewed toward the rear side (e.g., surface) of the supporting frame 310, the plurality of openings 320 may be arranged side by side at regular sizes and intervals.

[0063] According to an embodiment, the inner space S of the connector housing 300 may include a first space S1 in which the plurality of conductive pins 400 are disposed and a second space S2 in which the connector plug 40 is seated (e.g., disposed). The first space S1 and the second space S2 may be spaces connected to each other. The first space S1 may include a plurality of openings 320 and adjacent areas of the plurality of openings 320.

[0064] According to an embodiment, the first space S1 (e.g., the plurality of openings 320) formed by the first side wall 330 (or the third side wall 330) and the central wall 340 in the inner space S may be a space in which at least some of the plurality of conductive pins 400 are disposed. For example, a portion of each of the plurality of conductive pins 400 may protrude to the first space S1 for easier contact between the portion not inserted into the first groove 335 of the first side wall 330 and/or the portions not inserted into the second groove 345 of the central wall 340 and the conductive terminals of the connector plug 40. For example, the respective non-inserted portions of the plurality of conductive pins 400 may be positioned in the first space S1 (e.g., the plurality of openings 320).

[0065] According to an embodiment, the second space S2 formed by the second side wall 330 (or the fourth side wall 330) and the central wall 340 in the inner space S may be a space into which a protrusion portion (not shown) of the connector plug 40 is inserted. For stable coupling with the connector socket 30, the connector plug 40 may include a protrusion portion in which a portion other than the electrical contact with the conductive pins 400 is inserted into the connector housing 300 and fixed to the connector socket 30. The protrusion portion of the connector plug 40 and the second space S2 of the connector housing 300 may be male/female fitted to each other with shapes corresponding to each other.

[0066] According to an embodiment, the second space S2 may be defined as a space between two (2) opposite end portions of the central wall 340 and the side wall 330. For example, the second space S2 may include a 2-1th

space S21 providing a space between one end portion (e.g., an end portion facing in the +Y-axis) of the central wall 340 and the second side wall portion 332, and a 2-2th space S22 providing a space between the other end (e.g., an end facing in the -Y-axis) of the central wall 340 and the second side wall portion 332.

[0067] According to an embodiment, the second space S2 and the portion formed to surround the second space S2 may be referred to as an upper coupling portion. For example, the 2-1th space S21 is a space surrounded by the second side wall portion 332, the central wall 340, a portion of the first side wall portion 331, and a portion of the third side wall portion 333, and may extend toward the first space S1. For example, the 2-2th space S22 is a space surrounded by the fourth side wall portion 334, the central wall 340, a portion of the first side wall portion 331, and a portion of the third side wall portion 333, and may extend to the first space S1.

[0068] According to an embodiment, the coupling portion 350 may extend from two opposite ends of the supporting frame 310 and may be connected to one side (e.g., surface) of the circuit board 210. The coupling portion 350 may be referred to as a lower coupling portion. For example, the upper coupling portion of the connector housing 300 may be a portion for coupling and fixing with the connector plug 40, and the lower coupling portion of the connector housing 300 may be a portion for coupling and fixing with the circuit board 210.

[0069] According to an embodiment, the coupling portion 350 may include a seating area 351 extending from the supporting frame 310 or the side wall 330, and a fixing area 353 protruding from the seating area 351 toward the outside of the side wall 330. The seating area 351 may extend from two (2) opposite ends of the supporting frame 310 or the protruding portion 336. For example, the seating area 351 may include an area extending from the second protruding portion 336b and an area extending from the fourth protruding portion 336d. For example, the seating area 351 may include an area disposed in one end direction (e.g., +Y-axis direction) of the supporting frame 310 and an area disposed in one end direction (e.g., -Y-axis direction) of the supporting frame 310. The fixing area 353 may have a shape of protruding from two (2) opposite ends (e.g., the +X-axis direction and the -X-axis direction) of the seating area 351 and may contact and fix one side (e.g., surface) of the circuit board 210.

[0070] According to an embodiment, the plurality of conductive pins 400 may be disposed in the inner space S of the connector housing 300, and at least some thereof may be exposed to be electrically connected to the connector plug 40 and/or the circuit board 210.

[0071] According to an embodiment, the plurality of conductive pins 400 may include a first portion 410 disposed to pass through the plurality of openings 320 of the connector housing 300 and exposed toward the front side (e.g., surface) (e.g., the +Z-axis direction) and a second portion 420 exposed toward the rear side (e.g., surface) (e.g., the -Z-axis direction) to be electrically connected to

the circuit board 210 (e.g., the plurality of conductive pads 212 of the circuit board 210 of FIG. 5).

[0072] According to an embodiment, the plurality of conductive pins 400 may include first conductive pins 400a arranged in the first space S1 of the connector housing 300 and second conductive pins 400b arranged in the second space S2 of the connector housing 300. Each of the first conductive pins 400a may have the same shape and may be arranged at a designated (e.g., predetermined) interval in the first space S1 along the first length direction (e.g., the Y-axis direction). Each of the second conductive pins 400b may have the same shape and may be arranged at a designated interval in the second space S2 along the first length direction (e.g., the Y-axis direction). The first conductive pins 400a and the second conductive pins 400b may be arranged side by side with the central wall 340 interposed therebetween.

[0073] According to an embodiment, the first conductive pins 400a among the plurality of conductive pins 400 may be positioned between the first side wall portion 331 and the central wall 340. For example, at least a portion of each of the first conductive pins 400a may remain inserted in the 1-1th groove 335a formed in the first side wall portion 331 and the 2-1th groove 345a of the central wall 340. For example, as the front side (e.g., surface) (e.g., in the +Z-axis direction) of the 1-1th groove 335a and the 2-1th groove 345a is open, a portion of each of the first conductive pins 400a facing the front side (e.g., surface) may be exposed to the outside of the connector housing 300. For example, as at least a portion of each of the first conductive pins 400a includes an elastic portion, when coupled to the connector plug 40, the elastic portion may be pushed into the 2-1th groove 345a and may provide an elastic force in the opposite direction to enhance the coupling force.

[0074] For example, at least a portion of each of the second conductive pins 400b may remain inserted in the 1-2th groove 335b formed in the third side wall portion 333 and the 2-2th groove 345b of the central wall 340. For example, as the front side (e.g., surface) (e.g., in the +Z-axis direction) of the 1-2th groove 335b and the 2-2th groove 345b is open, a portion of each of the second conductive pins 400b facing the front side (e.g., surface) may be exposed to the outside of the connector housing 300. For example, as at least a portion of each of the second conductive pins 400b includes an elastic portion, when coupled to the connector plug 40, the elastic portion may be pushed (e.g., displaced) into the 2-2th groove 345b and may provide an elastic force in the opposite direction to enhance the coupling force.

[0075] FIG. 4 is a rear perspective view illustrating a cross-sectional view taken along line A-A' of the connector socket 30 of FIG. 2 according to an embodiment of the disclosure.

[0076] FIG. 5 is a cross-sectional view taken along line A-A' of the connector socket 30 of FIG. 2 disposed on a circuit board according to an embodiment of the disclo-

sure.

[0077] According to an embodiment, an electronic device (e.g., the electronic device 101 of FIG. 1) may include a circuit board 210 and a connector socket 30 disposed on the circuit board 210. The connector socket 30 may include a connector housing 300 and a plurality of conductive pins 400 disposed in the connector housing 300.

[0078] The configuration of the connector socket 30 of FIGS. 4 and 5 may be identical in whole or part to the configuration of the connector socket 30 of FIGS. 2 and 3. The embodiments of FIGS. 4 and 5 may be selectively combined with the embodiments of FIGS. 2 and 3 and the embodiments of FIGS. 6 to 14.

[0079] According to an embodiment, the connector housing 300 may include a supporting frame 310, a plurality of openings 320, a side wall 330 formed to surround at least some of the plurality of openings 320, and/or a central wall 340 partially partitioning an inner space.

[0080] According to an embodiment, the connector housing 300 may have an open upper side, and the side wall 330 of the connector housing 300 may be disposed to surround the inner space. According to an embodiment, the side wall 330 of the connector housing 300 may include an extension portion 337 extending toward the front side (e.g., surface) (e.g., the +Z-axis direction). Compared to the central wall 340, the extension portion 337 may further protrude toward the front side (e.g., surface) (e.g., in the +Z-axis direction). When the extension portion 337 is coupled to the connector plug (e.g., the connector plug 40 of FIG. 6), the extension portion 337 is extended to contact the circuit board (e.g., the second circuit board 220 of FIG. 6) of the connector plug 40, so that the connector housing 300 may provide an inner space blocked from the outside not to have an open portion.

[0081] According to an embodiment, the side wall 330 of the connector housing 300 may include a protruding portion 336 that protrudes (e.g., extends) toward the rear side (e.g., surface) (e.g., the -Z-axis direction) to be disposed in contact with the circuit board 210, and is formed to surround the plurality of conductive pins 400 so as not to be exposed. As the protruding portion 336 restricts not form a gap between the lower side (e.g., surface) of the connector housing 300 and the circuit board 210, the inflow of foreign substances (e.g., moisture or dust) under the connector housing 300 may be restricted or reduced. The protruding portion 336 may serve to seal between the connector housing 300 and the circuit board 210.

[0082] According to an embodiment, the circuit board 210 may include a recess 215 in which the protruding portion 336 of the connector housing 300 is positioned. The recess 215 may have a groove shape dug into the circuit board 210 and may be provided in a shape corresponding to the shape of the protruding portion 336. For example, if the protruding portion 336 has a loop shape

formed to surround the lower sides of the plurality of conductive pins 400, the recess 215 may have a loop shape corresponding to the protruding portion 336 to allow the protruding portion 336 to be fitted therein. The recess 215 may be formed through a side (e.g., surface) etching process of the circuit board 210.

[0083] In the state in which the protruding portion 336 of the connector housing 300 is inserted into and coupled to the recess 215 of the circuit board 210 according to the disclosure, the inner space of the connector housing 300 may be sealed from the outside. Accordingly, the plurality of conductive pins 400 may be blocked from the outside by coupling of the connector housing 300 and the circuit board 210 without a separate coating process, and the inflow of foreign substances (e.g., moisture or dust) may be restricted or reduced.

[0084] According to an embodiment, a plurality of conductive pads 212 may be disposed on one side (e.g., one surface facing in the +Z axis) of the circuit board 210. As the plurality of conductive pads 212 are formed for electrical connection with the plurality of conductive pins 400, the plurality of conductive pads 212 may be formed in positions and number corresponding to the plurality of conductive pins 400. For example, the plurality of conductive pads 212 may be electrically connected to the plurality of conductive pins 400, respectively, facing or contacting them through a bonding process through soldering.

[0085] According to an embodiment, the plurality of conductive pads 212 may be arranged side by side with respect to the virtual center line X1 extending from the central wall 340 of the connector housing 300. The plurality of conductive pads 212 may include first conductive pads 212a arranged inside the first openings 320a of the connector housing 300 and/or on the circuit board 210, and second conductive pads 212b arranged inside the second openings 320b of the connector housing 300 and/or on the circuit board 210. Each of the first conductive pads 212a may have the same shape and may be arranged at a designated interval along the first length direction (e.g., the Y-axis direction). Each of the second conductive pads 212b may have the same shape and may be arranged at a designated interval along the first length direction (e.g., the Y-axis direction). The first conductive pads 212a and the second conductive pads 212b may be arranged side by side with a virtual center line X1 therebetween.

[0086] According to an embodiment, the plurality of conductive pins 400 may be disposed in the inner space (e.g., the plurality of openings 320) of the connector housing 300, and at least a portion thereof may be exposed to be electrically connected to the connector plug 40 and/or the circuit board 210.

[0087] According to an embodiment, each of the plurality of conductive pins 400 may include a first portion 410 disposed to penetrate the plurality of openings 320 of the connector housing 300 and exposed toward the front side (e.g., surface) (e.g., the +Z-axis direction), a second

portion 420 exposed toward the rear side (e.g., surface) (e.g., the -Z-axis direction) and electrically connected to the plurality of conductive pads 212 of the circuit board 210, and/or a third portion 430 for fixing to the connector housing 300.

[0088] According to an embodiment, at least a portion of the first portion 410 of each of the plurality of conductive pins 400 is exposed to the outside of the connector housing 300, and the exposed portion is substantially a portion for electrical connection with the connector plug 40 and may not be exposed when coupled to the connector plug 40. The first portion 410 may include a 1-1th portion 410a and a 1-2th portion 410b spaced apart from each other, a conductive terminal (e.g., the conductive terminal 43 of FIG. 6) of the connector plug 40 may be inserted into a space formed by the 1-1th portion 410a and the 1-2th portion 410b, and two (2) opposite sides of the conductive terminal 43 may contact the 1-1th portion 410a and the 1-2th portion 410b, respectively, forming a contact.

[0089] According to an embodiment, the 1-1th portion 410a may be a portion adjacent to the central wall 340, and the 1-2th portion 410b may be a portion adjacent to the side wall 330. For example, at least a portion of the 1-1th portion 410a may be inserted into a groove (e.g., the 2-1th groove 345a or the 2-2th groove 345b of FIG. 2) of the central wall 340, and may have a partially curved shape. The grooves (e.g., the 2-1th groove 345a and the 2-2th groove 345b of FIG. 2) of the central wall 340 are open toward the front side (e.g., surface) (e.g., the +Z-axis direction), and when viewed from the front side (e.g., surface), the 1-1th portion 410a may be at least partially visible in the field of view.

[0090] According to an embodiment, the 1-1th portion 410a may include an end portion 410aa that is inserted into a groove (e.g., the 2-1th groove 345a or the 2-2th groove 345b) of the central wall 340 and is adjacent to the virtual center line X1, and an elastic portion 410ab extending from the end portion 410aaa to the second portion 420 and curved. The elastic portion 410ab may be moved left and right in the X-axis direction by coupling and detachment of the connector plug 40. For example, as a portion of the elastic portion 410ab is moved in the -X-axis direction to provide an elastic force in the +X-axis direction when the connector plug 40 is inserted, the elastic portion 410ab may maintain strong coupling with the connector plug 40.

[0091] According to an embodiment, the 1-2th portion 410b may be inserted into grooves (e.g., the 1-1th groove 335a and the 1-2th groove 335b of FIG. 2) of the side wall (e.g., the first side wall portion 331 and the third side wall portion 333), and may have a partially curved shape. The grooves (e.g., the 1-1th groove 335a and the 1-2th groove 335b of FIG. 2) of the side wall (e.g., the first side wall portion 331 and the third side wall portion 333) are open toward the front side (e.g., surface) (e.g., the +Z-axis direction), and when viewed from the front side (e.g., surface) (e.g., the +Z-axis direction), the 1-2th portion

410b may be at least partially visible in the field of view.

[0092] According to an embodiment, the 1-2th portion 410b may include a support portion 410ba inserted into a groove (e.g., the 1-1th groove 335a and the 1-2th groove 335b of FIG. 2) of the side wall 330 to contact the side wall, and a curved contact portion 410bb extending from the support portion 410ba to the third portion 430. The contact portion 410bb may protrude toward the inner space S to provide an electrical contact with the elastic portion 410ab when the connector plug 40 is coupled.

[0093] According to an embodiment, the second portion 420 of each of the plurality of conductive pins 400 may be disposed between the 1-1th portion 410a and the 1-2th portion 410b, and may extend from the 1-1th portion 410a to the 1-2th portion 410b. For example, each of the plurality of conductive pins 400 may be a pin structure extending to the 1-1th portion 410a, the second portion 420, and the 1-2th portion 410b, and the 1-1th portion 410a, the second portion 420, and the 1-2th portion 410b may be designed in different shapes.

[0094] According to an embodiment, the second portion 420 of each of the plurality of conductive pins 400 is a portion for electrical connection (e.g., soldering) with the conductive pad 212 of the circuit board 210 and may have a flat plate shape.

[0095] Unlike the conductive pins of a general connector socket (e.g., the connector socket 20 of FIG. 7A), in the conductive pins 400 of the connector socket 30 according to an embodiment, a portion (e.g., the second portion 420) for electrical connection with the circuit board 210 may be disposed inside the connector socket 30. For example, when the connector socket 30 is coupled to the connector plug 40, the conductive terminals 43 of the connector plug 40 and the second portions 420 of the conductive pins 400 may face each other while being spaced apart from each other. Accordingly, the size of the conductive pins 400 of the connector socket 30 may be reduced, and the overall size of the connector socket 30 on which the conductive pins 400 are mounted may be reduced.

[0096] According to an embodiment, the third portion 430 of each of the plurality of conductive pins 400 may be accommodated in a portion of the connector housing 300, thereby fixing the conductive pin 400. The side wall (e.g., the first side wall portion 331 and the third side wall portion 333) of the connector housing 300 may include a receiving groove 338 concave (e.g., curved) in the rear direction. As the third portion 430 of each of the plurality of conductive pins 400 extends from one end of the 1-2th portion 410b and is inserted into the receiving groove 338, each of the plurality of conductive pins 400 may be fixed to the connector housing 300. The third portion 430 of each of the plurality of conductive pins 400 may be fitted into the receiving groove 338 in the -Z-axis direction, and the length of the third portion 430 coupled to the receiving groove 338 may be at least half the height of the side wall (e.g., the first side wall portion 331 and the third side wall portion 333). Accordingly, each of the conduc-

tive pins 400 may be maintained in a stable state as a whole.

[0097] FIG. 6 is a cross-sectional view illustrating a coupled state between a connector socket and a connector plug according to an embodiment of the disclosure.

[0098] According to an embodiment, an electronic device (e.g., the electronic device 101 of FIG. 1) may include a first circuit board 210, a second circuit board 220 disposed to be spaced apart from and face the first circuit board 210, a connector socket 30 disposed on the first circuit board 210, and a connector plug 40 disposed on the second circuit board 220.

[0099] According to an embodiment, the connector socket 30 may include a connector housing 300 and a plurality of conductive pins 400 disposed in the connector housing 300. According to an embodiment, the connector plug 40 may include a supporting member 41 and a conductive terminal 43 formed to surround a portion of the supporting member 41.

[0100] The configuration of the connector socket 30 of FIG. 6 may be identical in whole or part to the configuration of the connector socket 30 of FIGS. 2 to 5. The embodiment of FIG. 6 may be selectively combined with the embodiments of FIGS. 2 to 5 and the embodiments of FIGS. 7 to 14.

[0101] According to an embodiment, the supporting member 41 of the connector plug 40 may be a structure that may be inserted into the inner space of the connector housing 300 and may be formed of an insulating material. The supporting member 41 may include a support portion facing the second circuit board 220 and a protrusion portion where two opposite ends of the support portion are bent toward one side (e.g., the inner space of the connector housing 300). For example, the supporting member 41 may have a '┌┐' shape.

[0102] According to an embodiment, the conductive terminal 43 of the connector plug 40 may include a portion that is disposed to surround the protrusion portions at two (2) opposite ends of the supporting member and bent toward the inner space of the connector housing 300 and a ground portion coupled (e.g., soldered) on the second circuit board 220. A plurality of conductive terminals 43 of the connector plug 40, as a portion for electrical connection with the conductive pin 400 of the connector socket 30, may be formed to correspond to the plurality of conductive pins 400.

[0103] According to an embodiment, the plurality of conductive terminals 43 of the connector plug 40 may include first conductive terminals 43a corresponding to the first conductive pins 400a and second conductive terminals 43b corresponding to the second conductive pins 400b. Each of the first conductive terminals 43a may have the same shape and may be arranged at a designated interval for physical coupling and electrical coupling with the first conductive pins 400a in the first opening 320a along the first length direction (e.g., the Y-axis direction). Each of the second conductive terminals 43b

may have the same shape and may be arranged at a designated interval for physical coupling and electrical coupling with the second conductive pins 400b in the second opening 320b along the first length direction (e.g., the Y-axis direction). The first conductive terminals 43a and the second conductive terminals 43b may be arranged side by side with the central wall 340 interposed therebetween.

[0104] According to an embodiment, the connector socket 30 and the connector plug 40 may be male/female coupled to each other. The conductive terminal 43 of the connector plug 40 may be plugged into the inner space of the connector socket 30 to provide an electrical connection between the first circuit board 210 and the second circuit board 220. Thereafter, the conductive terminal 43 of the connector plug 40 may be plugged from the inner space of the connector socket 30 to provide electrical separation between the first circuit board 210 and the second circuit board 220.

[0105] According to an embodiment, the plug-in state may be a state in which the first conductive pins 400a of the connector socket 30 contact and electrically connect to the first conductive terminals 43a of the connector plug 40. For example, the first conductive terminal 43a of the connector plug 40 may be inserted between the first portions (e.g., the 1-1th portion 410a and the 1-2th portion 410b spaced apart from each other) of the first conductive pins 400a of the connector socket 30, so that one side (e.g., surface) (e.g., one surface facing in the -X-axis) of the first conductive terminal 43a facing the central wall 340 may contact (or overlap) the 1-1th portion 410a, and one side (e.g., one surface facing in the +X-axis) of the first conductive terminal 43a facing the first side wall portion 331 may contact (or overlap) the 1-2th portion 410b. For example, the second conductive terminal 43b of the connector plug 40 may be inserted between the first portions (e.g., the 1-1th portion 410a and the 1-2th portion 410b spaced apart from each other) of the second conductive pins 400b of the connector socket 30, so that one side (e.g., one surface facing in the +X-axis) of the second conductive terminal 43b facing the central wall 340 may contact (or overlap) the 1-1th portion 410a, and one side (e.g., one surface facing in the -X-axis) of the second conductive terminal 43b facing the third side wall portion 333 may contact (or overlap) the 1-2th portion 410b.

[0106] According to an embodiment, the side wall 330 (e.g., the first side wall portion 331 and the third side wall portion 333) of the connector housing 300 may include a protruding portion 336 facing the first circuit board 210 and an extension portion 337 facing the second circuit board 220. The protruding portion 336 and the extension portion 337 may have a closed loop shape. The protruding portion 336 may be disposed in contact on the first circuit board 210 to partition and/or separate a space in which the conductive pin 400 and the conductive terminal 43 are positioned from other spaces. For example, the protruding portion 336 may remain in a state of being

inserted into the recess 215 of the first circuit board 210. In the plug-in state, the extension portion 337 may come in contact on the second circuit board 220 to partition and/or separate the space in which the conductive pin 400 and the conductive terminal 43 are positioned from the other space.

[0107] According to an embodiment of the disclosure, the lower and upper sides, where the conductive pin 400 and the conductive terminal 43 are coupled, may be blocked from the outside by the side wall (e.g., the protruding portion 336 and the extension portion 337) of the connector housing 300. Accordingly, it is possible to restrict or reduce the inflow of foreign substances (e.g., moisture or dust) into the connector socket 30 and the connector plug 40.

[0108] FIG. 7A is a cross-sectional view illustrating a structure of a general connector socket 20. FIG. 7B is a cross-sectional view illustrating a structure of a connector socket 30 according to an embodiment of the disclosure.

[0109] FIG. 8A is a cross-sectional view illustrating conductive connection pads 21a of a circuit board 21 for electrical connection with a general connector socket 20. FIG. 8B is a cross-sectional view illustrating conductive pads 212 of a circuit board 210 for electrical connection with a connector socket 30 according to an embodiment of the disclosure.

[0110] According to an embodiment, an electronic device (e.g., the electronic device 101 of FIG. 1) may include a circuit board 210 and a connector socket 30 disposed on the circuit board 210. The connector socket 30 may include a connector housing 300 and a plurality of conductive pins 400 disposed in the connector housing 300.

[0111] The configuration of the connector socket 30 of FIGS. 7B and 8B may be identical in whole or part to the configuration of the connector socket 30 of FIGS. 2 to 6. The embodiments of FIGS. 7B and 8B may be selectively combined with the embodiments of FIGS. 2 to 6 and the embodiments of FIGS. 9 to 14.

[0112] The following description focuses primarily on differences between the general connector socket 20 of FIGS. 7A and 8A and the connector socket 30 of the disclosure of FIGS. 7B and 8B.

[0113] Referring to the structures of the connector socket 20 and the circuit board 21 of FIGS. 7A and 8A, as the connector housing 22 provides a space in which a plurality of conductive pins 23 may be seated, a portion for coupling with the connector plug (e.g., the connector plug 40 of FIG. 6) may be positioned inside the connector housing 22, and a portion for coupling with the circuit board 21 (e.g., the mounting portion P1) may be positioned outside the connector housing 22. For example, the mounting portions P1 of the first conductive pins 23a may be positioned outside the connector housing 22 (e.g., in the +X-axis direction), and the mounting portions P1 of the second conductive pins 23a may be positioned outside the connector housing 22 (e.g., in the -X-axis direction).

[0114] Referring to the structure of the connector socket 20 and the circuit board 21 of FIGS. 7A and 8A, the circuit board 21 may include a plurality of conductive pads 26 for coupling with the plurality of conductive pins 23 and a coupling pad C for coupling with a coupling portion (e.g., the coupling portion 350 of FIG. 3) of the connector housing 22. As the mounting portions P1 of the plurality of conductive pins 23 are disposed outside the connector housing 22, the plurality of conductive pads 26 may be disposed at positions corresponding thereto (e.g., one side surface of the circuit board 21). For example, the first conductive pads 26a may be arranged along an outer line l1 (e.g., a line facing in the +X-axis direction) of the coupling pad C on the circuit board 21 to correspond to the mounting portions P1 of the first conductive pins 23a. For example, the second conductive pads 26b may be arranged along an outer line l2 (e.g., a line facing the -X-axis direction) of the coupling pad C on the circuit board 21 to correspond to the mounting portion P1 of the second conductive pins 23b. The distance (e.g., the outermost distance) between the first conductive pads 26a and the second conductive pads 26b may be defined as d1.

[0115] Referring to the structure of the connector socket 30 and the circuit board 210 of FIGS. 7B and 8B, the plurality of conductive pins 400 may be overall disposed in the inner space of the connector housing 300 so as not to be exposed to the outside. The portion for coupling with the connector plug (e.g., the connector plug 40 of FIG. 6) and the mounting portion (e.g., the second portion 420) for coupling with the circuit board 210 may be positioned inside the connector housing 300. For example, the mounting portion (e.g., the second portion 420) of the first conductive pins 400a may be positioned between the central wall 340 and the first side wall portion 331 of the connector housing 300, and the mounting portion (e.g., the second portion 420) of the second conductive pins 400b may be positioned between the central wall 340 and the third side wall portion 333 of the connector housing 300.

[0116] Referring to the structure of the connector socket 30 and the circuit board 210 of FIGS. 7B and 8B, the circuit board 210 may include a plurality of conductive pads 212 for coupling with the plurality of conductive pins 400 and a coupling pad C for coupling with a coupling portion (e.g., the coupling portion 350 of FIG. 3) of the connector housing 300. As the mounting portions (e.g., the second portion 420) of the plurality of conductive pins 400 are disposed inside the connector housing 300, the plurality of conductive pads 212 may be disposed at positions corresponding thereto (e.g., one surface of the circuit board 210). For example, the first conductive pads 212a may be arranged along an inner line L1 (e.g., a line facing the +X-axis direction) of the coupling pad C on the circuit board 210 to correspond to the mounting portion 420 of the first conductive pins 400a. For example, the second conductive pads 212b may be arranged along an inner line L2 (e.g., a line facing the -X-axis

direction) of the coupling pad C on the circuit board 210 to correspond to the mounting portion 420 of the second conductive pins 400b. The distance (e.g., the outermost distance) between the first conductive pads 212a and the second conductive pads 212b may be defined as D1.

[0117] As the mounting portions P1 of the conductive pins 23 of the connector socket 20 of FIGS. 7A and 8A are positioned outside the connector housing 22, they may be easily exposed to external foreign substances (e.g., moisture or dust). Accordingly, a water-resistant coating liquid is generally applied to the mounting portions P1 of the conductive pins 23. On the other hand, the conductive pins 400 of the connector socket 30 of FIGS. 7B and 8B, according to an embodiment, may be overall positioned inside the connector housing 300, and foreign substances (e.g., moisture or dust) may be restricted (e.g., prevented) from entering the mounting portion (e.g., the second portion 420) of the conductive pins 400 due to the structure of the side wall 330 that seals the circuit board 210 and the connector housing 300.

[0118] As the mounting portions P1 of the conductive pins 23 of the connector socket 20 of FIGS. 7A and 8A are positioned outside the connector housing 22 and the conductive pins 400 of the connector socket 30 of FIGS. 7B and 8B according to an embodiment are positioned inside the connector housing 300, the intervals between the conductive pins arranged side by side may be different. The distance (e.g., D1) between the conductive pads (e.g., the first conductive pads 212a and the second conductive pads 212b), arranged side by side on the circuit board 21 of FIG. 8B, may be smaller than the distance (e.g., d1) between the conductive pads (e.g., the first conductive pads 26a and the second conductive pads 26b), arranged side by side on the circuit board 21 of FIG. 8A. Accordingly, the overall size of the connector socket 30 mounted on the circuit board 210, according to an embodiment, may be relatively reduced. Given the mounting space in the mobile electronic device, the reduced size of the connector socket 30 may provide a better mounting space for other electrical components on the circuit board.

[0119] FIG. 9A is a rear perspective view illustrating a connector socket 30a according to an embodiment of the disclosure.

[0120] FIG. 9B is a rear perspective view illustrating a cross-sectional view taken along line B-B' of the connector socket 30a of FIG. 9A according to an embodiment of the disclosure.

[0121] FIG. 10 is a cross-sectional view taken along line B-B' of the connector socket 30a of FIG. 9A disposed on a circuit board 210a according to an embodiment of the disclosure.

[0122] According to an embodiment, an electronic device (e.g., the electronic device 101 of FIG. 1) may include a circuit board 210a and a connector socket 30a disposed on the circuit board 210a. The connector socket 30a may include a connector housing 300 and a

plurality of conductive pins 400 disposed in the connector housing 300.

[0123] The configuration of the connector socket 30a of FIGS. 9A, 9B, and 10 may be identical in whole or part to the configuration of the connector socket 30 of FIGS. 2 and 3. The configuration of the circuit board 210a of FIGS. 9A, 9B, and 10 may be identical in whole or part to the configuration of the circuit board 210 of FIG. 5. The embodiments of FIGS. 9A, 9B, and 10 may be selectively combined with the embodiments of FIGS. 2 to 6, 7B, and 8B, and the embodiments of FIGS. 11A to 14.

[0124] According to an embodiment, the connector housing 300 may include a supporting frame 310, a plurality of openings 320, and a side wall 330 formed to surround at least some of the plurality of openings 320, and/or a central wall 340 partially partitioning an inner space and/or a coupling portion 3501.

[0125] The description focuses primarily on a side wall 330 and a coupling portion 3501 different from the embodiment of FIGS. 2 to 6.

[0126] According to an embodiment, the side wall 330 may constitute a portion of the exterior of the connector housing 300. The side wall 330 may be disposed to surround the inner space (e.g., the plurality of openings 320) of the connector housing 300.

[0127] According to an embodiment, the side wall 330 may include a protruding portion 3361 protruding toward the rear side (e.g., surface) (e.g., in the -Z-axis direction) and disposed in contact with the circuit board 210a and positioned to surround the plurality of conductive pins 400 so as not to be exposed to the outside.

[0128] According to an embodiment, when viewed from the rear side (e.g., surface) of the connector housing 300, the protruding portion 3361 may have a closed loop shape. For example, the protruding portion 3361 may be formed of a first side wall portion 331, one end of a third side wall portion 333, and a portion extending from the one end, and may have a rectangular (e.g., square or rectangular) loop shape.

[0129] According to an embodiment, the coupling portion 3501 may extend from two (2) opposite ends of the supporting frame 310 and/or the protruding portion 3361 and may be connected to one side (e.g., surface) of the circuit board 210a. For example, the coupling portion 3501 may include an area extending from a portion of the protruding portion 3361 facing in the +Y-axis and an area extending from a portion of the protruding portion 3361 facing in the -Y-axis.

[0130] According to an embodiment, the coupling portion 3501 and the protruding portion 3361 may form a monolithic structure. The coupling portion 3501 and the protruding portion 3361 may be formed of the same material. According to an embodiment, the coupling portion 3501 and the protruding portion 3361 may form a structure integrated with another portion of the connector housing 300.

[0131] According to an embodiment, the coupling portion 3501 and the protruding portion 3361 may be man-

ufactured by insert injection molding together with another portion of the connector housing 300. For example, the coupling portion 3501 and the protruding portion 3361 may be formed of a metal material (e.g., an insert), and the other portions of the connector housing 300 (e.g., the supporting frame 310, the side wall 330 except for the protruding portion 3361, and the central wall 340) may be manufactured as an injection-molded product by an insert injection-molding process.

[0132] According to an embodiment, the coupling portion 3501 and the protruding portion 3361 may be a monolithic support body, and the monolithic support body may be exposed to the rear side (e.g., surface) of the connector housing 300 and may seamlessly extend from the coupling portion 3501 to the protruding portion 3361.

[0133] According to an embodiment, the coupling portion 3501 and the protruding portion 3361 may be formed as a single piece or one body. As the coupling portion 3501 and the protruding portion 3361 are formed by a cutting process when manufactured for an insert, they may be separated into separate elements and then may not be coupled (e.g., bonded with an adhesive material) or assembled.

[0134] According to an embodiment, the coupling portion 3501 and the protruding portion 3361 may be positioned toward the rear side (e.g., surface) (e.g., the -Z-axis direction) of the connector housing 300 and may be surface-mounted on the circuit board 210a. For example, the metal coupling portion 3501 may be surface-mounted on a coupling pad (e.g., the coupling pad C of FIG. 8B) of the circuit board 210a, and the metal protruding portion 3361 may be directly surface-mounted (e.g., soldered) on the circuit board 210a. The circuit board 210a may be coupled to the protruding portion 3361 without forming a separate recess for inserting the protruding portion 3361, blocking (e.g., waterproofing) the inner area of the protruding portion 3361 from the outside.

[0135] According to an embodiment, the coupling portion 3501, the protruding portion 3361, and the circuit board 210a may be formed to surround the second portion 420 of the plurality of conductive pins 400 so as not to be exposed. The second portion 420 of the plurality of conductive pins 400 may be a mounting portion (e.g., a portion soldered with the conductive pad 212) for electrical connection with the circuit board 210. As the protruding portion 3361 restricts not to form a gap between the lower side (e.g., surface) of the connector housing 300 and the circuit board 210, the inflow of foreign substances (e.g., moisture or dust) under the connector housing 300 may be restricted or reduced.

[0136] FIG. 11A is a rear perspective view illustrating a connector socket 30b according to an embodiment of the disclosure.

[0137] FIG. 11B is a rear perspective view illustrating a cross-sectional view taken along line C-C' of the connector socket 30b of FIG. 11A according to an embodiment of the disclosure.

[0138] FIG. 12 is a cross-sectional view taken along

line C-C' of the connector socket 30b of FIG. 11A disposed on a circuit board 210 according to an embodiment of the disclosure.

[0139] According to an embodiment, an electronic device (e.g., the electronic device 101 of FIG. 1) may include a circuit board 210 and a connector socket 30b disposed on the circuit board 210. The connector socket 30b may include a connector housing 300 and a plurality of conductive pins 400 disposed in the connector housing 300.

[0140] The configuration of the connector socket 30b of FIGS. 11A, 11B, and 12 may be identical in whole or part to the configuration of the connector socket 30 of FIGS. 2 and 3. The configuration of the circuit board 210 of FIGS. 11A, 11B, and 12 may be identical in whole or part to the configuration of the circuit board 210 of FIG. 5. The embodiments of FIGS. 11A, 11B, and 12 may be selectively combined with the embodiments of FIGS. 2 to 6, 7B, 8B, 9A to 10, and the embodiments of FIGS. 13A to 14.

[0141] According to an embodiment, the connector housing 300 may include a supporting frame 310, a plurality of openings 320, and a side wall 330 formed to surround at least some of the plurality of openings 320, a central wall 340 partially partitioning an inner space, and/or a coupling portion 350.

[0142] The description focuses primarily on a side wall 330 (e.g., the protruding portion 3362) different from the embodiment of FIGS. 2 to 6.

[0143] According to an embodiment, the side wall 330 may constitute a portion of the exterior of the connector housing 300. The side wall 330 may be disposed to surround the inner space (e.g., the plurality of openings 320) of the connector housing 300.

[0144] According to an embodiment, the side wall 330 may include a protruding portion 3362 protruding toward the rear side (e.g., surface) (e.g., in the -Z-axis direction) and disposed in contact with the circuit board 210 and positioned to surround a plurality of conductive pins 400 so as not to be exposed to the outside.

[0145] According to an embodiment, when viewed from the rear side (e.g., surface) of the connector housing 300, the protruding portion 3362 may have a closed loop shape. For example, the protruding portion 3362 may be formed of a first side wall portion 331, one end of a third side wall portion 333, and a portion extending from the one end, and may have a rectangular (e.g., square or rectangular) loop shape.

[0146] According to an embodiment, the protruding portion 3362 may be formed of a material different from the other portion (e.g., the portion extending from the side wall 330 toward the front side (e.g., surface) (e.g., in the +Z-axis direction) of the side wall 330. The protruding portion 3362 may be a thermoplastic polymer material and may be, e.g., at least one of polyethylene (PE), polypropylene (PP), polystyrene (PS), polycarbonate (PC), polyethylene terephthalate (PET), or polyacetal (POM). The thermoplastic polymer material may have

a melting point of about 150 degrees Celsius.

[0147] According to an embodiment, the protruding portion 3362 of the side wall 330 and other portions than the protruding portion 3362 may be manufactured by double injection molding. The side wall 330 may form a monolithic structure as a whole. According to an embodiment, the side wall 330 and other portions (e.g., the supporting frame 310 and the central wall 340) of the connector housing 300 may form a monolithic structure. The terminology "double injection molding" used herein refers to a well-known manufacturing process. Thus, the principle or the further detail of a double injection molding process is not elucidated so as not to obscure the disclosure. Accordingly, the terminology "double-injection molded structure" as a product of double injection molding process has its well-recognized meaning, as is readily apparent to those skilled in the art.

[0148] According to an embodiment, as the protruding portion 3362 of the side wall 330 is formed of a thermoplastic polymer material, it may be strongly coupled to the recess 215 of the circuit board 210. For example, when a surface mounting process (e.g., a heating process at a PEAK temperature of about 230 degrees Celsius) is performed while the protruding portion 3362 of the side wall 330 is inserted into the recess 215 of the circuit board 210, the protruding portion 3362 in the recess 215 may be cured at room temperature after melting (e.g., after fused) to maintain strong coupling with the circuit board 210. The cured protruding portion 3362 may be entirely in tight contact with the recess 215 of the circuit board 210 to form a sealing structure. For example, the cured protruding portion 3362 may fill or be adhered to the recess 215 of the circuit board 210.

[0149] According to an embodiment, the protruding portion 3362 of the thermoplastic material and the circuit board 210 may be formed to surround the second portion 420 of the plurality of conductive pins 400 so as not to be exposed. The second portion 420 of the plurality of conductive pins 400 may be a mounting portion (e.g., a portion soldered with the conductive pad 212) for electrical connection with the circuit board 210. The protruding portion 3362 may restrict not to form a gap between the lower side (e.g., surface) of the connector housing 300 and the circuit board 210 and play a sealing role, limiting or reducing the inflow of foreign substances (e.g., moisture or dust) under the connector housing 300.

[0150] FIG. 13A is a rear perspective view illustrating a connector socket 30c according to an embodiment of the disclosure.

[0151] FIG. 13B is a rear perspective view illustrating a cross-sectional view taken along line D-D' of the connector socket 30c of FIG. 13A according to an embodiment of the disclosure.

[0152] FIG. 14 is a cross-sectional view taken along line D-D' of the connector socket 30c of FIG. 13A disposed on a circuit board 210a according to an embodiment of the disclosure.

[0153] According to an embodiment, an electronic de-

vice (e.g., the electronic device 101 of FIG. 1) may include a circuit board 210 and a connector socket 30c disposed on the circuit board 210. The connector socket 30c may include a connector housing 300 and a plurality of conductive pins 400 disposed in the connector housing 300.

[0154] The configuration of the connector socket 30c of FIGS. 13A, 13B, and 14 may be identical in whole or part to the configuration of the connector socket 30 of FIGS. 2 and 3. The configuration of the circuit board 210a of FIGS. 13A, 13B, and 14 may be identical in whole or part to the configuration of the circuit board 210 of FIG. 5. The embodiments of FIGS. 13A, 13B, and 14 may be selectively combined with the embodiments of FIGS. 2 to 6, 7B, and 8B, and the embodiments of FIGS. 9A to 12.

[0155] According to an embodiment, the connector housing 300 may include a supporting frame 310, a plurality of openings 320, and a side wall 330 formed to surround at least some of the plurality of openings 320, a central wall 340 partially partitioning an inner space, and/or a coupling portion 350.

[0156] The description focuses primarily on a side wall 330 (e.g., the protruding portion 3363) different from the embodiment of FIGS. 2 to 6.

[0157] According to an embodiment, the side wall 330 may constitute a portion of the exterior of the connector housing 300. The side wall 330 may be disposed to surround the inner space (e.g., the plurality of openings 320) of the connector housing 300.

[0158] According to an embodiment, the side wall 330 may include a protruding portion 3363 protruding toward the rear side (e.g., surface) (e.g., in the -Z-axis direction) and disposed in contact with the circuit board 210 and positioned to surround a plurality of conductive pins 400 so as not to be exposed to the outside.

[0159] According to an embodiment, when viewed from the rear side (e.g., surface) of the connector housing 300, the protruding portion 3363 may have a closed loop shape. For example, the protruding portion 3363 may be formed of a first side wall portion 331, one end of a third side wall portion 333, and a portion extending from the one end and may have a rectangular (e.g., square or rectangular) loop shape.

[0160] According to an embodiment, the protruding portion 3363 may be formed of a material different from the other portion (e.g., the portion extending from the side wall 330 toward the front side (e.g., surface) (e.g., in the +Z-axis direction) of the side wall 330. The protruding portion 3363 may include a conductive material (e.g., a metal material) and may form a structure of being overall integrated with other portions of the side wall 330.

[0161] According to an embodiment, the protruding portion 3363 may be manufactured through laser direct structuring (LDS). A conductive pattern (e.g., the protruding portion 3363) may be formed by forming a rough surface in micro units by selectively patterning using a laser on an end portion of the side wall 330 and/or the supporting frame 310 formed of an injection-molded

material of the connector housing 300, and plating on the rough surface. The plating method may be a primary method or primary and secondary methods, the primary plating may be Cu plating, and the secondary plating may be Ni plating.

[0162] According to an embodiment, the protruding portion 3363 may be positioned toward the rear side (e.g., surface) (e.g., the -Z-axis direction) of the connector housing 300 and may be surface-mounted on the circuit board 210a. For example, the protruding portion 3363 formed of the metal material may be directly surface-mounted (e.g., soldered) on the circuit board 210a. The circuit board 210a may be coupled to the protruding portion 3363 without forming a separate recess for inserting the protruding portion 3363, blocking (e.g., water-proofing) the inner area of the protruding portion 3363 from the outside.

[0163] According to an embodiment, the protruding portion 3363 formed of an LDS material and the circuit board 210a may be formed to surround the second portion 420 of the plurality of conductive pins 400 so as not to be exposed. The second portion 420 of the plurality of conductive pins 400 may be a mounting portion (e.g., a portion soldered with the conductive pad 212) for electrical connection with the circuit board 210. As the protruding portion 3363 restricts not to form a gap between the lower side (e.g., surface) of the connector housing 300 and the circuit board 210, the inflow of foreign substances (e.g., moisture or dust) under the connector housing 300 may be restricted or reduced.

[0164] A connector socket disposed on a circuit board, according to an embodiment, may provide a structure capable of preventing inflow of foreign substances (e.g., inflow of moisture).

[0165] In the connector socket according to an embodiment of the disclosure, a plurality of conductive pins may be disposed inside the connector housing. For example, the connector housing may include a side wall formed to surround the side surfaces of the plurality of conductive pins. Accordingly, as the electrical connection portion between the connector socket and the circuit board is not exposed to the outside of the connector housing, inflow of foreign substances (e.g., inflow of moisture) may be restricted or reduced. Further, costs for separate coating on the outer side (e.g., surface) of the plurality of conductive pins may be excluded, saving manufacturing costs.

[0166] According to an embodiment, the mounting portion (e.g., contact portion) of a plurality of conductive pins typically exposed to the outside of the connector housing are disposed inside the connector housing, thus reducing the size of the connector socket. Accordingly, the positions of the plurality of conductive pads of the circuit board soldered with the plurality of conductive pins may be changed, reducing the mounting space occupied by the connector socket on the circuit board. Given the mounting space in the mobile electronic device, the reduced size of the connector socket may provide a better

mounting space for other electrical components on the circuit board.

[0167] Effects obtainable from the disclosure are not limited to the above-mentioned effects, and other effects not mentioned may be apparent to one of ordinary skill in the art from the following description.

[0168] An electronic device (e.g., 101 of FIG. 1) according to an embodiment may comprise a circuit board (e.g., 210 of FIG. 5) on which a plurality of conductive pads (e.g., 212 of FIG. 5) are formed and a connector socket (e.g., 30 of FIG. 5) disposed on the circuit board. The connector socket (e.g., 30 of FIG. 5) include a connector housing (e.g., 300 of FIG. 5) including a plurality of openings (e.g., 320 of FIG. 5) and a side wall (e.g., 330 of FIG. 5) configured to surround at least a portion of each of the plurality of openings (e.g., 320 of FIG. 5), and a plurality of conductive pins (e.g., 400 of FIG. 5) disposed to penetrate the plurality of openings (e.g., 320 of FIG. 5) of the connector housing (e.g., 300 of FIG. 5), and including a first portion (e.g., 410 of FIG. 5) exposed toward a front side (e.g., in the +Z-axis direction of FIG. 5), and a second portion (e.g., 420 of FIG. 5) exposed toward a rear side (e.g., in the -Z-axis direction of FIG. 5) to be electrically connected to the plurality of conductive pads. The side wall of the connector housing include a protruding portion protruding toward the rear side, and the second portion of the plurality of conductive pins is surrounded by the protruding portion and be positioned so as not to be exposed to an outside. In this manner, inflow of foreign substances (e.g., inflow of moisture) into the connector housing or the electrical connection portion may be effectively prevented or restricted.

[0169] According to an embodiment, the connector housing (e.g., 300 of FIG. 5) may further include a coupling portion (e.g., 350 of FIG. 5) extending from two (2) opposite sides of the closed loop-shaped protruding portion and coupled to the circuit board.

[0170] According to an embodiment, the protruding portion and the coupling portion may be formed as a monolithic structure formed of substantially the same material.

[0171] According to an embodiment, at least one of the protruding portion or the coupling portion may include a metal material.

[0172] According to an embodiment, the first portion (e.g., 410 of FIG. 5) of each of the plurality of conductive pins (e.g., 400 of FIG. 5) includes a 1-1th portion (e.g., 410a of FIG. 5) and a 1-2th portion (e.g., 410b of FIG. 5) spaced apart from each other. According to an embodiment, the second portion (e.g., 420 of FIG. 5) of each of the plurality of conductive pins may be disposed between the 1-1th portion and the 1-2th portion and extend from the 1-1th portion to the 1-2th portion.

[0173] According to an embodiment, the side wall may include a receiving groove (e.g., 338 of FIG. 5) concave toward the rear side. The first portion (e.g., 410 of FIG. 5) of each of the plurality of conductive pins (e.g., 400 of FIG. 5) may include a 1-1th portion (e.g., 410a of FIG. 5) and a

1-2th portion (e.g., 410b of FIG. 5) spaced apart from each other. Each of the plurality of conductive pins may include a third portion (e.g., 430 of FIG. 5) that extends from one end of the 1-2th portion and is inserted into the receiving groove to secure each of the plurality of conductive pins of the connector housing.

[0174] According to an embodiment, the connector housing may further include a central wall (e.g., 340 of FIG. 5) partitioning at least a portion of an inner space of the connector housing. The 1-1th portion (e.g., 410a of FIG. 5) may include an end portion (e.g., 410aa of FIG. 5) adjacent to or in contact with the central wall, and an elastic portion (e.g., 410ab of FIG. 5) extending and curved toward the second portion.

[0175] According to an embodiment, the connector housing may further include a central wall (e.g., 340 of FIG. 5) partitioning at least a portion of an inner space of the connector housing. Each of the plurality of conductive pins may be positioned between the side wall and the central wall, and at least some of the plurality of conductive pins may remain inserted into a groove formed in the side wall and a groove formed in the central wall.

[0176] According to an embodiment, the protruding portion of the side wall may have a shape that protrudes from a lower side (e.g., surface) of the second portion of each of the plurality of conductive pins toward the rear side.

[0177] According to an embodiment, the circuit board may include a recess (e.g., 215 of FIG. 5) disposed to surround the plurality of conductive pads. The protruding portion of the connector housing may be inserted into the recess.

[0178] According to an embodiment, the circuit board may include a recess (e.g., 215 of FIG. 12) disposed to surround the plurality of conductive pads. At least a portion of the protruding portion of the connector housing may be formed of a thermoplastic polymer material and fills the recess.

[0179] According to an embodiment, the connector housing may have a protruding portion and other portions formed in a double injection-molded structure.

[0180] According to an embodiment, at least a portion of the protruding portion may be plated, and the plated protruding portion may be surface mounted on one side (e.g., surface) of the circuit board.

[0181] According to an embodiment, the electronic device may further comprise a second circuit board (e.g., 220 of FIG. 6) facing the circuit board and being spaced apart from the circuit board and a connector plug (e.g., 40 of FIG. 6) disposed on the second circuit board and capable of being coupled to a connector socket. The connector plug may include a plurality of conductive terminals (e.g., 43 of FIG. 6) configured to contact the first portion of the plurality of conductive pins and face the second portion of the plurality of conductive pins when inserted into an inside formed by each of the plurality of conductive pins.

[0182] According to an embodiment, the side wall of

the connector socket may further include an extension portion (e.g., 337 of FIG. 6) extending toward the front side. If the connector socket and the connector plug are coupled to each other, the extension portion may contact the second circuit board and be disposed to surround the connector plug, providing an inner space restricted from an outside.

[0183] A connector socket (e.g., 30 of FIG. 5), according to an embodiment, may comprise a connector housing (e.g., 300 of FIG. 5) including a plurality of openings (e.g., 320 of FIG. 5) and a side wall 330 configured to surround at least a portion of each of the plurality of openings (e.g., 320 of FIG. 5), and a plurality of conductive pins (e.g., 400 of FIG. 5) disposed to penetrate the plurality of openings (e.g., 320 of FIG. 5) of the connector housing (e.g., 300 of FIG. 5), and including a first portion (e.g., 410 of FIG. 5) exposed toward a front side (e.g., in the +Z-axis direction of FIG. 5), and a second portion (e.g., 420 of FIG. 5) exposed toward a rear side (e.g., in the -Z-axis direction of FIG. 5) to form an electrical contact with the circuit board. The side wall of the connector housing may include a protruding portion protruding toward the rear side, and the second portion of the plurality of conductive pins may be surrounded by the protruding portion and be positioned.

[0184] According to an embodiment, the first portion (e.g., 410 of FIG. 5) of each of the plurality of conductive pins (e.g., 400 of FIG. 5) includes a 1-1th portion (e.g., 410a of FIG. 5) and a 1-2th portion (e.g., 410b of FIG. 5) spaced apart from each other. According to an embodiment, the second portion (e.g., 420 of FIG. 5) of each of the plurality of conductive pins may be disposed between the 1-1th portion and the 1-2th portion and extend from the 1-1th portion to the 1-2th portion.

[0185] According to an embodiment, the connector housing may further include a central wall (e.g., 340 of FIG. 5) partitioning at least a portion of an inner space of the connector housing. Each of the plurality of conductive pins may be positioned between the side wall and the central wall, and at least some of the plurality of conductive pins remains inserted into a groove formed in the side wall and a groove formed in the central wall.

[0186] According to an embodiment, the connector housing (e.g., 300 of FIG. 5) may further include a coupling portion (e.g., 350 of FIG. 5) extending from two (2) opposite sides of the closed loop-shaped protruding portion and coupled to the circuit board. The protruding portion and the coupling portion may be formed as a monolithic structure formed of substantially the same material.

[0187] According to an embodiment, at least one of the protruding portion or the coupling portion may include a metal material.

[0188] It should be appreciated that various embodiments of the disclosure and the terms used therein are not intended to limit the technological features set forth herein to particular embodiments and include various changes, equivalents, or replacements for a correspond-

ing embodiment.

Claims

1. An electronic device (101) comprising:

a first circuit board (210) on which a plurality of conductive pads (212) are formed; and
a connector socket (30) disposed on the first circuit board (210),
wherein the connector socket (30) includes:

a connector housing (300) including a plurality of openings (320) and a side wall (330) configured to surround at least a portion of each of the plurality of openings (320); and
a plurality of conductive pins (400) disposed to penetrate the plurality of openings (320) of the connector housing (300), and including a first portion (410) exposed toward a front side (+Z-axis direction), and a second portion (420) exposed toward a rear side (-Z-axis direction) to be electrically connected to the plurality of conductive pads (212), and

wherein the side wall (330) of the connector housing (300) includes a protruding portion (336) protruding toward the rear side, and the second portion (420) of the plurality of conductive pins (400) is surrounded by the protruding portion (336) and is positioned so as not to be exposed to an outside.

2. The electronic device (101) of claim 1, wherein the connector housing (300) further includes:

a coupling portion (350) extending from two opposite sides of the closed loop-shaped protruding portion (336) and coupled to the first circuit board (210).

3. The electronic device (101) of claim 2, wherein the protruding portion (336) and the coupling portion (350) are formed as a monolithic structure formed of substantially the same material.

4. The electronic device (101) of any one of claim 2 or 3, wherein at least one of the protruding portion (336) or the coupling portion (350) includes a metal material.

5. The electronic device (101) of any one of claims 1 to 4,

wherein the first portion (410) of each of the plurality of conductive pins (400) includes a 1-1th portion (410a) and a 1-2th portion (410b) spaced apart from each other, and wherein the second portion (420) of each of the

- plurality of conductive pins (400) is disposed between the 1-1th portion (410a) and the 1-2th portion (410b) and extends from the 1-1th portion (410a) to the 1-2th portion (410b).
- 5
6. The electronic device (101) of any one of claims 1 to 4,
- 10
- wherein the side wall (330) includes a receiving groove (338) concave toward the rear side, wherein the first portion (410) of each of the plurality of conductive pins (400) includes a 1-1th portion (410a) and a 1-2th portion (410b) spaced apart from each other, and wherein each of the plurality of conductive pins (400) includes a third portion (430) that extends from one end of the 1-2th portion (410b) and is inserted into the receiving groove (338) to secure each of the plurality of conductive pins (400) to the connector housing (300).
- 15
7. The electronic device (101) of any one of claim 5 or 6,
- 20
- wherein the connector housing (300) further includes a central wall (340) partitioning at least a portion of an inner space of the connector housing (300), and wherein the 1-1th portion (410a) includes an end portion (410aa) adjacent to or in contact with the central wall (340), and an elastic portion (410ab) extending and curved toward the second portion (420).
- 25
8. The electronic device (101) of any one of claims 1 to 6,
- 30
- wherein the connector housing (300) further includes a central wall (340) partitioning at least a portion of an inner space of the connector housing (300), and wherein each of the plurality of conductive pins (400) is positioned between the side wall (330) and the central wall (340), and at least some of the plurality of conductive pins (400) remains inserted into a groove formed in the side wall (330) and a groove formed in the central wall (340).
- 35
9. The electronic device (101) of any one of claims 1 to 8,
- 40
- wherein the protruding portion (336) of the side wall (330) has a shape that protrudes from a lower surface of the second portion (420) of each of the plurality of conductive pins (400) toward the rear side.
- 45
10. The electronic device (101) of any one of claims 1 to 9,
- 50
- wherein the first circuit board (210) includes a recess (215) disposed to surround the plurality of conductive pads (212), and wherein the protruding portion (336) of the connector housing (300) is inserted into the recess (215).
- 55
11. The electronic device (101) of any one of claim 1 or 9,
- wherein the first circuit board (210) includes a recess (215) disposed to surround the plurality of conductive pads (212), and wherein at least a portion of the protruding portion (336) of the connector housing (300) is formed of a thermoplastic polymer material and fills the recess (215).
12. The electronic device (101) of claim 11, wherein the connector housing (300) has a protruding portion (336) and other portions formed in a double injection-molded structure.
13. The electronic device (101) of claim 1 or 9, wherein at least a portion of the protruding portion (336) is plated, and the plated protruding portion (336) is surface mounted on one surface of the first circuit board (210).
14. The electronic device (101) of any one of claims 1 to 13, further comprising:
- a second circuit board (220) facing the first circuit board (210) and being spaced apart from the first circuit board (210); and a connector plug (40) disposed on the second circuit board (220) and capable of being coupled to a connector socket (30), wherein the connector plug (40) includes a plurality of conductive terminals (43) configured to contact the first portion (410) of the plurality of conductive pins (400) and face the second portion (420) of the plurality of conductive pins (400) when inserted into an inside formed by each of the plurality of conductive pins (400).
15. The electronic device (101) of claim 14,
- wherein the side wall (330) of the connector socket (30) further includes an extension portion (337) extending toward the front side, and wherein when the connector socket (30) and the connector plug (40) are coupled to each other, the extension portion (337) contacts the second circuit board (220) and is disposed to surround the connector plug (40), providing an inner space restricted from an outside.

FIG. 1

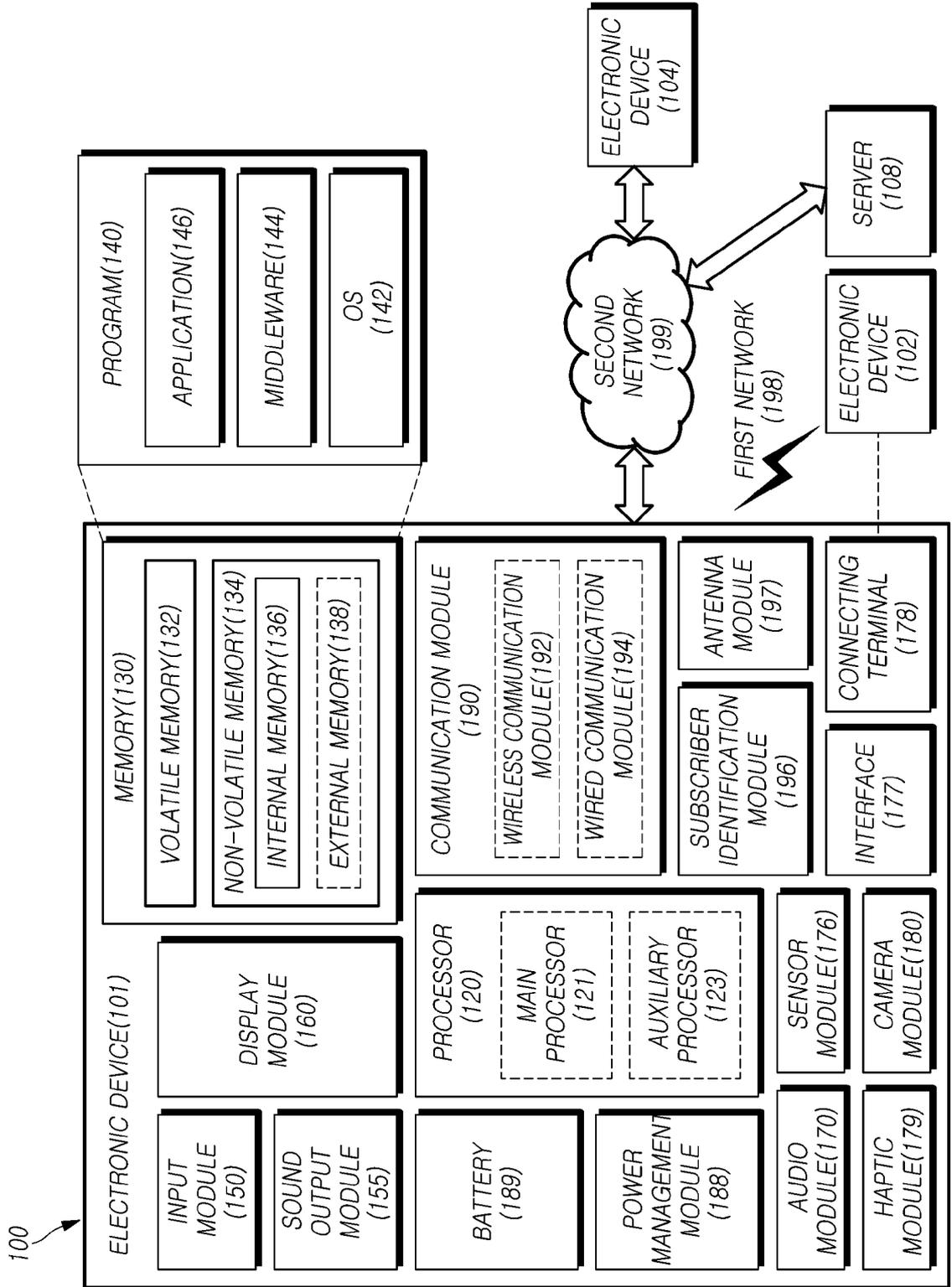


FIG.3

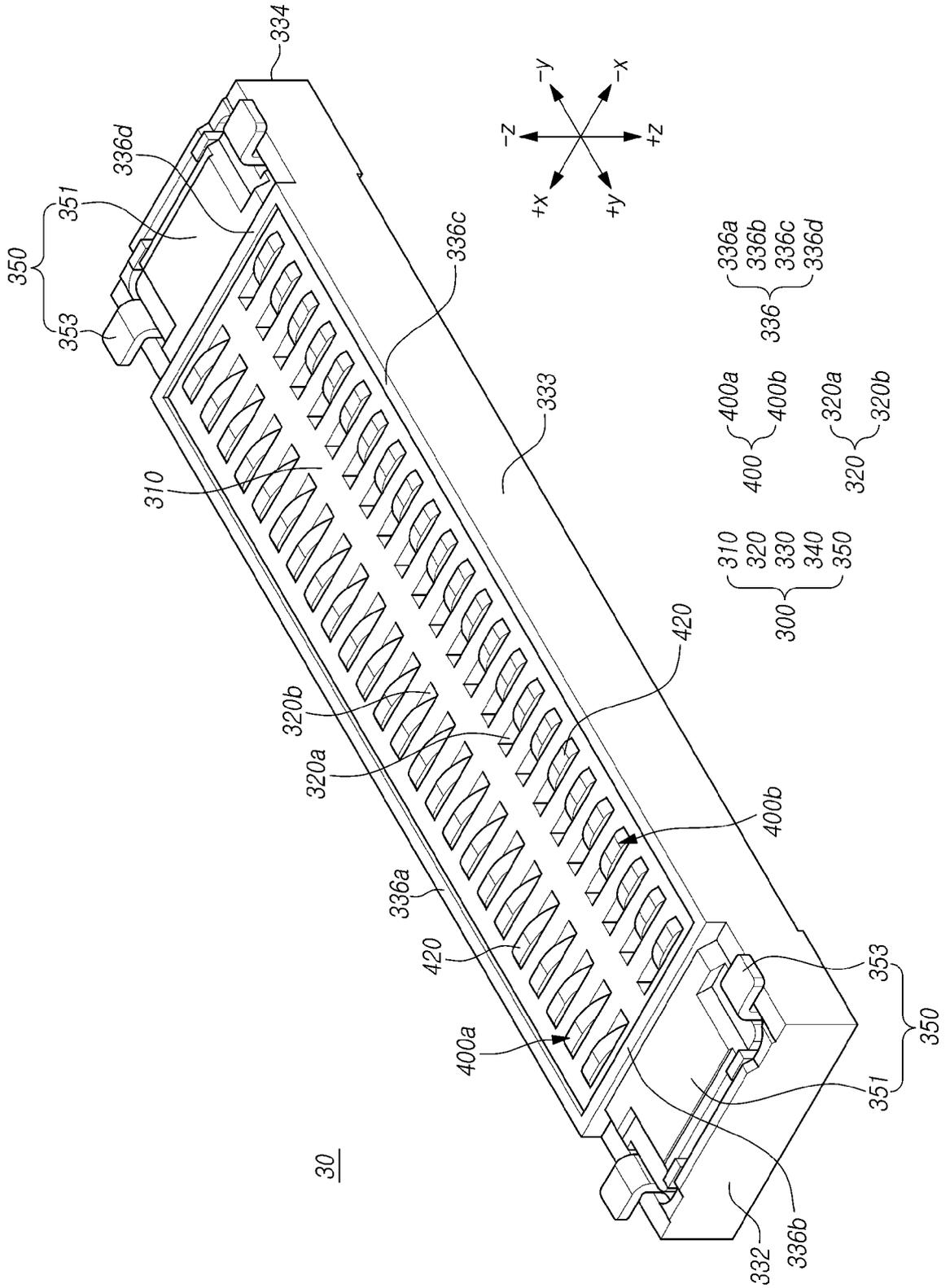


FIG. 4

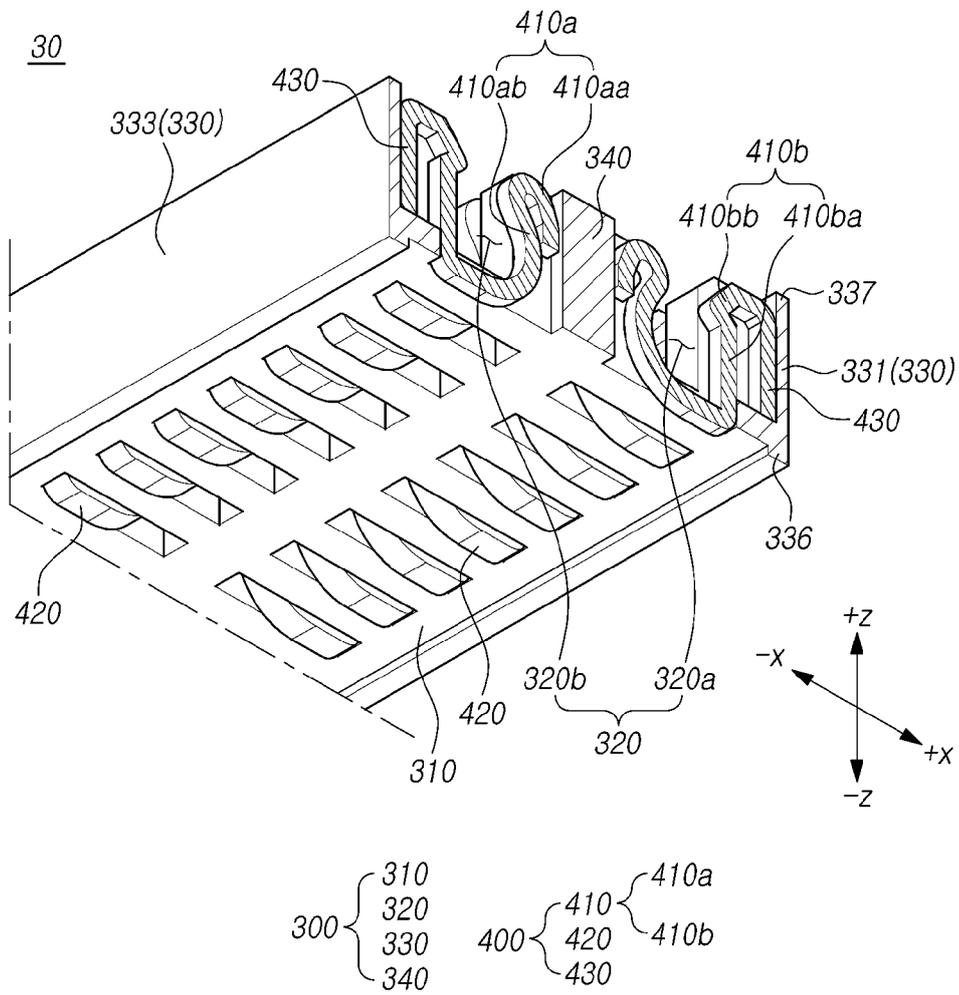


FIG. 5

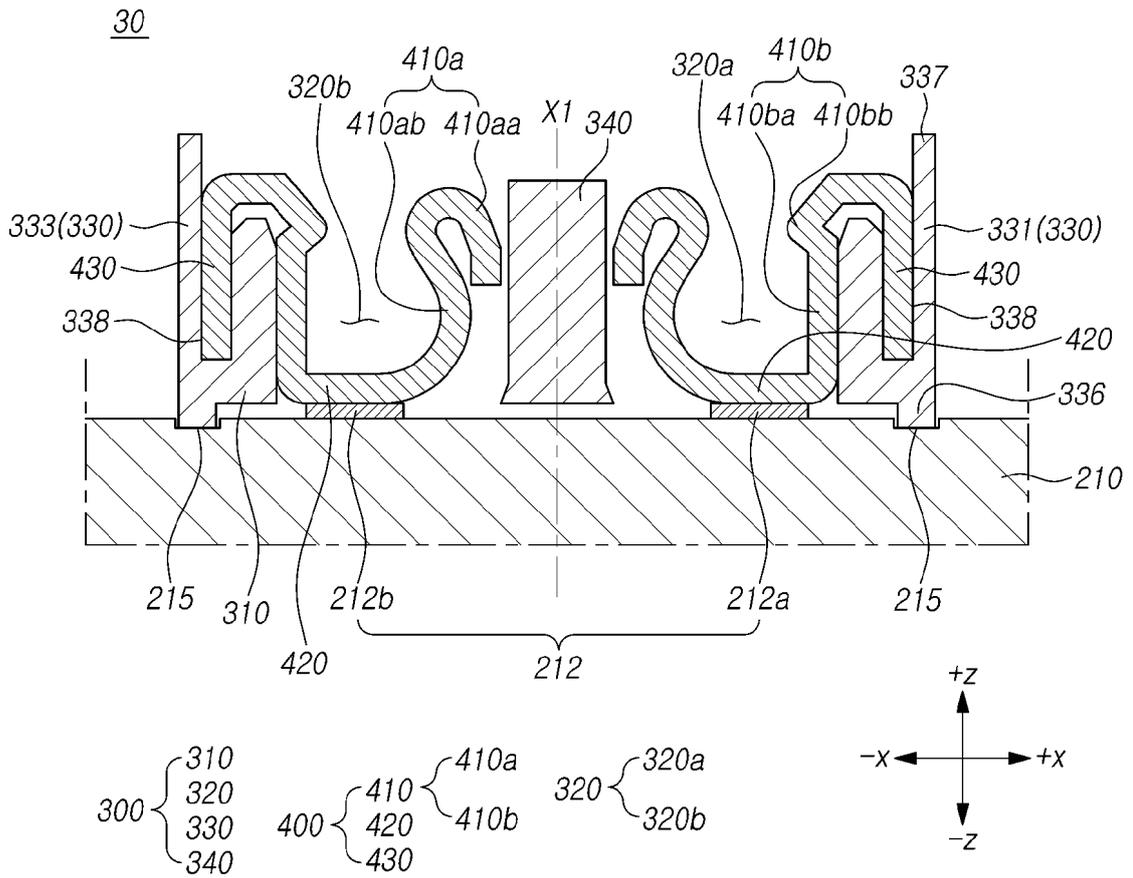


FIG. 7A

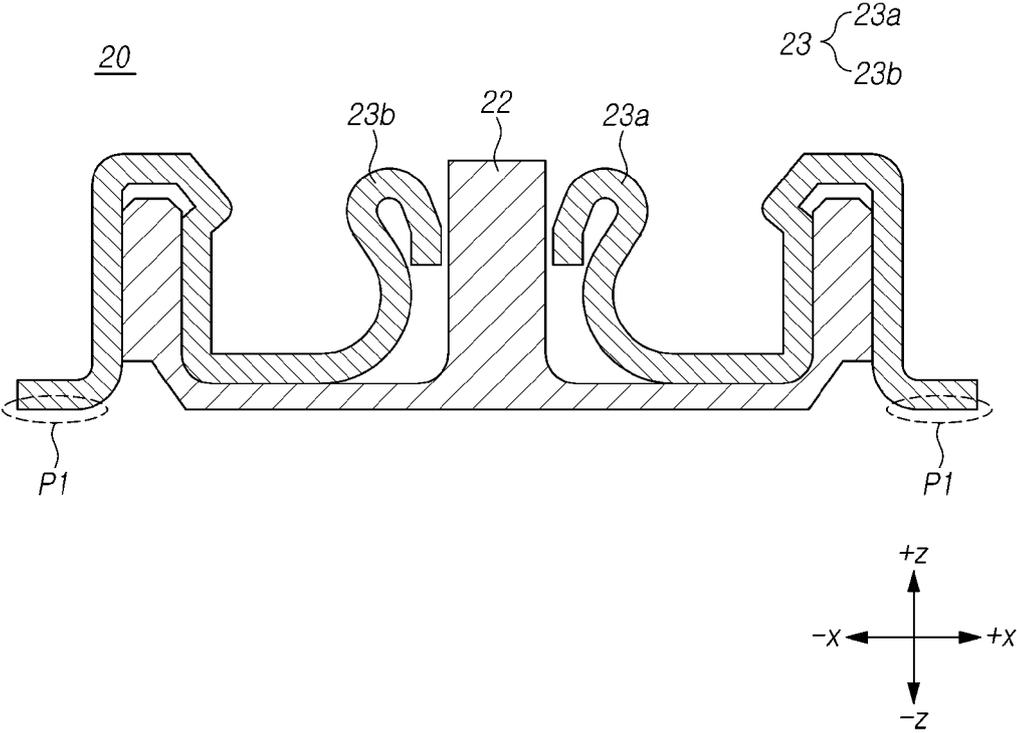


FIG. 8A

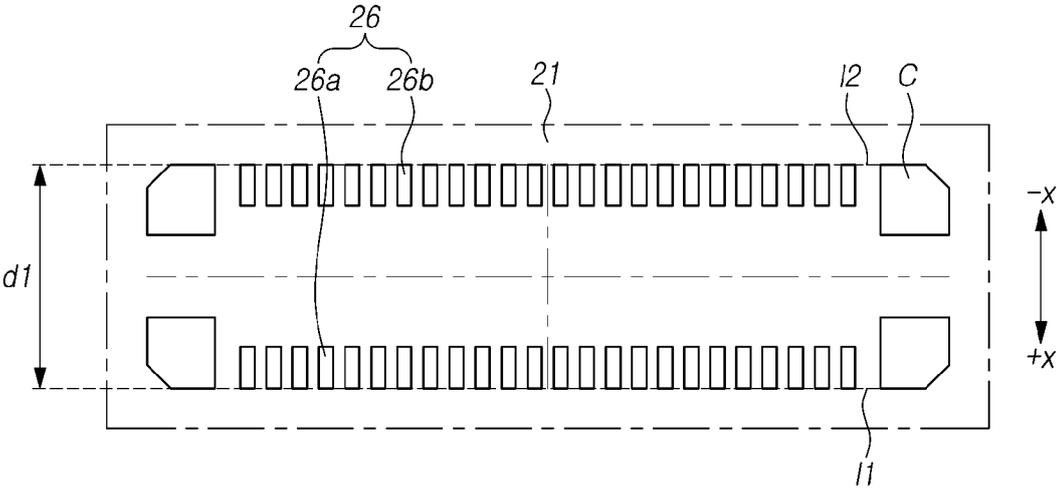


FIG. 8B

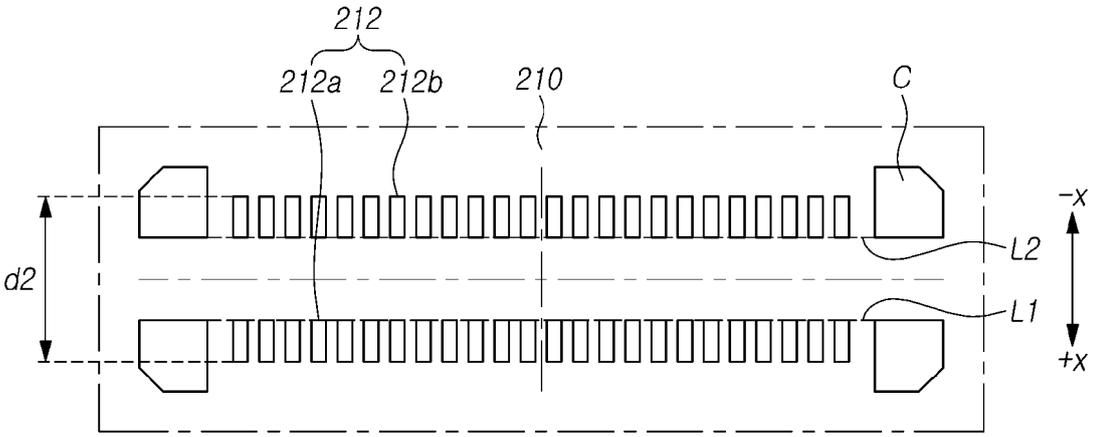


FIG. 9A

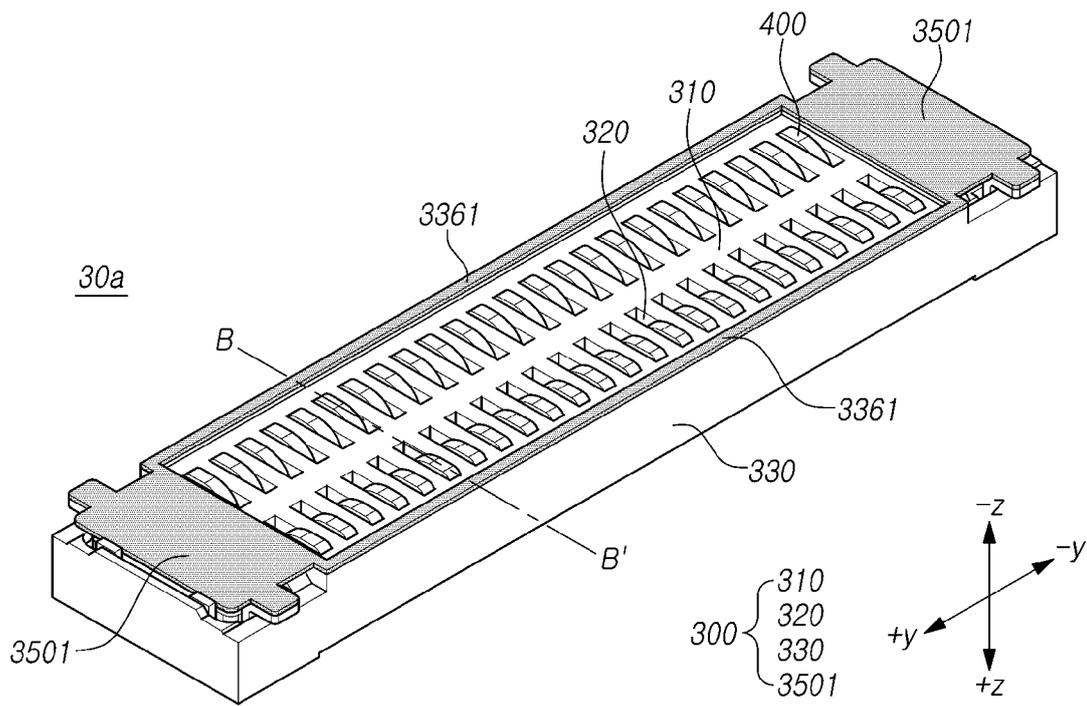


FIG. 9B

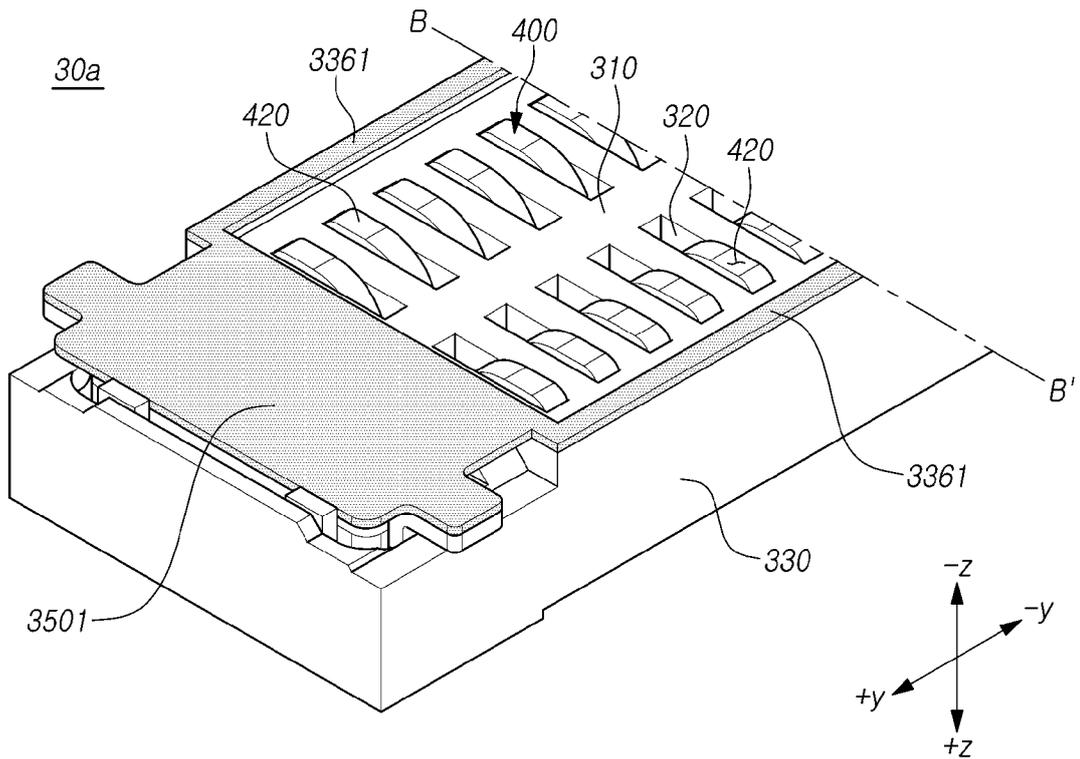


FIG. 10

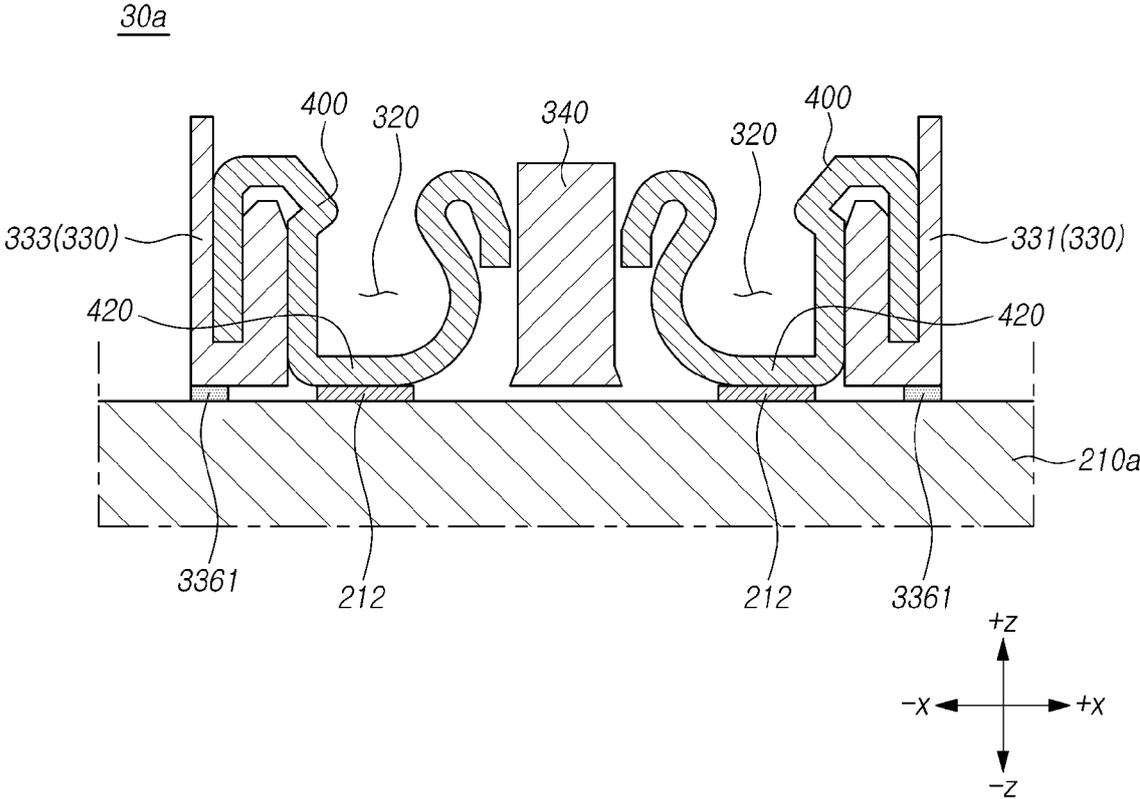


FIG. 11A

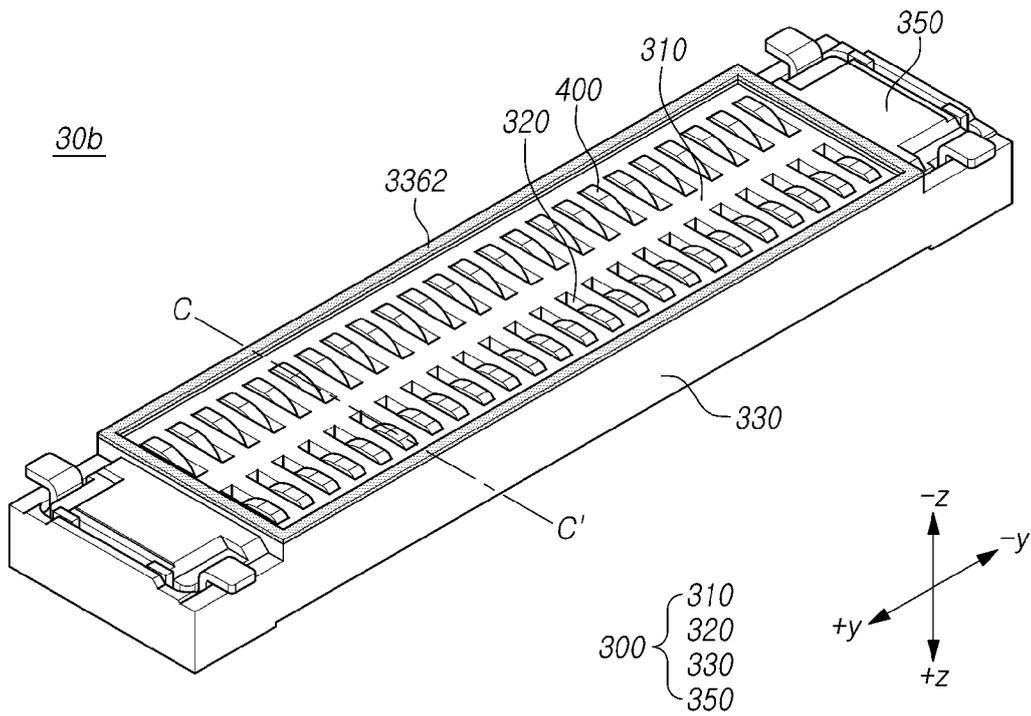


FIG. 11B

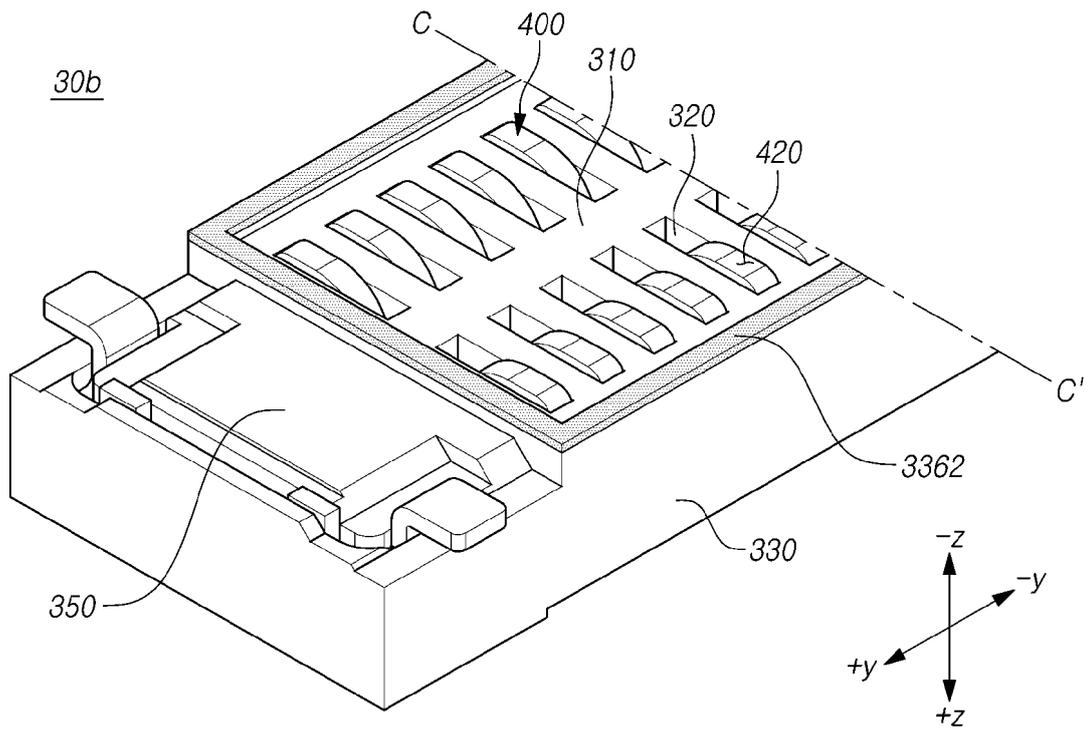


FIG. 12

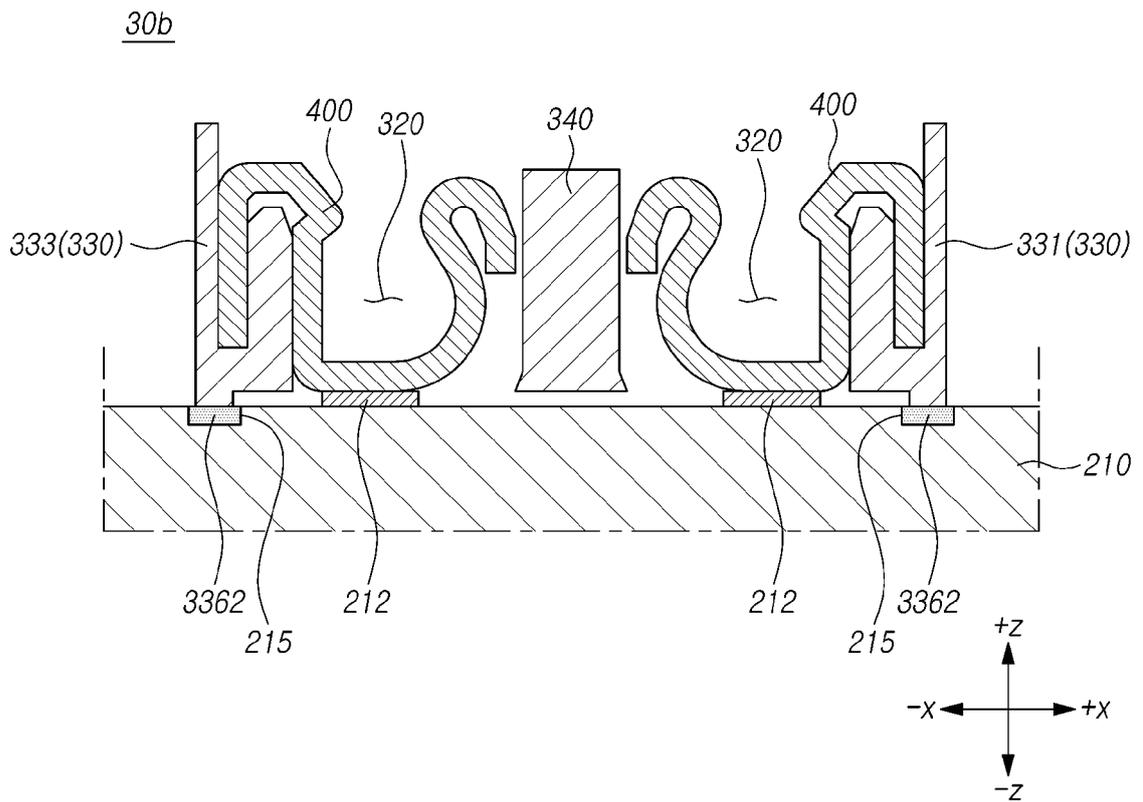


FIG. 13A

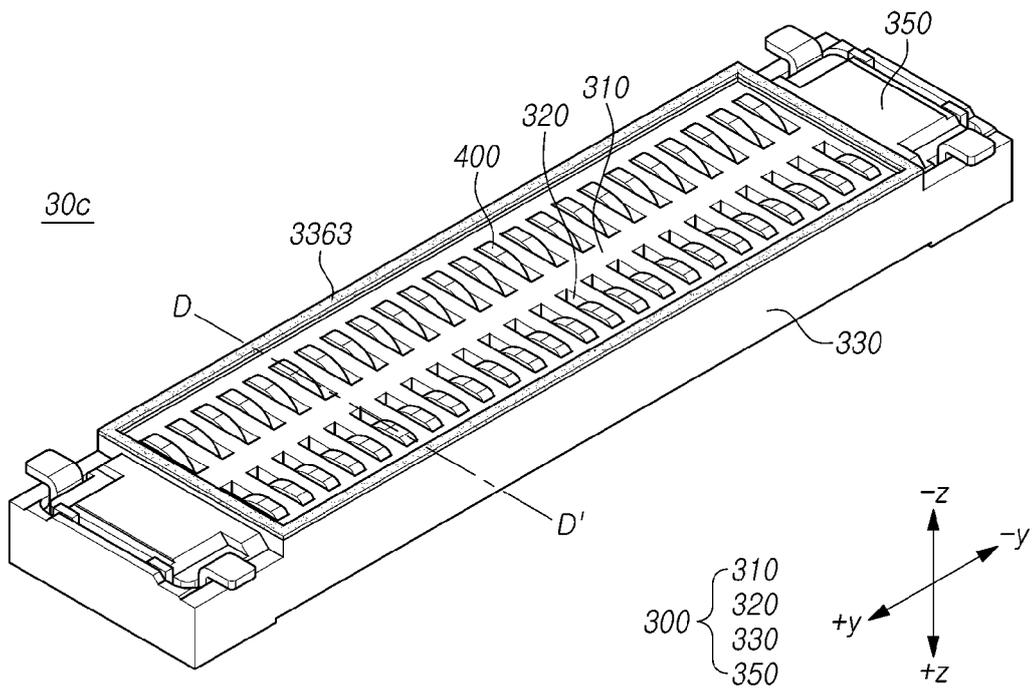


FIG. 13B

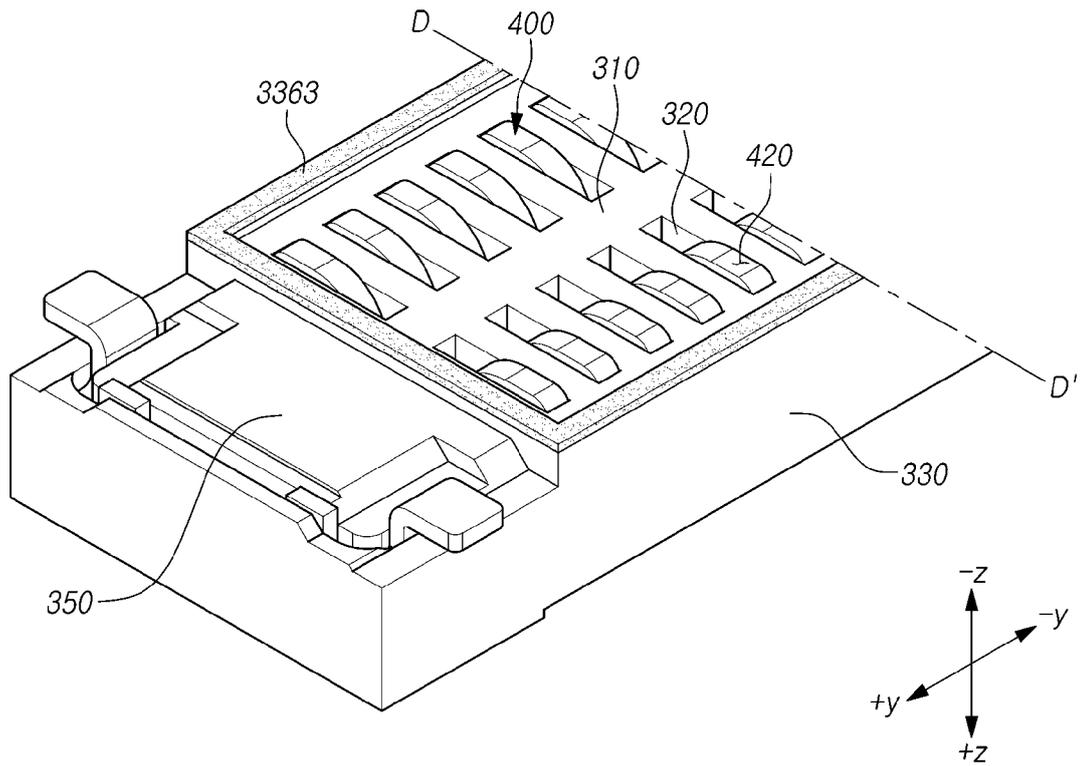
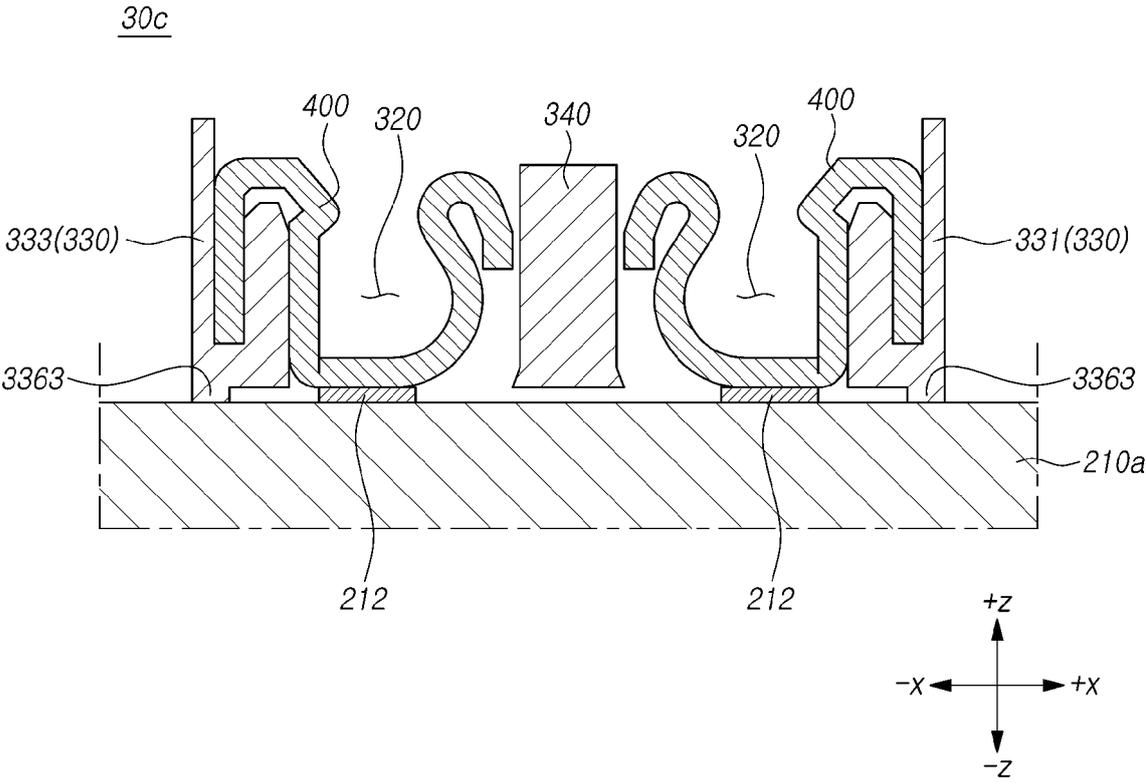


FIG. 14



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2024/017408

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A. CLASSIFICATION OF SUBJECT MATTER
H01R 12/71(2011.01)i; H01R 12/73(2011.01)i; H01R 13/03(2006.01)i; H01R 13/24(2006.01)i
 According to International Patent Classification (IPC) or to both national classification and IPC

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B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 H01R 12/71(2011.01); H01Q 1/38(2006.01); H01R 12/78(2011.01); H01R 12/79(2011.01); H01R 13/24(2006.01);
 H01R 13/64(2006.01); H01R 13/6581(2011.01); H01R 24/38(2011.01)

15

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 Korean utility models and applications for utility models: IPC as above
 Japanese utility models and applications for utility models: IPC as above

20

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 eKOMPASS (KIPO internal) & keywords: 커넥터(connector), 소켓(socket), 도전성 패드(conductive pad), 측벽(side wall), 도전성 핀(conductive pin), 돌출(protrusion)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2022-0046204 A (SAMSUNG ELECTRONICS CO., LTD.) 14 April 2022 (2022-04-14) See paragraphs [0057]-[0059] and figures 6a-6b.	1-15

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A	KR 10-2022-0163726 A (SAMSUNG ELECTRONICS CO., LTD.) 12 December 2022 (2022-12-12) See paragraphs [0084]-[0092] and figure 6.	1-15
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A	JP 2012-138320 A (JAPAN AVIATION ELECTRONICS INDUSTRY LTD.) 19 July 2012 (2012-07-19) See paragraphs [0046]-[0051] and figure 9.	1-15
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Further documents are listed in the continuation of Box C. See patent family annex.

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* Special categories of cited documents:
 "A" document defining the general state of the art which is not considered to be of particular relevance
 "D" document cited by the applicant in the international application
 "E" earlier application or patent but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed
 "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 "&" document member of the same patent family

Date of the actual completion of the international search **05 February 2025**
 Date of mailing of the international search report **05 February 2025**

Name and mailing address of the ISA/KR **Korean Intellectual Property Office
 Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208**
 Facsimile No. **+82-42-481-8578**
 Authorized officer
 Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2024/017408

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