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(54) **STRUCTURALLY MOUNTABLE BATTERY**

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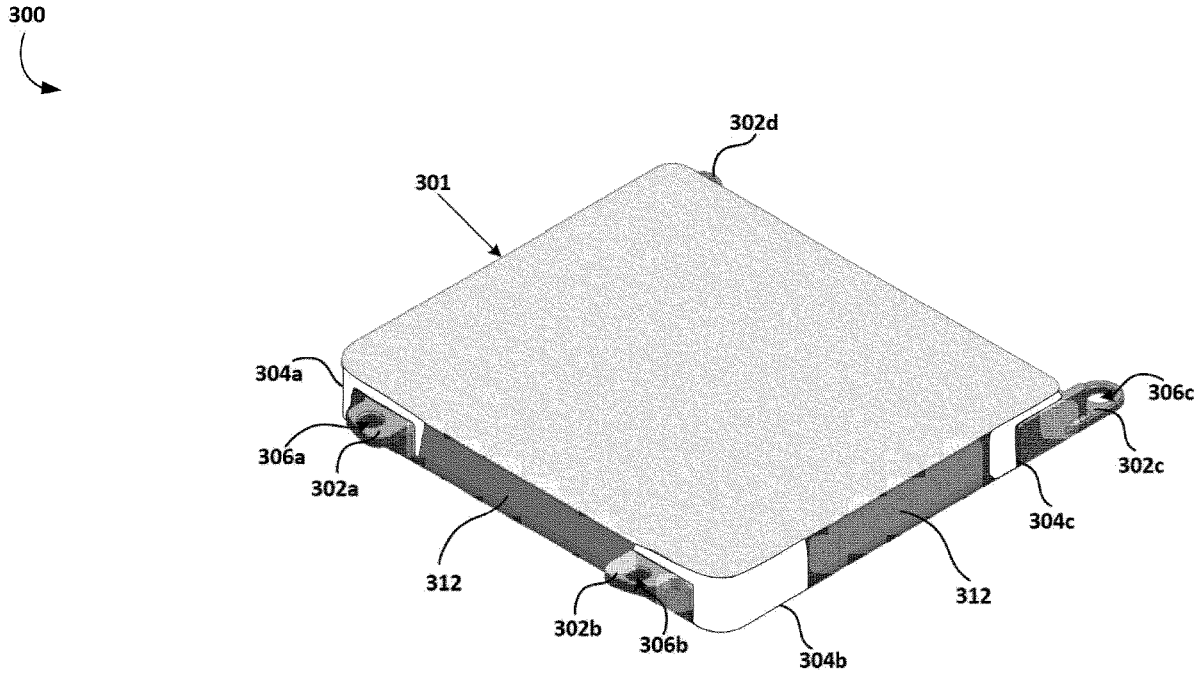
(57) **ABSTRACT**

The disclosed technology relates to a battery pack configured to be structurally mounted to a portable electronic device. The battery pack comprises a plurality of layers and an enclosure. The enclosure comprises a first surface and a plurality of walls that extend from the first surface in a direction perpendicular to the first surface. A portion of the first surface extends past at least one wall of the plurality of walls. The enclosure comprises a second surface configured to be connected to the plurality of walls to form a body configured to enclose the plurality of layers. The portion of the first surface is configured to be coupled to a device and the battery pack is configured to provide at least one component of the device with power when the portion of the first surface is coupled to the device.



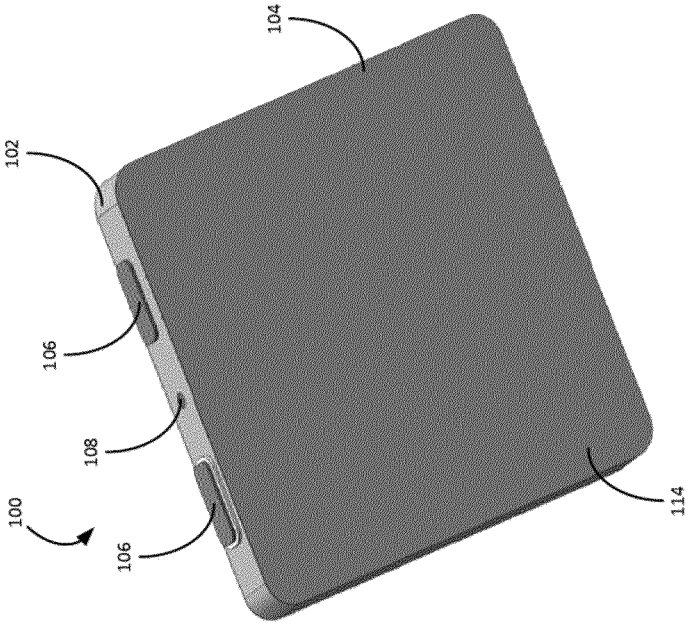


FIG. 1B

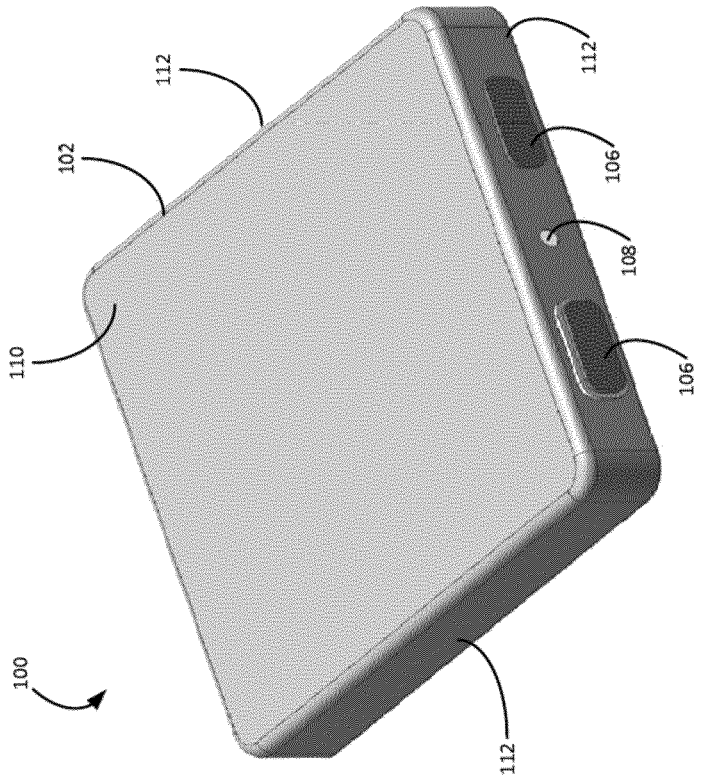


FIG. 1A

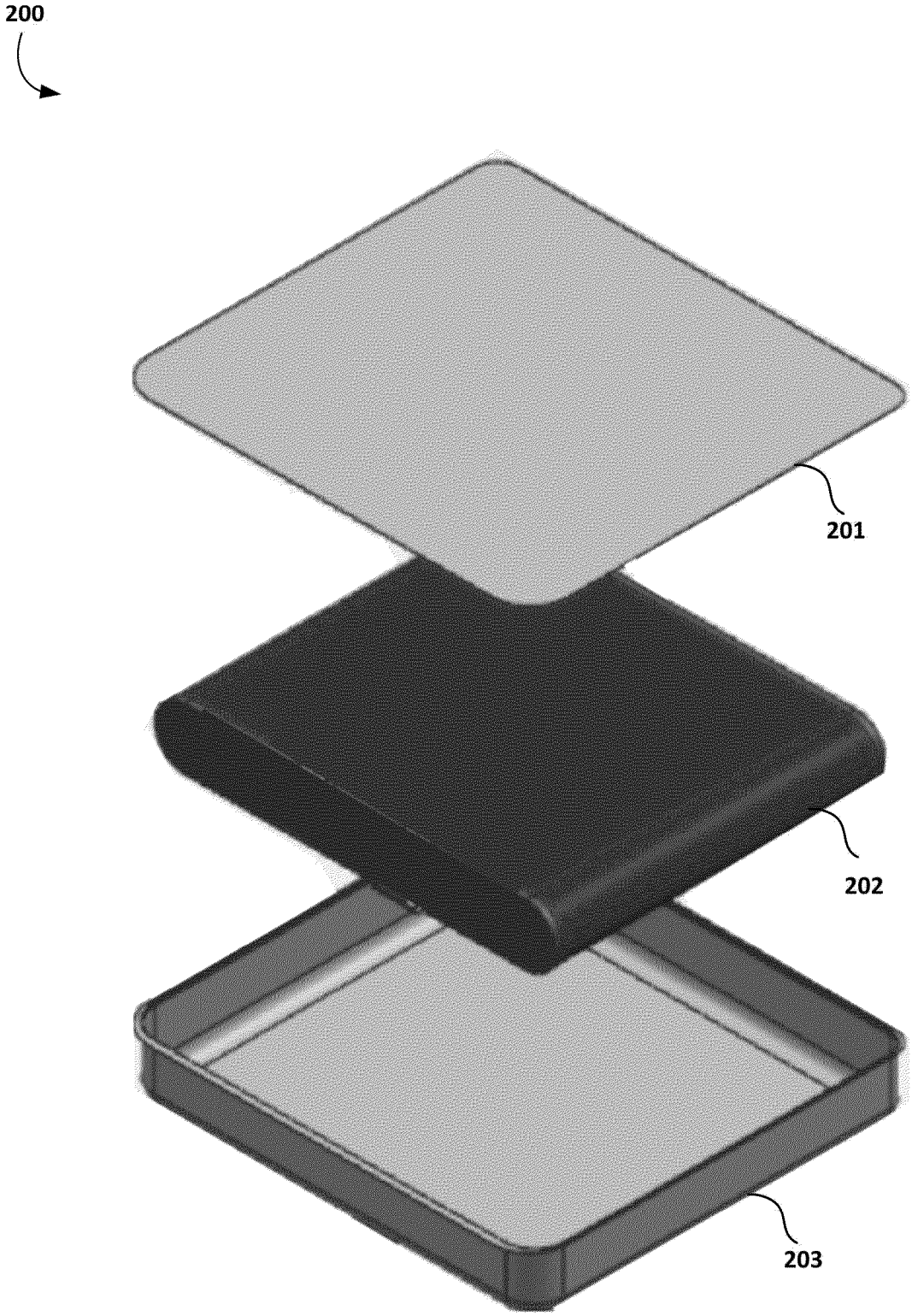


FIG. 2

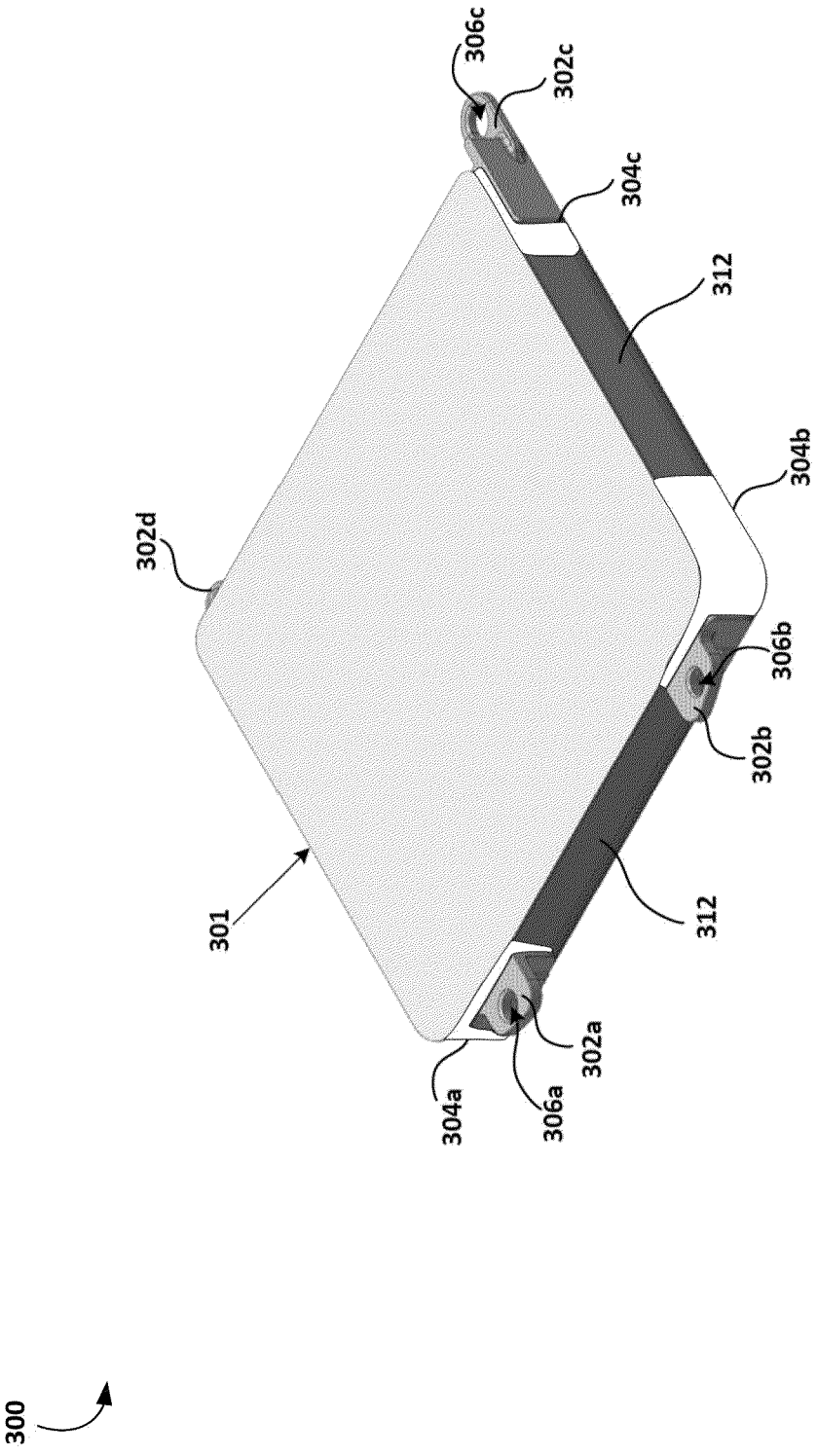

306c
302c
304c
312
304b
302d
306b
302b
301
312
302a
304a
306a
300

FIG. 3

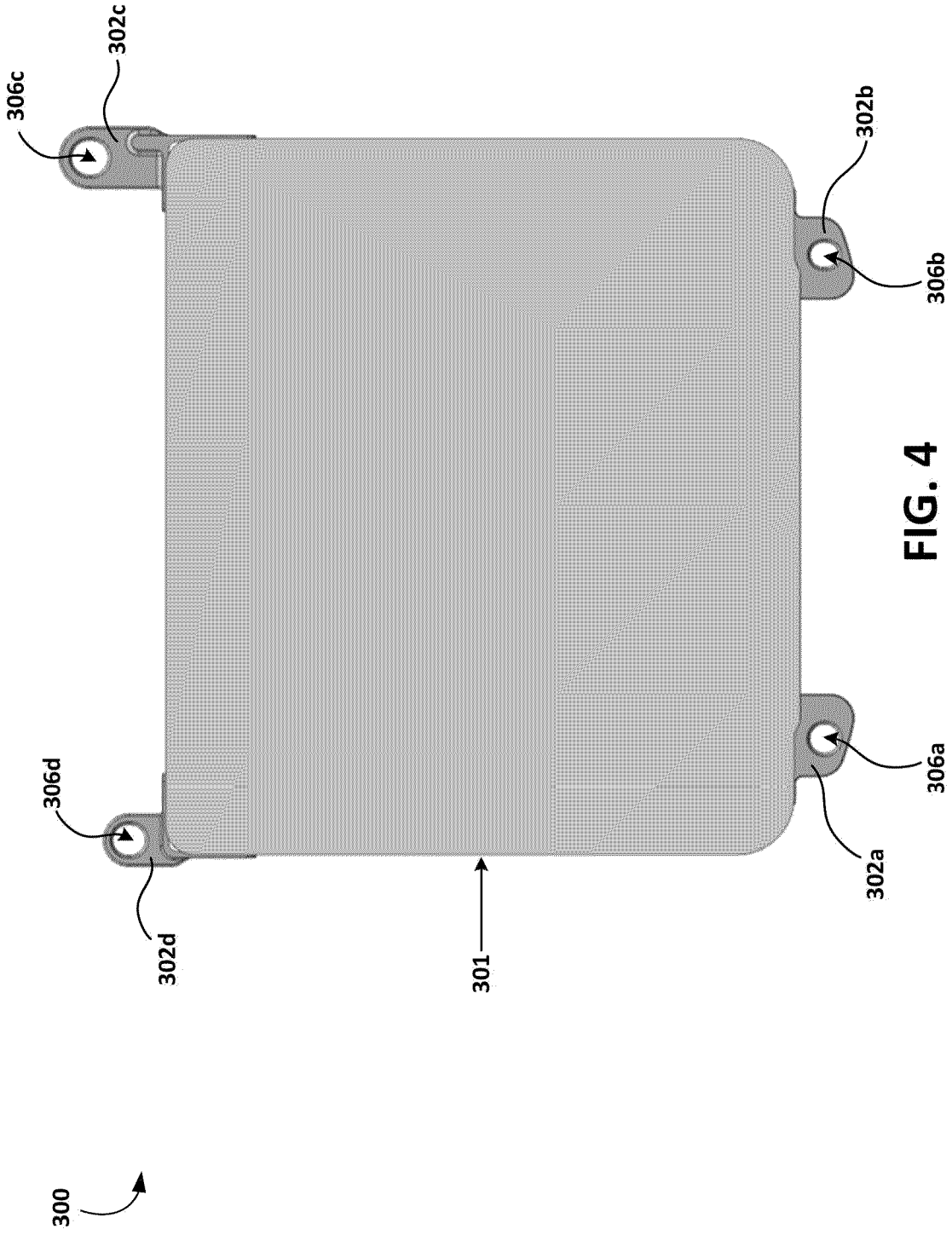


FIG. 4

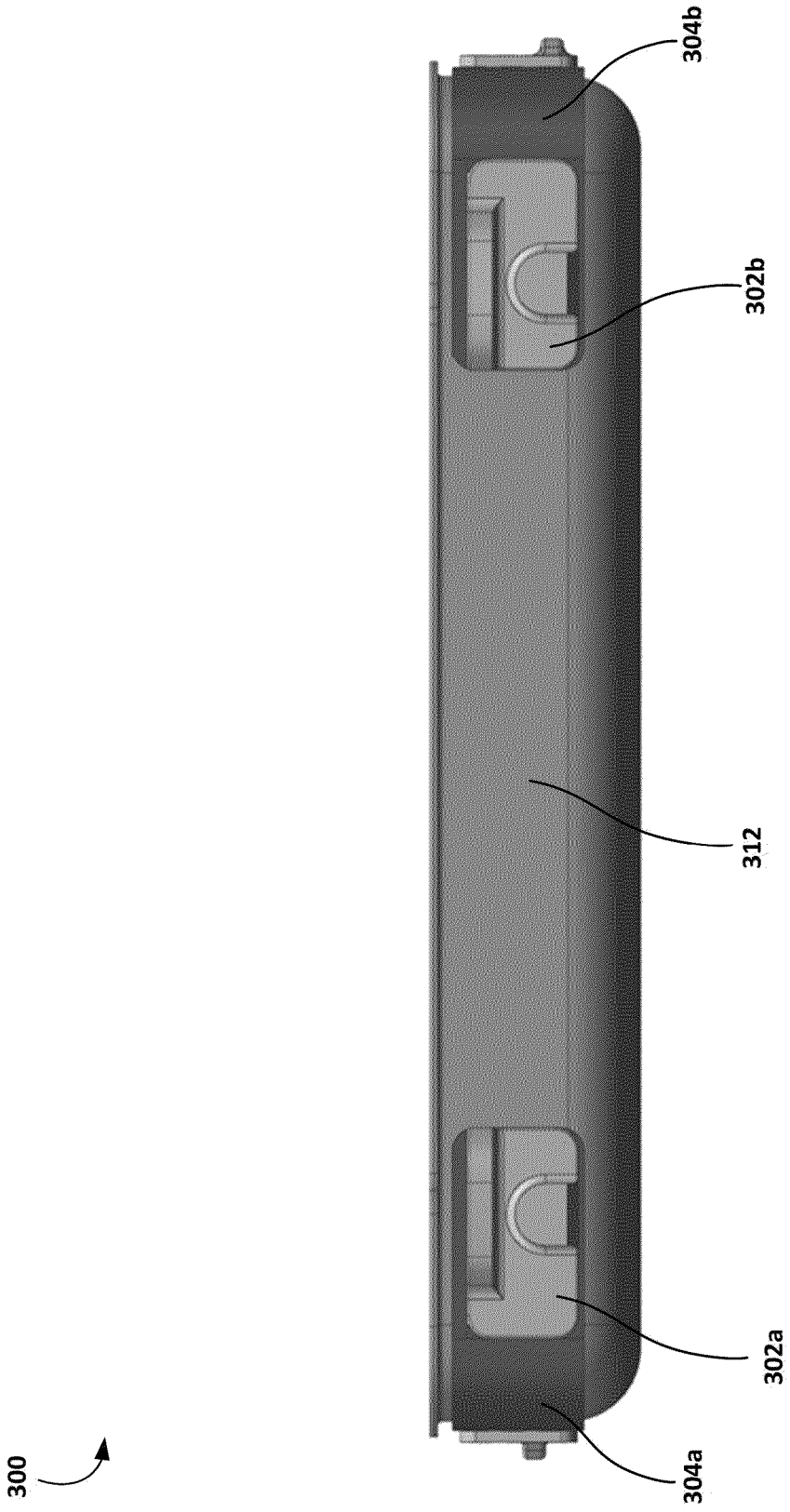


FIG. 5

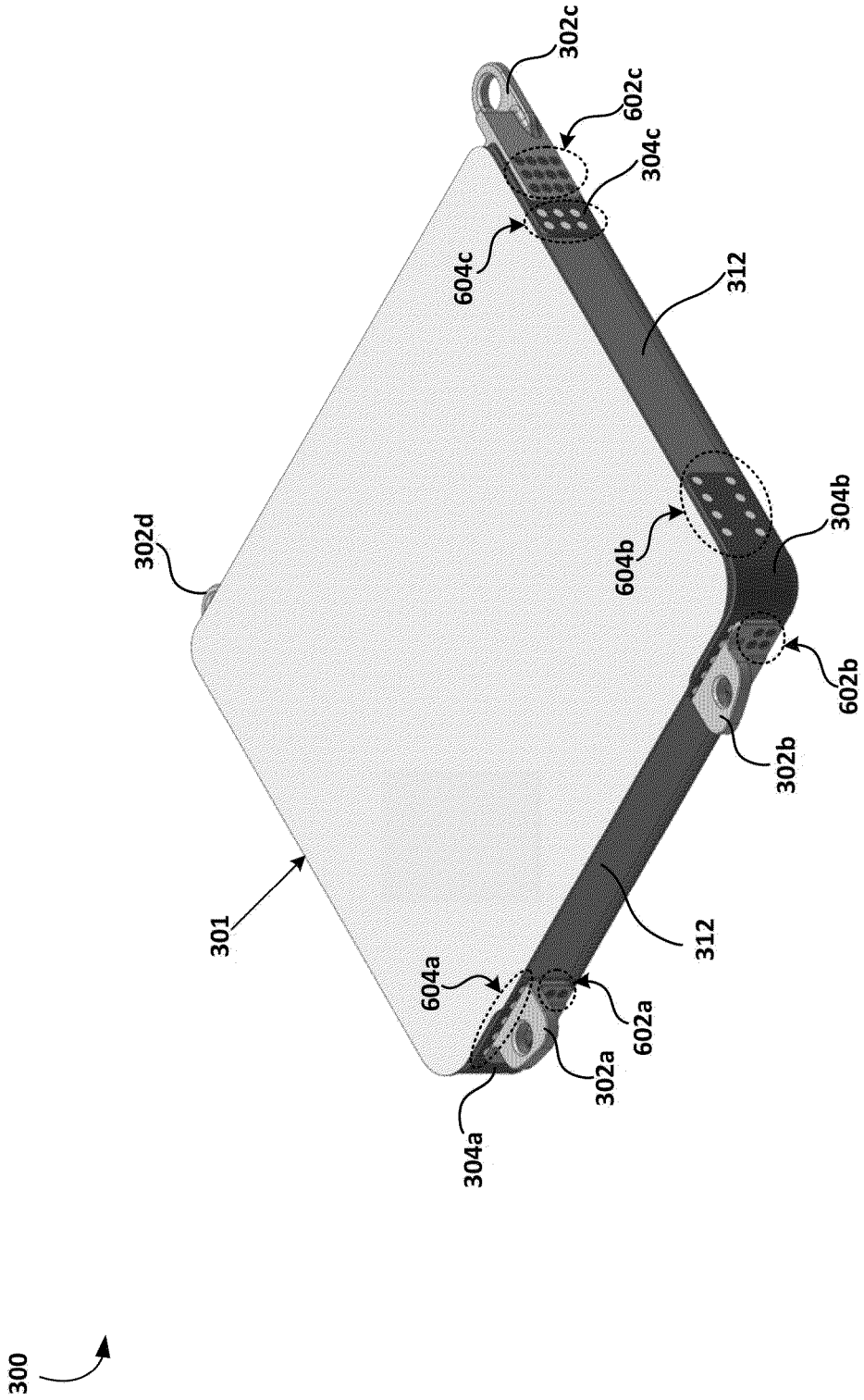

302c
602c
304c
604c
312
302d
604b
304b
602b
302b
301
312
604a
602a
302a
304a
300

FIG. 6

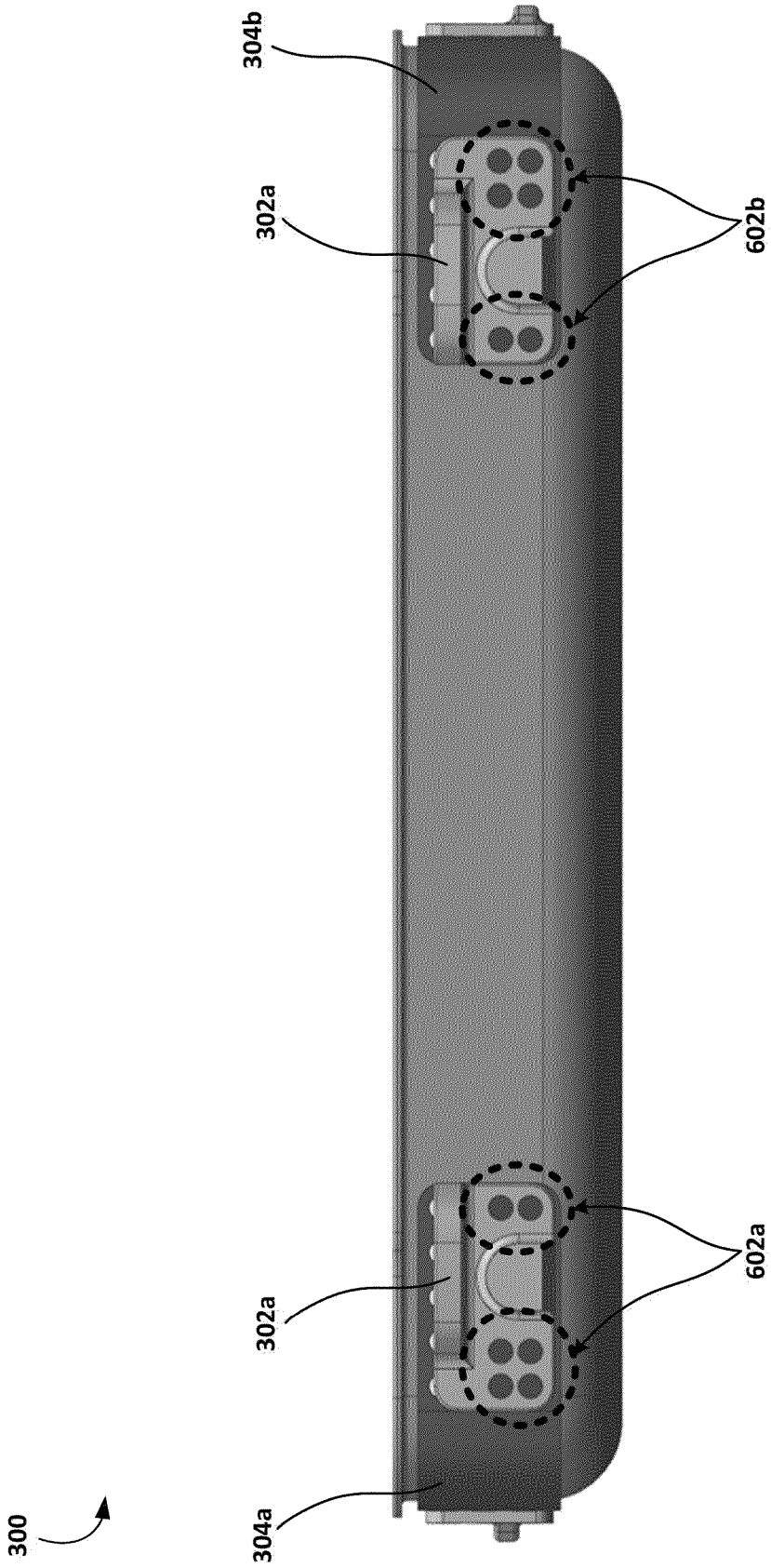


FIG. 7

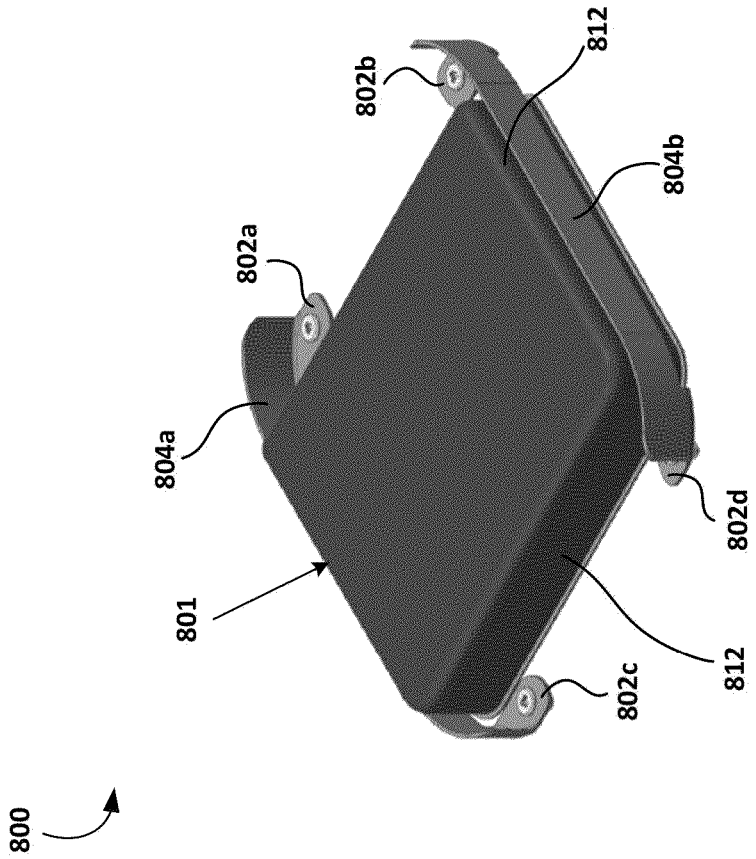

800
801
802a
802b
802c
802d
804a
804b
812

FIG. 8A

800
801
802a
802b
802c
802d
804a
804b
812

FIG. 8B

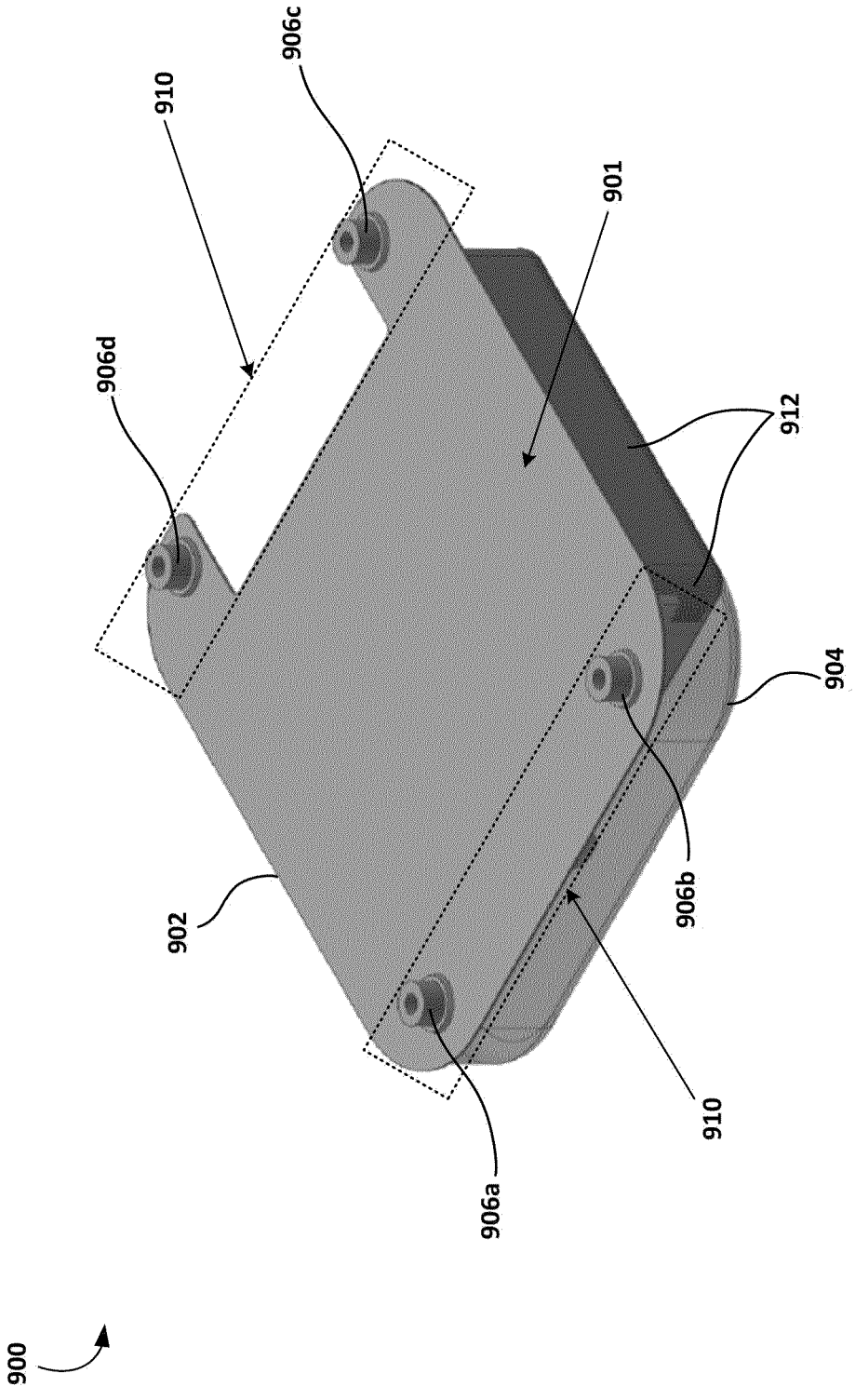


FIG. 9

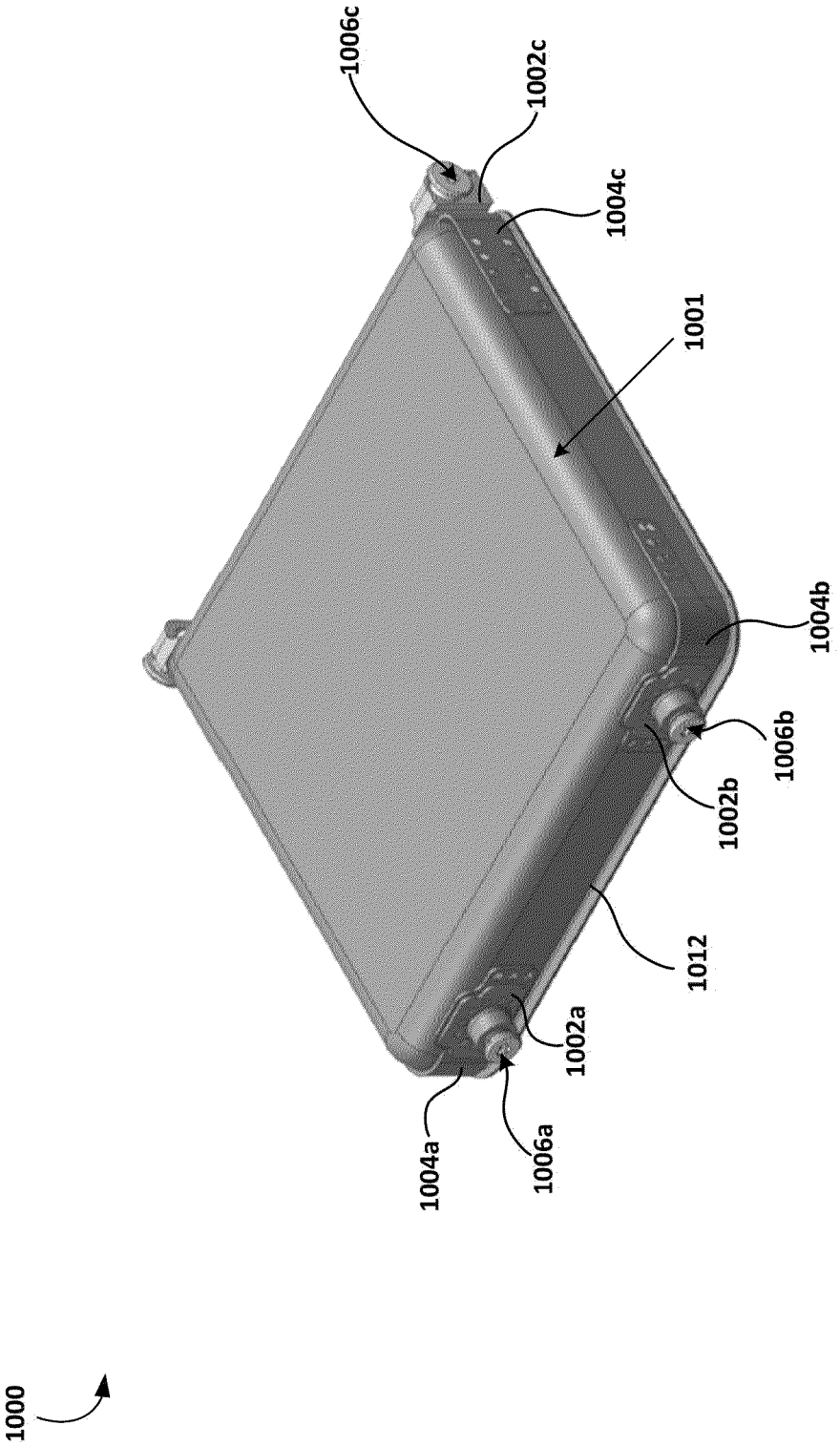

1006c
1002c
1004c
1001
1004b
1006b
1002b
1012
1002a
1004a
1006a
1000

FIG. 10

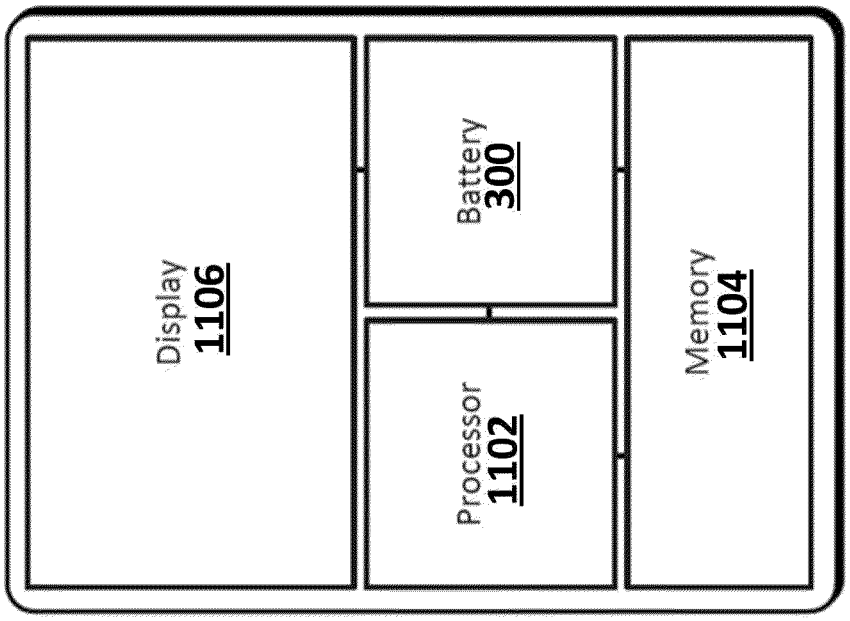


FIG. 11

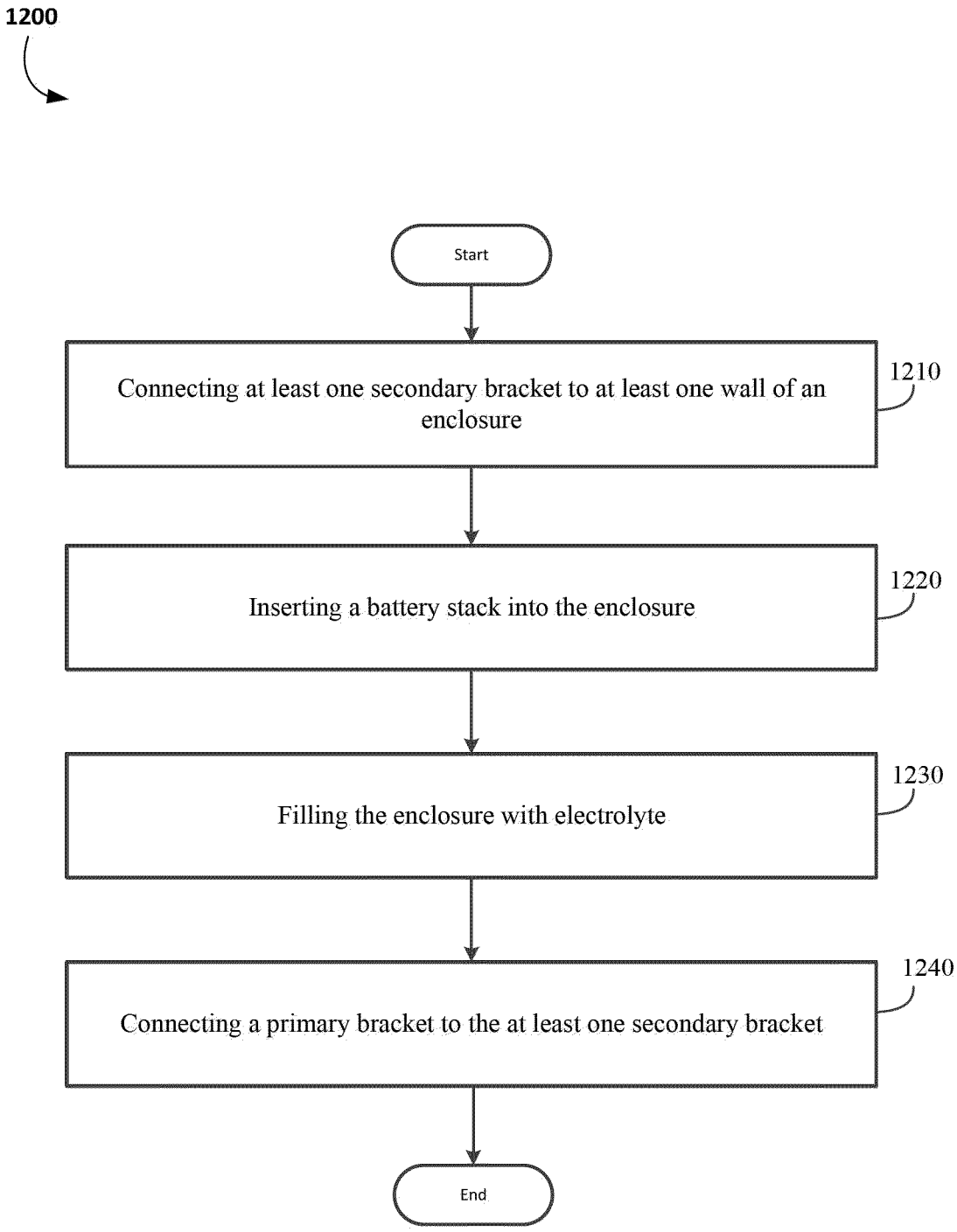

1200
Start
Connecting at least one secondary bracket to at least one wall of an enclosure
1210
Inserting a battery stack into the enclosure
1220
Filling the enclosure with electrolyte
1230
Connecting a primary bracket to the at least one secondary bracket
1240
End

FIG. 12

STRUCTURALLY MOUNTABLE BATTERY

PRIORITY

[0001] The disclosure claims the benefit under 35 U.S.C. §119(e) of U.S. Provisional Pat. Application No. 63/248,254 entitled "Structurally Mountable Battery", filed on Sep. 24, 2021, and U.S. Provisional Pat. Application No. 63/248,242 entitled "Structurally Mountable Battery", filed on Sep. 24, 2021, both of which are incorporated herein by reference in their entirety.

TECHNICAL FIELD

[0002] The present disclosure relates generally to battery cells, and more particularly, to a battery cell configured to be structurally mounted to a portable electronic device.

BACKGROUND

[0003] Batteries are used to provide power to a wide variety of portable electronic devices, including laptop computers, tablet computers, mobile phones, personal digital assistants (PDAs), digital music players, watches, and wearable devices.

[0004] Batteries are commonly connected to the portable electronic devices using an adhesive. Such adhesive may prevent the battery from moving around within the device. However, such adhesive may cause issues in the battery-replacement process and/or the battery design process.

SUMMARY

[0005] The disclosed embodiments provide for a battery pack that is configured to be structurally mounted to a portable electronic device. The battery pack includes an enclosure configured to enclose a plurality of layers. One or more primary brackets may be connected to at least one wall of the enclosure. Each of the one or more primary brackets is configured to be coupled to a device. The battery pack is configured to provide at least one component of the device with power when the one or more primary brackets are coupled to the device. The battery pack includes a secondary bracket interposed between at least one of the one or more primary brackets and the at least one wall of the enclosure. The secondary bracket is configured to provide a layer of protection between the at least one primary bracket and the plurality of layers.

[0006] In some embodiments, a portable electronic device is disclosed. The portable electronic device includes a set of components powered by a battery pack and a device enclosure configured to receive the battery pack. The battery pack includes an enclosure configured to enclose a plurality of layers. The battery pack includes one or more primary brackets connected to at least one wall of the enclosure. Each of the one or more primary brackets is configured to be coupled to the device enclosure. The battery pack is configured to provide the set of components with power when the one or more primary brackets are coupled to the device enclosure. The battery pack includes a secondary bracket interposed between at least one of the one or more primary brackets and the at least one wall of the enclosure. The secondary bracket is configured to provide a layer of protection between the at least one primary bracket and the plurality of layers.

[0007] In some embodiments, a battery pack is enclosed. The battery pack includes a plurality of layers and an enclosure. The enclosure includes a first surface and a plurality of walls that extend from the first surface in a direction perpendicular to the first surface. A portion of the first surface extends past at least one wall of the plurality of walls. The enclosure includes a second surface configured to be connected to the plurality of walls to form a body configured to enclose the plurality of layers. The portion of the first surface is configured to be coupled to a device and the battery pack is configured to provide at least one component of the device with power when the portion of the first surface is coupled to the device.

[0008] In some embodiments, a portable electronic device is disclosed. The portable electronic device includes a set of components powered by a battery pack and a device enclosure configured to receive the battery pack. The battery pack includes a first surface and a plurality of walls that extend from the first surface in a direction perpendicular to the first surface. A portion of the first surface extends past at least one wall of the first plurality of walls. The enclosure includes a second surface configured to be connected to the plurality of walls to form a body configured to enclose a plurality of layers. The portion of the first surface is configured to be coupled to the device enclosure and the battery pack is configured to provide at least one component of the device with power when the portion of the first surface is coupled to the device enclosure.

[0009] In some embodiments, a battery enclosure is disclosed. The battery enclosure includes a first surface and a plurality of walls that extend from the first surface in a direction perpendicular to the first surface. A portion of the first surface extends past at least one wall of the first plurality of walls. The enclosure includes a second surface connected to the second plurality of walls to form a body configured to enclose a plurality of layers. The portion of the first surface is configured to be coupled to a device enclosure. The battery pack is configured to provide at least one component of the device with power when the portion of the first surface is coupled to the device enclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The embodiments herein may be better understood by referring to the following description in conjunction with the accompanying drawings in which like reference numerals indicate identical or functionally similar elements. Understanding that these drawings depict only exemplary embodiments of the disclosure and are not therefore to be considered to be limiting of its scope, the principles herein are described and explained with additional specificity and detail through the use of the accompanying drawings in which:

[0011] FIG. **1**A is a first isometric view of a battery can using two dish or clamshell shaped outer surfaces.

[0012] FIG. **1**B is a second isometric view of the battery can of FIG. **1**A.

[0013] FIG. **2** is an exploded view of a battery can.

[0014] FIG. **3** is an isometric view of a battery pack configured to be structurally mounted to a portable electronic device.

[0015] FIG. **4** is a top view of the battery pack of FIG. **3**.

[0016] FIG. **5** is a side view of the battery pack of FIG. **3**.

[0017] FIG. **6** is a detailed isometric view of the battery pack of FIG. **3**.
[0018] FIG. **7** is a detailed side view of the battery pack of FIG. **3**.
[0019] FIG. **8**A is a top view of a battery pack configured to be structurally mounted to a portable electronic device.
[0020] FIG. **8**B is an isometric view of the battery pack of FIG. **8**A.
[0021] FIG. **9** is an isometric view of a battery pack configured to be structurally mounted to a portable electronic device.
[0022] FIG. **10** is an isometric view of a battery pack configured to be structurally mounted to a portable electronic device
[0023] FIG. **11** is a portable electronic device.
[0024] FIG. **12** illustrates an example method for manufacturing a battery pack configured to be structurally mounted to a portable electronic device.

DETAILED DESCRIPTION

[0025] Various embodiments of the disclosure are discussed in detail below. While specific implementations are discussed, it should be understood that this is done for illustration purposes only. A person skilled in the relevant art will recognize that other components and configurations may be used without parting from the spirit and scope of the disclosure.
[0026] Batteries are used to provide power to a wide variety of portable electronic devices, including laptop computers, tablet computers, mobile phones, personal digital assistants (PDAs), digital music players, watches, and wearable devices.
[0027] Batteries are commonly connected to the portable electronic devices using an adhesive. Such adhesive may prevent the battery from moving around within the device. However, such adhesive may cause the battery-replacement process to be difficult and/or costly. For example, removing and replacing a battery that has been connected to a portable electronic device using adhesive may damage the battery and/or the portable electronic device.
[0028] Such adhesive may cause inflexibility in the battery-design process. Batteries, such as lithium-ion batteries, may swell during use. For example, a battery may balloon outwards during use. It may not be possible to control the direction of such swelling due to the use of adhesive. If one side of the battery is attached to an adhesive, then that side of the battery may not be capable of swelling. The other side of the battery that is not attached to the adhesive may necessarily be the side of the battery that swells.
[0029] Accordingly, there is a need for batteries that may be attached to portable electronic devices without the use of adhesive. The disclosed technology addresses the foregoing limitations of conventional batteries packs by introducing a battery pack configured to be structurally mounted to a portable electronic device.
[0030] FIGS. **1**A and **1**B are isometric views of a battery can using two dish or clamshell shaped outer surfaces. In particular, the battery can **100** includes a first portion, or upper portion **102**, that has an optionally flat or semi-flat surface **110** and four walls **112** that extend from the flat or semi-flat surface. In general, the dimensions (e.g., width and length) of the flat or semi-flat surface **110** are larger than the dimensions of the walls **112** such that the four walls are smaller in area than the larger flat or semi-flat surface to form a rectangular shape with an opening along one of the larger surfaces of the rectangle. The regions of the first portion **102** where the surface **110** meets the four walls **112** may form an edge. In some embodiments the edge can have a right angle or may be rounded. Similarly, the regions of the first portion **102** where the four walls **112** meet may form a corner; in some embodiments the corner may be a right angle, an obtuse angle, an acute angle or may be rounded. In addition, one or more feedthroughs **106** may be located on a wall **112** of the first portion **102**. The feedthroughs **106** provide electrical connections to a battery stack contained within the battery can **100**. In addition, one or more fill holes **108** may also be located on a wall **112** of the first portion **102**. The fill hole **108** may or may not be on the same wall **112** of the first portion **102** as the feedthroughs **106**.
[0031] The battery can **100** may also include a second portion **104**. In one embodiment, the second portion **104** includes a similar shape as the first portion **102**, namely, a flat or semi-flat surface **114** and four walls that extend from the surface to form a rectangular shape with an opening along one of the larger surfaces of the rectangle. The length and width of the flat or semi-flat surface **114** may include slightly smaller dimensions than corresponding dimensions of the flat or semi-flat surface **110** of the first portion **102**. Thus, when mated, the walls of the second portion **104** fit inside the walls **112** of the first portion **102** to form a box-like enclosure. In another embodiment, the second portion **104** includes the flat or semi-flat surface **114**. In general, the dimensions of the flat or semi-flat surface **114** of the second portion **104** may be the same or similar to the flat or semi-flat surface **110** of the first portion **102** such that, when mated, the first and second portion of the battery can form a box-like enclosure for housing a battery cell.
[0032] FIG. **2** illustrates an exploded view of a battery can **200**. The battery can **200** includes a first portion **201** and a second portion **203**. The first portion **201** and the second portion **203** may, when mated, enclose a plurality of layers **202** (alternatively referred to as "battery stack"). The plurality of layers **202** may comprise a cathode with an active coating, a separator, and an anode with an active coating. For example, the cathode may be an aluminum foil coated with a lithium compound (e.g., $LiCoO_2$, LiNCoMn, LiCoAl or $LiMn_2O_4$) and the anode may be a copper foil coated with carbon or graphite. The separator may include polyethylene (PE), polypropylene (PP), and/or a combination of PE and PP, such as PE/PP or PP/PE/PP. The separator may comprise a micro-porous membrane that also provides a "thermal shut down" mechanism. If the battery cell reaches the melting point of these materials, the pores shut down which prevents ion flow through the membrane.
[0033] The plurality of layers **202** may be wound to form a jelly roll structure or can be stacked to form a stacked-cell structure. The plurality of layers may be immersed in an electrolyte, which for example, can be a LiPF6-based electrolyte that can include Ethylene Carbonate (EC), Polypropylene Carbonate (PC), Ethyl Methyl Carbonate (EMC) or DiMethyl Carbonate (DMC). The electrolyte can also include additives such as Vinyl carbonate (VC) or Polyethylene Soltone (PS). The electrolyte can additionally be in the form of a solution or a gel.
[0034] FIG. **3** illustrates an isometric view of a battery pack **300** configured to be structurally mounted to a portable electronic device, in accordance with various aspects of the

subject technology. The battery pack **300** comprises an enclosure **301**, one or more primary brackets **302***a-d*, and one or more protectors **304***a-d* (e.g., protective brackets, protective layer, secondary brackets, etc.).

[0035] The enclosure **301** may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. The enclosure **301** may have a non-corrosive coating line the interior of the enclosure **301** and is configured to enclose and protect a plurality of layers (e.g., the plurality of layers **202**) within the enclosure. The enclosure **301** may have a cylindrical, cuboid, prism, conical, pyramid, combinations thereof or still other shape.

[0036] The one or more primary brackets **302***a-d* may be connected to at least one wall **312** of the enclosure **301**. While the battery pack **300** is illustrated as having four primary brackets **302***a-d*, it should be appreciated that in other embodiments, the battery pack **300** may include one, two, three, or more than four primary brackets.

[0037] The one or more primary brackets **302***a-d* may be configured to be coupled to a device, such as a portable electronic device. The battery pack **300** may be configured to provide at least one component of the device with power when the one or more primary brackets **302***a-d* are coupled to the device.

[0038] In an embodiment, at least one of the one or more primary brackets **302***a-d* may comprise an opening **306***a-c* configured to receive a fastener. The one or more primary brackets **302***a-d* may be configured to be coupled to the device when one or more of the at least one openings **306***a-c* receives the fastener. The fastener may, for example, comprise at least one of a screw, a rivet, a nail, a washer, an anchor, and/or any other suitable fastener.

[0039] In other embodiments, the one or more primary brackets **302***a-d* are coupled to the device by fitting or sliding each of the one or more primary brackets **302***a-d* into a corresponding opening of the device. The corresponding opening(s) may be, for example, slits, pockets, or other openings configured to receive the one or more primary brackets **302***a-d*. For example, each of the one or more primary brackets **302***a-d* may be slid into or fit into a slit, pocket, or opening and the one or more primary brackets **302***a-d* may latch onto the device.

[0040] In other embodiments, the one or more primary brackets **302***a-d* are coupled to the device by attaching each of the one or more primary brackets **302***a-d* to a corresponding component of the device. For example, the one or more primary brackets **302***a-d* may be coupled to the device by attaching each of the one or more primary brackets **302***a-d* to a clip, spring contact, latch, or any other device component capable of being attached to or coupled with the one or more primary brackets **302***a-d*.

[0041] The one or more primary brackets **302***a-d* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more one or more primary brackets **302***a-d* may be a different conductive material than the material from which the enclosure **301** is formed.

[0042] At least one of the one or more protectors **304***a-d* may be interposed between at least one of the one or more primary brackets **302***a-d* and the at least one wall **312** of the enclosure **301**. The at least one protector **304***a-d* may be configured to provide a layer of protection between the at least one primary bracket **302***a-d* and the plurality of layers enclosed within the enclosure **301**. For example, the at least one protector **304***a-d* may be configured to prevent damage to the plurality of layers and/or to the enclosure **301** when the at least one primary bracket **302***a-d* is being connected (e.g., welded, laser welded, etc.) to the at least one wall **312** of the enclosure **301**. For example, the at least one protector **304***a-d* may be configured to prevent physical damage and/or heat damage to the plurality of layers and/or to the enclosure **301** when the at least one primary bracket **302***a-d* is being connected (e.g., welded, laser welded, etc.) to the at least one wall **312** of the enclosure **301**.

[0043] The one or more protectors **304***a-d* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more protectors **304***a-d* may be the same material as the material from which the enclosure **301** is formed. In an embodiment, the one or more protectors **304***a-d* may be the same material as the material from which the enclosure **301** is formed and the one or more protectors **304***a-d* may be a different material than the one or more primary brackets **302***a-d*.

[0044] In an embodiment, the one or more primary brackets **302***a-d*, the one or more protectors **304***a-d*, and/or the at least one wall **312** of the enclosure all have different thicknesses. The at least one wall **312** of the enclosure **301** may be thin relative to the one or more primary brackets **302***a-d*. For example, the at least one wall **312** of the enclosure **301** may have a thickness that is less than a thickness of the one or more primary brackets **302***a-d*.

[0045] The one or more protectors **304***a-d* may have a thickness that is different than the thickness of the at least one wall **312** of the enclosure **301**. The one or more protectors **304***a-d* may have a thickness that is different than the thickness of the one or more primary brackets **302***a-d*. For example, the one or more protectors **304***a-d* may have a thickness that is greater than a thickness of the at least one wall **312** of the enclosure **301**. The one or more protectors **304***a-d* may have a thickness that is less than a thickness of the one or more primary brackets **302***a-d*.

[0046] In embodiments, the at least one wall **312** of the enclosure **301** has a thickness less than 75 microns. In other embodiments, the at least one wall **312** of the enclosure **301** has a thickness less than 100 microns. In embodiments, the one or more primary brackets **302***a-d* have a thickness less than 500 microns. In other embodiments, the one or more primary brackets **302***a-d* have a thickness less than 400 microns. In embodiments, the one or more protectors **304***a-d* have a thickness less than 300 microns. In other embodiments, the one or more protectors **304***a-d* have a thickness less than 200 microns.

[0047] In other embodiments, some or all of the one or more primary brackets **302***a-d*, the one or more protectors **304***a-d*, and the at least one wall **312** of the enclosure have the same thickness.

[0048] As discussed above, batteries usually swell. In a standard cell design, due to the adhesive used to attach the battery pack to the portable electronic device, the battery is only able to swell in one direction (e.g., away from the adhesive). The use of the primary brackets **302***a-d* and/or the

protectors **304***a-d* to attach the battery pack **300** to the portable electronic device eliminates the need for adhesive. Accordingly, the use of the primary brackets **302***a-d* and/or the protectors **304***a-d* provides the battery pack **300** with the ability to swell in any direction.

[0049] Depending on the portable electronic device, it may be desirable for the battery pack **300** to swell in a particular direction. The thinnest wall of the battery pack **300** may be the wall of the battery pack **300** that swells. Accordingly, if it is desirable for the battery pack **300** to swell downwards, the bottom surface of the battery pack **300** may be constructed with thinner material than the top surface and/or side walls. Conversely, if it is desirable for the battery pack **300** to swell upwards, the top surface of the battery pack **300** may be constructed with thinner material than the bottom surface and/or side walls.

[0050] FIG. **4** is a top view of the battery pack **300**. A portion of each of the one or more primary brackets **302***a-d* may extend outward from the at least one wall **312** of the enclosure **301**. For example, the portion of the one or more primary brackets **302***a-d* extending outward from the at least one wall **312** of the enclosure **301** may be the portion of the one or more primary brackets **302***a-d* that are configured to be coupled to a device, such as a portable electronic device.

[0051] In an embodiment, the portion of each of the one or more primary brackets **302***a-d* extending outward from the at least one wall **312** of the enclosure **301** may be the portion of the one or more primary brackets **302***a-d* that comprises the openings **306***a-d* configured to receive a fastener. The one or more primary brackets **302***a-d* may be configured to be coupled to the device when one or more of the at least one openings **306***a-d* receives the fastener. The fastener may, for example, comprise at least one of a screw, a rivet, a nail, a washer, an anchor, and/or any other suitable fastener.

[0052] In other embodiments, the portion of the one or more primary brackets **302***a-d* extending outward from the at least one wall **312** of the enclosure **301** may be the portion of the one or more primary brackets **302***a-d* configured to be fit or slid into a corresponding opening of the device. As discussed above, the corresponding opening(s) may be, for example, slits, pockets, or openings configured to receive the portion of the one or more primary brackets **302***a-d* extending outward from the at least one wall **312** of the enclosure **301**. For example, each of the portions may be slid into or fit into a slit, pocket, or opening and the one or more primary brackets **302***a-d* may latch onto the device.

[0053] In other embodiments, the portion of the one or more primary brackets **302***a-d* extending outward from the at least one wall **312** of the enclosure **301** may be coupled to the device by attaching each of the portion of one or more primary brackets **302***a-d* to a corresponding component of the device. For example, the portion of the one or more primary brackets **302***a-d* may be coupled to the device by attaching each the portions to a clip, spring contact, latch, or any other device component capable of being attached to or coupled with the portion one or more primary brackets **302***a-d*.

[0054] FIG. **5** is a side view of the battery pack **300**. The one or more primary brackets **302***a-b* may be connected to the at least one wall **312** of the enclosure **301**. Additional primary brackets (e.g., primary brackets **302***c-d*) may be connected to the at least one wall **312** of the enclosure **301**, such as on a different side of the enclosure **301**. At least one of the protectors **304***a-b* may be interposed between at least one of the one or more primary brackets **302***a-b* and the at least one wall **312** of the enclosure **301**. The at least one protector **304***a-b* may be configured to provide a layer of protection between the at least one primary bracket **302***a-b* and the plurality of layers enclosed within the enclosure **301**. For example, the at least one protector **304***a-b* may be configured to prevent damage to the plurality of layers and/or to the enclosure **301** when the at least one primary bracket **302***a-b* is being connected (e.g., welded, laser welded, etc.) to the at least one wall **312** of the enclosure **301**.

[0055] FIG. **6** is a detailed isometric view of the battery pack **300**. As discussed above, the battery pack **300** comprises an enclosure **301**, one or more primary brackets **302***a-d*, and one or more protectors **304***a-d*.

[0056] The enclosure **301** may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art.

[0057] The one or more primary brackets **302***a-d* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more one or more primary brackets **302***a-d* may be a different conductive material than the material from which the enclosure **301** is formed.

[0058] The one or more protectors **304***a-d* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more protectors **304***a-d* may be the same material as the material from which the enclosure **301** is formed.

[0059] The one or more primary brackets **302***a-d* may be connected to the at least one wall **312** of the enclosure **301**. For example, the one or more primary brackets **302***a-c* may be connected to the at least one wall **312** of the enclosure **301** at connection points **602***a-c*.

[0060] The connection points **602***a-c* may each include, for example, one or more welds. If the connection points **602***a-c* include weld(s), the connection points **602***a-c* may be created by welding the one or more primary brackets **302***a-c* onto the at least one wall **312** from outside of the enclosure **301**. For example, the connection points **602***a-c* may be created by welding the one or more primary brackets **302***a-c* onto the at least one wall **312** from outside of the enclosure **301** after a plurality of layers is already enclosed within the enclosure **301**. The connection points **602***a-c* may each include any number of welds.

[0061] If a protector **304***a-c* is interposed between at least one of the one or more primary brackets **302***a-c* and the at least one wall **312** of the enclosure **301**, the connection points **602***a-c* may be created by welding the one or more primary brackets **302***a-c* onto the protector **304***a-c* from outside of the enclosure **301**. For example, the connection points **602***a-c* may be created by welding the one or more primary brackets **302***a-c* onto the protectors **304***a-c* from outside of the enclosure **301** after a plurality of layers is already enclosed within the enclosure **301**. The at least one protector **304***a-c* may be configured to prevent damage to the plurality of layers and/or to the enclosure **301** when the

at least one primary bracket **302***a-c* is being connected (e.g., welded, laser welded, etc.) to the at least one wall **312** of the enclosure **301**.

[0062] FIG. **7** is a detailed side view of the battery pack **300** depicting the connection points **602***a-b* from a different angle.

[0063] While welds associated with the primary bracket **302***d* are not depicted in FIG. **6**, it should be appreciated that the primary bracket **302***d* may similarly be connected to the at least one wall **312** of the enclosure **301** by welding the primary bracket **302***d* onto the at least one wall **312** from outside of the enclosure **301** and/or onto the protector **304***d* from outside of the enclosure **301**.

[0064] The one or more protectors **304***a-d* may be connected to the at least one wall **312** of the enclosure **301**. For example, the one or more protectors **304***a-c* may be connected to the at least one wall **312** of the enclosure **301** at connection points **604***a-c*.

[0065] The connection points **604***a-c* may each include, for example, one or more welds. If the connection points **604***a-c* include weld(s), the connection points **604***a-c* may be created by welding the one or more protectors **304***a-c* onto the at least one wall **312** from inside of the enclosure **301**. For example, the connection points **604***a-c* may be created by welding the one or more protectors **304***a-c* onto the at least one wall **312** from inside of the enclosure **301** before a plurality of layers is inserted into the enclosure **301**. The connection points **604***a-c* may each include any number of welds.

[0066] While welds associated with the protector **304***d* are not depicted in FIG. **6**, it should be appreciated that the protector **304***d* may similarly be connected to the at least one wall **312** of the enclosure **301** by welding the protector **304***d* onto the at least one wall **312** from inside of the enclosure **301**.

[0067] FIGS. **8**A-B illustrate isometric views of a battery pack **800** configured to be structurally mounted to a portable electronic device, in accordance with various aspects of the subject technology. The battery pack **800** comprises an enclosure **801**, one or more primary brackets **802***a-d*, and one or more secondary brackets **804***a-b*.

[0068] The enclosure **801** may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. The enclosure **801** may have a non-corrosive coating line the interior of the enclosure **801** and is configured to enclose and protect a plurality of layers (e.g., the plurality of layers **202**) within the enclosure. The enclosure **801** may have a cylindrical, cuboid, prism, conical, pyramid, combinations thereof or still other shape. The enclosure **801** may comprise, for example, the battery can **100** discussed above with reference to FIG. **1**.

[0069] The one or more primary brackets **802***a-d* may be connected to at least one wall **812** of the enclosure **301**. While the battery pack **800** is illustrated as having four primary brackets **802***a-d*, it should be appreciated that in other embodiments, the battery pack **800** may include one, two, three, or more than four primary brackets.

[0070] The one or more primary brackets **802***a-d* may be configured to be coupled to a device, such as a portable electronic device. The battery pack **800** may be configured to provide at least one component of the device with power when the one or more primary brackets one or more primary brackets **802***a-d* are coupled to the device.

[0071] In an embodiment, at least one of the one or more primary brackets **802***a-d* may comprise an opening configured to receive a fastener. The one or more primary brackets **802***a-d* may be configured to be coupled to the device when one or more of the at least one openings receives the fastener. The fastener may, for example, comprise at least one of a screw, a rivet, a nail, a washer, an anchor, and/or any other suitable fastener.

[0072] In other embodiments, the one or more primary brackets **802***a-d* are coupled to the device by fitting or sliding each of the one or more primary brackets **802***a-d* into a corresponding opening of the device. The corresponding opening(s) may be, for example, slits, pockets, or openings configured to receive the one or more primary brackets **802***a-d*. For example, each of the one or more primary brackets **802***a-d* may be slid into or fit into a slit, pocket, or opening and the one or more primary brackets **802***a-d* may latch onto the device.

[0073] In other embodiments, the one or more primary brackets **802***a-d* are coupled to the device by attaching each of the one or more primary brackets **802***a-d* to a corresponding component of the device. For example, the one or more primary brackets **802***a-d* may be coupled to the device by attaching each of the one or more primary brackets **802***a-d* to a clip, spring contact, latch, or any other device component capable of being attached to or coupled with the one or more primary brackets **802***a-d*.

[0074] The one or more primary brackets **802***a-d* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more one or more primary brackets **802***a-d* may be a different conductive material than the material from which the enclosure **801** is formed.

[0075] At least one of the protectors **304***a-b* may be interposed between at least one of the one or more primary brackets **802***a-d* and the at least one wall **812** of the enclosure **801**. Each of the secondary brackets **804***a-b* may be interposed between more than one primary brackets **802***a-d* and the at least one wall **812** of the enclosure **801**. The secondary brackets **804***a-d* are molded/stretched into a different, more elongated shape than the protectors **304***a-d* discussed above.

[0076] However, despite the aesthetic differences, the one or more secondary brackets **804***a-b* may serve a similar function as the protectors **304***a-d* discussed above. In particular, the secondary brackets **804***a-b* may be configured to provide a layer of protection between the at least one primary bracket **802***a-d* and the plurality of layers enclosed within the enclosure **801**. For example, the at least one secondary bracket **804***a-b* may be configured to prevent damage to the plurality of layers and/or to the enclosure **801** when the at least one primary bracket **802***a-d* is being connected (e.g., welded, laser welded, etc.) to the at least one wall **812** of the enclosure **801**.

[0077] The one or more secondary brackets **804***a-b* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more secondary brackets **804***a-b* may be

the same material as the material from which the enclosure **801** is formed. In an embodiment, the one or more secondary brackets **804***a-d* may be the same material as the material from which the enclosure **801** is formed and the one or more secondary brackets **804***a-d* may be a different material than the one or more primary brackets **802***a-d*.

[0078] In an embodiment, the one or more primary brackets **802***a-d*, the one or more secondary brackets **804***a-b*, and/or the at least one wall **812** of the enclosure all have different thicknesses. The at least one wall **812** of the enclosure **301** may be thin relative to the one or more primary brackets **802***a-d*. For example, the at least one wall **812** of the enclosure **801** may have a thickness that is less than a thickness of the one or more primary brackets **802***a-d*. The one or more secondary brackets **804***a-b* may have a thickness that is different than the thickness of the at least one wall **812** of the enclosure **801**. The one or more secondary brackets **804***a-b* may have a thickness that is different than the thickness of the one or more primary brackets **802***a-d*. For example, the one or more secondary brackets **804***a-b* may have a thickness that is greater than a thickness of the at least one wall **812** of the enclosure **801**. The one or more secondary brackets **804***a-b* may have a thickness that is less than a thickness of the one or more primary brackets **802***a-d*.

[0079] In other embodiments, the one or more primary brackets **802***a-d*, the one or more secondary brackets **804***a-d*, and/or the at least one wall **812** of the enclosure have the same thickness.

[0080] FIG. **9** illustrate isometric views of a battery pack **900** configured to be structurally mounted to a portable electronic device, in accordance with various aspects of the subject technology. The battery pack **900** comprises an enclosure **901**.

[0081] The enclosure **901** may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. The enclosure **901** may have a non-corrosive coating line the interior of the enclosure **901** and is configured to enclose and protect a plurality of layers (e.g., the plurality of layers **202**) within the enclosure. The enclosure **801** may have a cylindrical, cuboid, prism, conical, pyramid, combinations thereof or still other shape. The enclosure **901** may comprise, for example, the battery can **100** discussed above with reference to FIG. **1**.

[0082] The enclosure **901** may include a first surface **902** and a plurality of walls **912** that extend from the first surface **902** in a direction perpendicular to the first surface **902**. A portion **910** of the first surface **902** extends past at least one wall of the plurality of walls **912**. The enclosure **901** may include a second surface **904**. The second surface **904** may be configured to be connected to the plurality of walls **912** to form a body configured to enclose a plurality of layers (e.g., the plurality of layers **202**).

[0083] The portion **910** of the first surface **902** may be configured to be coupled to a device, such as a portable electronic device. The battery pack **900** may be configured to provide at least one component of the device with power when the portion **910** of the first surface **902** is coupled to the device.

[0084] In an embodiment, the portion **910** of the first surface **902** comprises at least one opening configured to receive a fastener **906***a-d*. The portion **910** of the first surface **902** may be configured to be coupled to the device when the at least one opening receives the fastener **906***a-d*. The fastener **906***a-d* may, for example, comprise at least one of a screw, a rivet, a nail, a washer, an anchor, and/or any other suitable fastener.

[0085] In other embodiments, the portion **910** of the first surface **902** is configured to be coupled to an opening in a device enclosure of the device. For example, the portion **910** of the first surface **902** may be configured to be fit or slid into a corresponding opening of the device. As discussed above, the corresponding opening(s) may be, for example, slits, pockets, or any other suitable opening. For example, the portion **910** of the first surface **902** may be fit or slid into a slit, pocket, or opening and the portion **910** of the first surface **902** may latch onto the device.

[0086] In other embodiments, the portion **910** of the first surface **902** may be configured to be coupled to a corresponding component or fastener of the device. For example, the portion **910** of the first surface **902** may be coupled to the device by attaching the portion **910** of the first surface **902** to a clip, spring contact, latch, or any other device component capable of being attached to or coupled with the portion **910** of the first surface **902**.

[0087] FIG. **10** is an isometric view of a battery pack **1000** configured to be structurally mounted to a portable electronic device in accordance with various aspects of the subject technology. The battery pack **1000** comprises an enclosure **1001**, one or more primary brackets **1002***a-c*, and one or more secondary brackets **1004***a-c*.

[0088] The enclosure **1001** may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. The enclosure **1001** may have a non-corrosive coating line the interior of the enclosure **1001** and is configured to enclose and protect a plurality of layers (e.g., the plurality of layers **202**) within the enclosure. The enclosure **1001** may have a cylindrical, cuboid, prism, conical, pyramid, combinations thereof or still other shape. The enclosure **1001** may comprise, for example, the battery can **100** discussed above with reference to FIG. **1**.

[0089] The one or more primary brackets **1002***a-c* may be connected to at least one wall **1012** of the enclosure **1001**. While the battery pack **1000** is illustrated as having three primary brackets **302***a-c*, it should be appreciated that in other embodiments, the battery pack **1000** may include one, two, or more than three primary brackets.

[0090] The one or more primary brackets **1002***a-d* may be configured to be coupled to a device, such as a portable electronic device. The battery pack **1000** may be configured to provide at least one component of the device with power when the one or more primary brackets one or more primary brackets **1002***a-d* are coupled to the device.

[0091] In an embodiment, at least one of the one or more primary brackets **1002***a-c* may comprise an opening **1006***a-c* configured to receive a fastener. While the one or more primary brackets **302***a-d* discussed above may be configured to receive a fastener in a direction parallel to the at least one wall **312**, the one or more primary brackets **1002***a-c* may comprise an opening **1006***a-c* configured to receive a fastener in a direction perpendicular to the at least one wall **1012**. The one or more primary brackets **1002***a-c* may be coupled to the device when one or more of the at least one openings **1006***a-c* receives the fastener. The fastener may,

for example, comprise at least one of a screw, a rivet, a nail, a washer, an anchor, and/or any other suitable fastener.

[0092] In other embodiments, the one or more primary brackets **1002***a-c* are coupled to the device by fitting or sliding each of the one or more primary brackets **1002***a-c* into a corresponding opening of the device. The corresponding opening(s) may be, for example, slits, pockets, or openings configured to receive the one or more primary brackets **1002***a-c*. For example, each of the one or more primary brackets **1002***a-c* may be slid into or fit into a slit, pocket, or opening and the one or more primary brackets **1002***a-c* may latch onto the device.

[0093] In other embodiments, the one or more primary brackets **1002***a-c* are coupled to the device by attaching each of the one or more primary brackets **1002***a-c* to a corresponding component of the device. For example, the one or more primary brackets **1002***a-c* may be coupled to the device by attaching each of the one or more primary brackets **1002***a-c* to a clip, spring contact, latch, or any other device component capable of being attached to or coupled with the one or more primary brackets **1002***a-c*.

[0094] The one or more primary brackets **1002***a-c* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more one or more primary brackets **1002***a-c* may be a different conductive material than the material from which the enclosure **1001** is formed.

[0095] At least one of the one or more secondary brackets **1004***a-c* may be interposed between at least one of the one or more primary brackets **1002***a-c* and the at least one wall **1012** of the enclosure **1001**. The at least one secondary bracket **1004***a-c* may be configured to provide a layer of protection between the at least one primary bracket **1002***a-c* and the plurality of layers enclosed within the enclosure **1001**. For example, the at least one secondary bracket **1004***a-c* may be configured to prevent damage to the plurality of layers and/or to the enclosure **1001** when the at least one primary bracket **1002***a-c* is being connected (e.g., welded, laser welded, etc.) to the at least one wall **1012** of the enclosure **1001**.

[0096] The one or more secondary brackets **1004***a-c* may be formed of a rigid material, such as a metal alloy which may, for example, include stainless steel, aluminum, aluminum alloy, or other sufficiently rigid materials as would be known by a person of ordinary skill in the art. In an embodiment, the one or more secondary brackets **1004***a-c* may be the same material as the material from which the enclosure **1001** is formed. In an embodiment, the one or more secondary brackets **1004***a-c* may be the same material as the material from which the enclosure **1001** is formed and the one or more secondary brackets **1004***a-c* may be a different material than the one or more primary brackets **1002***a-c*.

[0097] In an embodiment, the one or more primary brackets **1002***a-c*, the one or more secondary brackets **1004***a-c*, and/or the at least one wall **1012** of the enclosure all have different thicknesses. The at least one wall **1012** of the enclosure **1001** may be thin relative to the one or more primary brackets **1002***a-c*. For example, the at least one wall **1012** of the enclosure **1001** may have a thickness that is less than a thickness of the one or more primary brackets **1002***a-c*. The one or more secondary brackets **1004***a-c* may have a thickness that is different than the thickness of the at least one wall **1012** of the enclosure **1001**. The one or more secondary brackets **1004***a-c* may have a thickness that is different than the thickness of the one or more primary brackets **1002***a-c*. For example, the one or more secondary brackets **1004***a-c* may have a thickness that is greater than a thickness of the at least one wall **1012** of the enclosure **1001**. The one or more secondary brackets **1004***a-c* may have a thickness that is less than a thickness of the one or more primary brackets **1002***a-c*.

[0098] In other embodiments, the one or more primary brackets **1002***a-c*, the one or more secondary brackets **1004***a-c*, and/or the at least one wall **1012** of the enclosure have the same thickness.

[0099] FIG. **11** illustrates a portable electronic device **1100**, in accordance with various aspects of the subject technology. The batteries **300**, **800**, **900**, or **1000** can generally be used in any type of electronic device. For example, FIG. **11** illustrates a portable electronic device **1100** which includes a processor **1102**, a memory **1104** and a display **1106**, which are all powered by the battery **300**. Portable electronic device **1100** may correspond to a laptop computer, tablet computer, mobile phone, personal digital assistant (PDA), digital music player, watch, and wearable device, and/or other type of battery-powered electronic device.

[0100] Battery **300** may correspond to a battery pack that includes one or more battery cells. Each battery cell may include a plurality of layers enclosed within an enclosure. One or more primary brackets may be connected to at least one wall of the enclosure. Each of the one or more primary brackets may configured to be coupled to the device **1100**. The battery cell may be configured to provide at least one component of the device **1100** with power when the one or more primary brackets are coupled to the device **1100**. A secondary bracket may be interposed between at least one of the one or more primary brackets and the at least one wall of the enclosure. The secondary bracket configured to provide a layer of protection between the at least one primary bracket and the plurality of layers.

[0101] While the portable electronic device **1100** is illustrated as including the battery **300**, it should be appreciated that, in other embodiments, the portable electronic device **1100** includes the battery **800**, the battery **900**, or the battery **1000** instead of the battery **300**.

[0102] FIG. **12** illustrates an example method **1200** for manufacturing the battery cell **300**, in accordance with various aspects of the subject technology. It should be understood that, for any process discussed herein, there can be additional, fewer, or alternative steps performed in similar or alternative orders, or in parallel, within the scope of the various embodiments unless otherwise stated.

[0103] At operation **1210**, at least one protector **304***a-c* may be connected to at least one wall **312** of the enclosure **301**. The at least one protector **304***a-c* may be connected to at least one wall of the enclosure **301** by welding (e.g., laser welding) the at least one protector **304***a-c* to at least one wall **312** of the enclosure **301**, such as from inside the enclosure **301**.

[0104] At operation **1220**, a plurality of layers **202** is inserted within the enclosure **301**, such as through an opening in the enclosure **301**. The plurality of layers **202** may comprise a cathode with an active coating, a separator, and an anode with an active coating. The plurality of layers **202** may be wound to form a jelly roll structure or can be stacked to form a stacked-cell structure.

[0105] At operation **1230**, the enclosure **310** may be filled with electrolyte. The plurality of layers **202**, for example, may be immersed in an electrolyte, which for example, can be a LiPF6-based electrolyte that can include Ethylene Carbonate (EC), Polypropylene Carbonate (PC), Ethyl Methyl Carbonate (EMC) or DiMethyl Carbonate (DMC). The electrolyte can also include additives such as Vinyl carbonate (VC) or Polyethylene Soltone (PS). The electrolyte can additionally be in the form of a solution or a gel.

[0106] At operation **1240**, at least one primary bracket **302***a-d* may be connected to the at least one protector **304***a-c*. The at least one primary bracket **302***a-d* may be connected to the at least one protector **304***a-c* by welding (e.g., laser welding) the at least one primary bracket **302***a-d* to the at least one protector **304***a-c*, such as from outside the enclosure **301**.

[0107] Although a variety of examples and other information was used to explain aspects within the scope of the appended claims, no limitation of the claims should be implied based on particular features or arrangements in such examples, as one of ordinary skill would be able to use these examples to derive a wide variety of implementations. Further and although some subject matter may have been described in language specific to examples of structural features and/or method steps, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to these described features or acts. For example, such functionality can be distributed differently or performed in components other than those identified herein. Rather, the described features and steps are disclosed as examples of components of systems and methods within the scope of the appended claims.

What is claimed is:

1. A battery pack comprising:
a plurality of layers; and
an enclosure comprising:
a first surface and a plurality of walls that extend from the first surface in a direction perpendicular to the first surface, wherein a portion of the first surface extends past at least one wall of the plurality of walls; and
a second surface configured to be connected to the plurality of walls to form a body configured to enclose the plurality of layers, and wherein the portion of the first surface is configured to be coupled to a device and the battery pack is configured to provide at least one component of the device with power when the portion of the first surface is coupled to the device.

2. The battery pack of claim **1**, wherein the portion of the first surface comprises at least one opening configured to receive a fastener, and wherein the portion of the first surface is configured to be coupled to the device when the at least one opening receives the fastener.

3. The battery pack of claim **1**, wherein the fastener comprises at least one of a screw, a rivet, a nail, a washer, and an anchor.

4. The battery pack of claim **1**, wherein at least one of the first surface, the second surface, and the plurality of walls is a material comprising stainless steel, aluminum, an aluminum alloy, or a combination thereof.

5. The battery pack of claim **1**, wherein the portion of the first surface is configured to be coupled to an opening in a device enclosure of the device.

6. The battery pack of claim **1**, wherein the portion of the first surface is configured to be coupled to a fastener in a device enclosure of the device.

7. The battery pack of claim **6**, wherein the fastener comprises at least one of a clip, a spring contact, or a latch.

8. A portable electronic device, comprising:
a set of components powered by a battery pack; and
a device enclosure configured to receive the battery pack, the battery pack comprising:
a first surface and a plurality of walls that extend from the first surface in a direction perpendicular to the first surface, wherein a portion of the first surface extends past at least one wall of the first plurality of walls; and
a second surface configured to be connected to the plurality of walls to form a body configured to enclose a plurality of layers, and wherein the portion of the first surface is configured to be coupled to the device enclosure and the battery pack is configured to provide at least one component of the device with power when the portion of the first surface is coupled to the device enclosure.

9. The portable electronic device of claim **8**, wherein the portion of the first surface comprises at least one opening configured to receive a fastener, and wherein the portion of the first surface is configured to be coupled to the device when each of the openings receives the fastener.

10. The portable electronic device of claim **9**, wherein the fastener comprises at least one of a screw, a rivet, a nail, a washer, and an anchor.

11. The portable electronic device of claim **8**, wherein at least one of the first surface, the second surface, and the plurality of walls is a material comprising stainless steel, aluminum, an aluminum alloy, or a combination thereof.

12. The portable electronic device of claim **8**, wherein the device enclosure comprises a fastener configured to couple to the portion of the first surface.

13. The portable electronic device of claim **12**, wherein the fastener comprises at least one of a clip, a spring contact, or a latch.

14. The portable electronic device of claim **8**, wherein the device enclosure comprises an opening configured to receive the portion of the first surface, and wherein the portion of the first surface is coupled to the device enclosure when the opening receives the portion of the first surface.

15. A battery enclosure comprising:
a first surface and a plurality of walls that extend from the first surface in a direction perpendicular to the first surface, wherein a portion of the first surface extends past at least one wall of the first plurality of walls; and
a second surface connected to the second plurality of walls to form a body configured to enclose a plurality of layers, wherein the portion of the first surface is configured to be coupled to a device enclosure, and wherein the battery pack is configured to provide at least one component of the device with power when the portion of the first surface is coupled to the device enclosure.

16. The battery enclosure of claim **15**, wherein the portion of the first surface comprises at least one opening configured to receive a fastener, and wherein the portion of the first surface is configured to be coupled to the device enclosure when each of the openings receives the fastener.

17. The battery enclosure of claim **16**, wherein the fastener comprises at least one of a screw a rivet, a nail, a washer, and an anchor.

18. The battery enclosure of claim **15**, wherein the device enclosure comprises a fastener configured to couple to the portion of the first surface.

19. The battery enclosure of claim **18**, wherein the fastener comprises at least one of a clip, spring contact, or latch.

20. The battery enclosure of claim **15**, wherein the device enclosure comprises an opening configured to receive the portion of the first surface, and wherein the portion of the first surface is coupled to the device enclosure when the opening receives the portion of the first surface.

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