(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 October 2018 (25.10.2018)

WIPO | PCT

(10) International Publication Number
WO 2018/194545 A1

(51) International Patent Classification:
H05K 5/04 (2006.01) *H05K 10/00* (2006.01)
H05K 7/14 (2006.01)

(21) International Application Number:
PCT/US2017/027943

(22) International Filing Date:
17 April 2017 (17.04.2017)

(25) Filing Language: English

(26) Publication Language: English

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

(54) Title: HOUSING FOR ELECTRONIC DEVICES

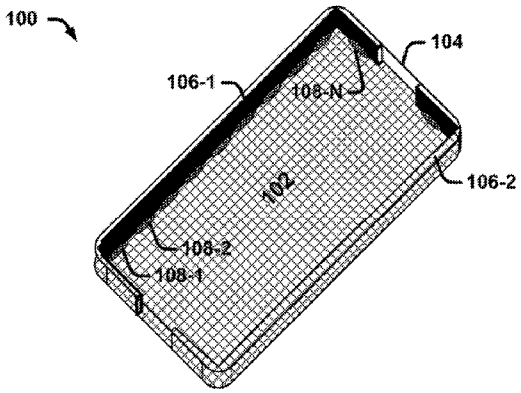

Fig. 1

(57) Abstract: The present subject matter relates to housings for electronic devices. In an example implementation of the present subject matter, techniques for fabricating such housings are described. In an example, a housing includes a metal body to house components of the electronic device, where the metal body comprises of a base and walls extending from edges of the base. The housing further includes a supporting bracket, laser welded to the metal body, comprising a plurality of bends to provide structural support to the metal body. In an example, the supporting bracket conforms to shape of the edges of the base.

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WO 2018/194545 A1

TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

— *with international search report (Art. 21(3))*

HOUSINGS FOR ELECTRONIC DEVICES

BACKGROUND

[0001] Electronic devices, such as stylus, display devices, laptops and mobile phones include a housing, which also forms an exterior body of the electronic devices. The housing is made of different substrates, such as metals, fibers, and composite materials and houses the various components of the electronic device. For the electronic devices to be durable, the housing of the electronic device should be able to withstand wear and tear in course of its regular use. At the same time, the housing of the electronic device should also be able to withstand minor impacts, such as falls and crashes.

Brief Description of Drawings

[0002] The following detailed description references the drawings, wherein:

[0003] Fig. 1 illustrates a housing of an electronic device including a supporting bracket, according to an example implementation of the present subject matter;

[0004] Fig. 2 illustrates integration of a supporting bracket with a metal body to form a housing of an electronic device, according to an example implementation of the present subject matter;

[0005] Fig. 3 illustrates a supporting bracket for integration with a metal body to form a housing of an electronic device, according to an example implementation of the present subject matter;

[0006] Fig. 4 illustrates a cross-section view of the housing for an electronic device, according to an example implementation of the present subject matter;

[0007] Fig. 5 illustrates an electronic device comprising a housing, according to an example implementation of the present subject matter; and

[0008] Fig 6 illustrates a method of fabricating a housing for an electronic device, according to an example implementation of the present subject matter.

DETAILED DESCRIPTION

[0009] Housings of electronic devices accommodate various components, such as motherboards, cameras, displays, antennas, and input/output (I/O) units. With the electronic devices becoming smaller and lighter, the housings are also acting as an outer body of the electronic devices. To provide durable housings which protect the components of the electronic devices while withstanding regular wear and tear, metal bodies are generally used as substrates of the housings. However, housings made of light metals, such as aluminum, do not provide sufficient protection to components of the electronic devices. Therefore, to provide further support to the housings of electronic devices, support structures, such as reinforcing strips are used. However, the support structures are generally made of materials such as plastics, and are generally coupled to the housing by thermal bonding. Such thermally bonded materials are neither stable, nor do they provide sufficient support to the housing to withstand prolonged wear and tear.

[0010] According to an aspect of the present subject matter, techniques for providing support to a metal body of a housing of an electronic device are described. The described techniques provide support to the metal body of the housing to allow the housing to withstand wear and tear, and provide protection to the components of the electronic device. Therefore, the housings fabricated based on the described techniques can enhance robustness of the electronic device.

[0011] In an example implementation of the present subject matter, a housing of an electronic device includes a metal body having a base, along with multiple edges and walls extending from such edges. Further, the metal body is coupled to a supporting bracket to offer structural support to the metal body of the housing. In an example, the supporting bracket includes two or more bends, such that while providing strength to a base of the metal body, the supporting bracket also provides structural support to walls of the metal body.

[0012] In an example implementation, the supporting bracket conforms to the shape of at least two edges of the base, and is laser welded to the metal body of the housing. Further, the supporting bracket also abuts at least one of, the base and a wall of the metal body, to provide structural support to the metal body. In

another example, the bends of the supporting bracket may also conform to the shape of one or more walls of the metal body.

[0013] In an example, the supporting bracket may be a metal or a metal alloy such that the laser welding between the supporting bracket and the metal body provides a strong adhesion and a resilient joint. The laser welding of the supporting bracket to the metal body provides structural strength to the housing, and also reduces the stacking size of the housing of electronic devices. Further, the laser welded supporting bracket provides protection to the metal body of the housing against deformation and regular wear and tears.

[0014] The present subject matter further describes example techniques for fabrication a housing for a smartphone. The housing of the smartphone may include a metal body with a rectangular base with walls extending from each edge of the rectangular base. To provide support to the metal body, a rectangular supporting bracket may be used. The rectangular supporting bracket may have two bends at about 90 degrees to form a 'C' shaped supporting bracket. Further, the 'C' shaped supporting bracket may be laser welded to the base of the metal body, such that the supporting bracket abuts the walls of the metal body. The laser welded 'C' shaped supporting bracket provides structural support to the metal body, and therefore, provide a rugged housing for the smartphone.

[0015] It would be noted that the supporting bracket used for providing support to the metal body may be of different shapes and sizes, depending on the geometry of the metal body. Further, it would also be noted that multiple supporting brackets may be included in a housing, laser welded to the metal body, to provide structural support to the base and walls of the metal body.

[0016] The above techniques are further described with reference to Figs. 1-6. It should be noted that the description and the figures merely illustrate the principles of the present subject matter along with examples described herein, and should not be construed as a limitation to the present subject matter. It is thus understood that various arrangements may be devised that, although not explicitly described or shown herein, embody the principles of the present subject matter. Moreover, all statements herein reciting principles, aspects, and

implementations of the present subject matter, as well as specific examples thereof, are intended to encompass equivalents thereof.

[0017] Fig. 1 illustrates a housing 100 of an electronic device including a supporting bracket, according to an example implementation of the present subject matter. The housing 100 may include a metal body comprising of a base 102 and walls 104 extending from the edges of the base 102. Further, the metal body may include two supporting brackets 106-1 and 106-2, laser welded to the base 102. For the ease of explanation, the supporting brackets 106-1 and 106-2 have been collectively referred to as supporting brackets 106, hereinafter.

[0018] In an example implementation of the present subject matter, the base 102 is made of a light metal, such as magnesium, aluminium, steel, or an alloy thereof. Further, thickness of the base 102 of the metal body may be about 0.5 to 1 millimetre (mm). Although the base 102 has been depicted to be rectangular, the shape of the base 102 may vary, depending upon the shape of the housing 100. For example, the base 102 may be hexagonal with 6 edges and corresponding 6 walls 104 extending each edge. Similarly, the base 102 may be a quadrilateral including a square, rectangle, etc., to have 4 edges and corresponding 4 walls 104, each wall extending from each edge of the base 102. Thus, it would be noted that the base 102 may include multiple edges, and the shape of the edge may vary depending upon the shape of the housing 100.

[0019] Further, the walls 104 extending from the edges of the base 102 may also be made of a light metal, such as magnesium, aluminium, steel, or an alloy thereof. Furthermore, the height and width of the walls 104 may vary depending upon an electronic device requisite, and the structural strength to be provided to the housing 100. In an example implementation, if the base 102 is octagonal in shape, 8 walls 104 may extend from the edges of the octagonal base 102.

[0020] It would be noted that in an example implementation of the present subject matter, the walls 104 may extend from some of the edges of the base 102, while some of the edges of the base 102 may not include any walls. For example, an electronic device having a curved display, curved towards one edge of the electronic device, may include a housing with walls 104 extending from all edges, but from the edge towards which the display of the electronic device is

curved. In such a scenario, the base 102 may include no wall on one such edge while all the other edges may extend walls 104.

[0021] In an example implementation of the present subject matter, the supporting brackets 106 may include at least two bends, such that they conform to at least three edges of the base 102, or may conform to the shape of one or more walls of the metal body. For example, if the base 102 is rectangular in shape, a supporting bracket with two bends at about 90 degrees, forming a '∏' shaped bracket may be utilized. Also, in another example implementation, a supporting bracket with three bends at about 90 degrees, forming a ' ⊏ ' shaped bracket may be utilized. It would be noted that if the base 102 includes multiple edges, one or more supporting brackets 106 may be utilized to provide support to the base 102 and the walls 104. For example, in the above described scenario, if the base 102 includes 8 edges, two or more supporting brackets 106 may be utilized to provide support to the base 102 and the walls 104. Further, the supporting brackets 106 may include two or more bends to provide support to multiple walls 104 of the housing 100. In an example implementation of the present subject matter, the thickness of the supporting bracket is about 0.3 to 0.5 mm. Therefore, various geometries of the metal body and that of the supporting brackets 106 may be utilized to form the housing 100.

[0022] In an example implementation of the present subject matter, the supporting brackets 106 are laser welded to the metal body. The laser welding may provide strong adhesion between the metal body and the supporting brackets 106. In an example, the supporting brackets 106 are laser welded with the base 102 of the metal body at different welding points, such as 108-1, 08-2, ..., 108-N. For the ease of explanation, the welding points, such as 108-1, 08-2, ..., 108-N have been commonly referred to as welding points 108, hereinafter.

[0023] In another example implementation, the supporting brackets 106 may be laser welded to the walls 104 of the metal body, instead of the base 102, to provide support to the walls 104. In another example, the supporting brackets 106 may be laser welded to both the walls 104 as well as the base 102 of the metal body. Therefore, it would be noted that the supporting brackets 106 are laser welded to the metal body to provide support to the base 102 and the walls 104,

and the welding points 108 may either be included at the base 102, or at the walls 104, or both.

[0024] Different type of supporting brackets 106 and their integration to a metal body to form the housing 100 has been further described in reference to Fig.2 and Fig. 3.

[0025] Fig. 2 illustrates integration of a supporting bracket with a metal body to form the housing 100 of an electronic device, according to an example implementation of the present subject matter. Two supporting brackets 106, each including two bends at about 90 degrees is formed to fit within a metal body having the base 102 and the walls 104. The bends of the supporting brackets 106 are such that the supporting brackets 106 conform to at least three edges of the base 102, or to the shape of one or more walls of the metal body. In an example implementation of the present subject matter, the supporting brackets 106 are placed inside the metal body such that the supporting brackets 106 abut the base 102 and the walls 104.

[0026] Further, each of the supporting brackets 106 is laser welded to form the housing 100. In an example implementation of the present subject matter, the laser welding is done at the welding points 108. As described earlier, the welding points 108 may either be located at the base 102 of the metal body, or may also be located at the walls 104. In another implementation of the present subject matter, some welding points 108 are located at the base 102, while other welding points 108 are located at the walls 104. Such a laser welding between the supporting brackets 106 and the metal body may allow string adhesion between the supporting brackets 106 and the metal body, thereby providing structural support the base 102 and walls 104, and providing a sturdy housing 100.

[0027] Fig. 3 illustrates a supporting bracket for integration with a metal body to form the housing 100 of an electronic device, according to an example implementation of the present subject matter.

[0028] As described earlier, supporting brackets 106 of different shapes and sizes may be utilized to provide support to the base 102 and walls 104 of the metal body, and form the housing 100. In an example, the supporting brackets 106 may have different cross-sections, such as a 'C' shaped cross-section, an 'I'

shaped cross-section, an inverted 'T' shaped cross-section, a 'U' shaped cross-section, a 'Z' shaped cross-section, a 'H' shaped cross-section, and a 'L' shaped cross-section.

[0029] In an example implementation of the present subject matter, the supporting brackets 106 may include a groove, to provide a 'C' shaped cross-section to the supporting brackets 106. Cross-sectional view 302, of one of the supporting brackets 106, depicts such a groove, and a corresponding 'C' shaped cross-section of the supporting bracket 106-1. It would be noted that since the supporting bracket 106-1 includes two bends, it forms a C shaped supporting bracket 106-1. Further, the C shaped supporting bracket 106-1 includes a groove such that it has a 'C' shaped cross-section. Thus, it would be noted that a 'C' shaped bracket having different cross-sections, such as 'I' and 'T', and 'U' may be utilized to provide support to the base 102 and the walls 104 of the metal body.

[0030] It would further be noted that either a single supporting bracket or more than two supporting brackets may also be utilized to provide support to the metal body. For example, 4 supporting brackets may be utilized in case of an octagonal base 102 of the metal body.

[0031] In an example implementation of the present subject matter, a lower overhang of the supporting bracket may be longer than an upper overhang of the supporting bracket, as shown in view 302. Such an arrangement may be provided to allow laser welding between the supporting bracket and the base 102. In another example, the upper overhang and the lower overhang of the supporting bracket may be of similar lengths. Further, in another implementation, the supporting bracket may include a single overhang, i.e., the lower overhang. It would be noted that in such an implementation, the supporting bracket may have a 'L' shaped cross-section.

[0032] Fig. 4 illustrates a cross-section view of the housing 100, for an electronic device, according to an example implementation of the present subject matter. The supporting brackets 106 are laser welded with the base 102 of the metal body, and abut the walls 104.

[0033] In an example implementation of the present subject matter, the metal body is made of a light metal substrate 402, anodized to form an anodized layer

404 over the metal body. It would be noted that the anodized layer 404 may provide corrosion-resistance to the metal body and increasing durability of the meta body. It would be noted that the substrate 402 may be forged, or stamped to form the base 102 and the walls 104.

[0034] As described earlier, the supporting brackets 106 may be laser welded to the base 102 of the metal body at the welding points 108. In an example, the supporting brackets 106 may include a chamfered edge to provide stability to the supporting brackets 106. In an example, each supporting bracket may be stamped to form the bends and the grooves. As described earlier, the bends in the supporting brackets 106 may conform to the edges of the base 102 and the grooves of the supporting brackets 106 may correspond to the cross-section of the supporting brackets 106.

[0035] Fig. 5 illustrates an electronic device 502 comprising the housing 100, according to an example implementation of the present subject matter. The electronic device 502 may include, but are not limited to, servers, workstations, all-in-one computers, laptops, smartphones, personal digital assistants (PDAs), tablets and other handheld portable devices.

[0036] In an example implementation of the present subject matter, the electronic device 502 may include the housing 100 comprising of a metal body which includes the base 102 and the walls 104 extending from the edges of the base 102. Further, the housing 100 may include one or more supporting brackets, such as the supporting brackets 106-1 and 106-2. The supporting brackets may be laser welded to the metal body of the housing 100 to provide strong adhesion between the supporting brackets and the metal body.

[0037] In an example, the supporting brackets may include two or more bends which conform to shape of at least one wall of the metal body to provide support to the at least one wall of the metal body. In an example implementation, the housing of the electronic device 502 may form the outer body of the electronic device 502. In another example, an outer body may be provided over the housing 100 of the electronic device 502.

[0038] Fig. 6 illustrates a method 600 of fabricating a housing for an electronic device, according to an example implementation of the present subject

matter. While the method 600 is described in context of fabrication of the housing 100 for devices, the method may be utilized for fabrication of other housings for electronic devices.

[0039] Referring to Fig. 6, at block 602, a metal body of a housing of an electronic device is anodized to form an oxide layer over the metal body. The anodized metal body may include a base and walls extending from edges of the base. In an example implementation of the present subject matter, the metal body is surface cleaned for anodizing. Further, the anodized metal body may also be forged, or stamped to form the base and the walls.

[0040] In an example, the metal body is made of a light metal or their alloys, such as magnesium, aluminium, and steel. Further, the thickness and height of the walls, extending from the edges of the base, may depend on the electronic device and its design.

[0041] At block 604, a supporting bracket is laser welded to the metal body to provide support to the metal body of the housing. In an example implementation of the present subject matter, the supporting bracket supporting bracket confirms to edges of the base and abuts a wall of the metal body. Further, the supporting bracket is laser welded to the base of the metal body. In another example, the supporting bracket is laser welded to the walls of the metal body.

[0042] The supporting bracket may be made of a light metal or alloys thereof, such as magnesium, aluminium, and steel. In an example, the supporting bracket may have a cross-section that is 'L' shaped, 'I' shaped, 'T' shaped, 'U' shaped, 'H' shaped, and 'Z' shaped. The different cross-sections of the supporting brackets may provide requisite support to the metal body to provide a rugged and sturdy housing 100.

[0043] Although examples for the present disclosure have been described in language specific to structural features and/or methods, it should be understood that the appended claims are not necessarily limited to the specific features or methods described. Rather, the specific features and methods are disclosed and explained as examples of the present disclosure.

We claim:

1. A housing for an electronic device comprising:

a metal body to house components of the electronic device, the metal body comprising a base and walls extending from edges of the base; and

a supporting bracket, laser welded to the metal body, comprising a plurality of bends to provide structural support to the metal body, wherein the supporting bracket abuts the base and a wall of the metal body, and wherein the supporting bracket conforms to shape of the edges of the base.

2. The housing as claimed in claim 1, wherein the plurality of bends of the supporting bracket provides support to the wall of the metal body.

3. The housing as claimed in claim 1, wherein thickness of the base of the metal body is about 0.5 to 1 millimetre (mm), and wherein the thickness of the supporting bracket is about 0.3 to 0.5 mm.

4. The housing as claimed in claim 1, wherein the plurality of bends comprises two bends to form a C shaped supporting bracket.

5. The housing as claimed in claim 1, wherein the metal body and the supporting bracket are made of one of magnesium, aluminium, steel, and alloys thereof.

6. The housing as claimed in claim 1, wherein the supporting bracket has one of an I, C, T, U, Z, H, and L shaped cross-section.

7. The housing as claimed in claim 1, wherein in cross-section the supporting bracket comprises a chamfered edge.

8. A method comprising:

anodizing a metal body of a housing of an electronic device to form an oxide layer over the metal body, wherein the metal body comprises a base and walls extending from edges of the base; and

laser welding a supporting bracket to the metal body to provide support to the metal body of the housing, wherein the supporting bracket comprises a plurality of bends and conforms to edges of the base, and wherein the supporting bracket abuts a wall of the metal body.

9. The method as claimed in claim 8 further comprising forging the metal body to form the base and the walls.

10. The method as claimed in claim 8 further comprising stamping the metal body to form the base and the walls.

11. The method as claimed in claim 8 further comprising surface cleaning the metal body for the anodizing.

12. The method as claimed in claim 8, wherein the method further comprises stamping the supporting bracket to form the plurality of bends in the supporting bracket, and wherein the plurality of bends provide support to at least one wall of the metal body.

13. An electronic device comprising:

a metal body to form a base and walls extending from edges of the base, wherein the metal body is to house components of the electronic device; and

a supporting bracket laser welded to the base of the metal body to provide structural support to the metal body, wherein the supporting bracket comprises of a plurality of bends to conform to the walls of the metal body, and wherein the supporting bracket abuts the base of the metal body.

14. The electronic device as claimed in claim 13, wherein in cross-section the supporting bracket comprises a chamfered edge.

15. The electronic device as claimed in claim 13, wherein the metal body and the supporting bracket are made of one of magnesium, aluminium, steel, and alloys thereof.

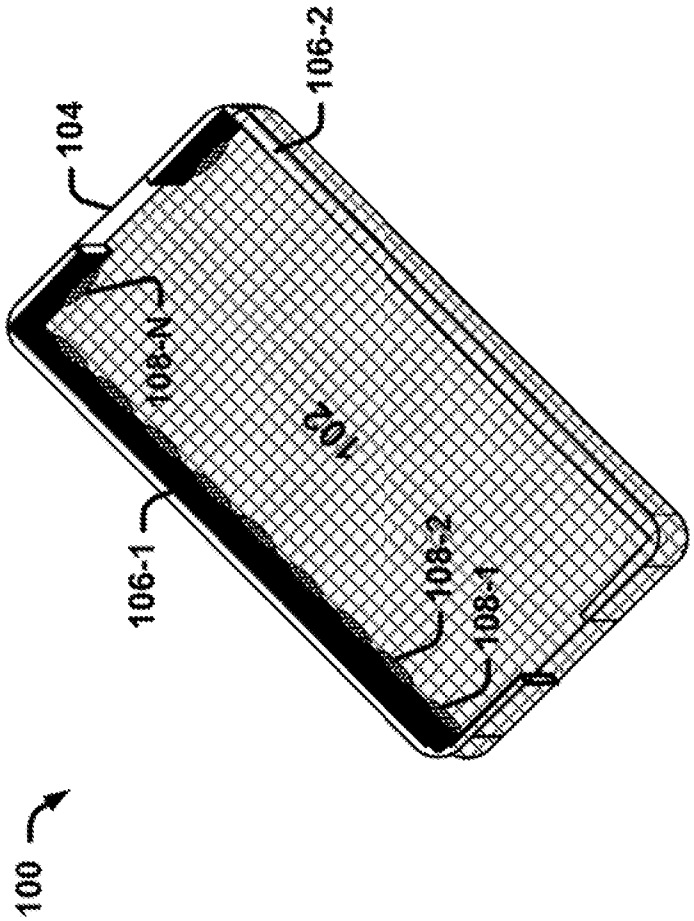

Fig. 1

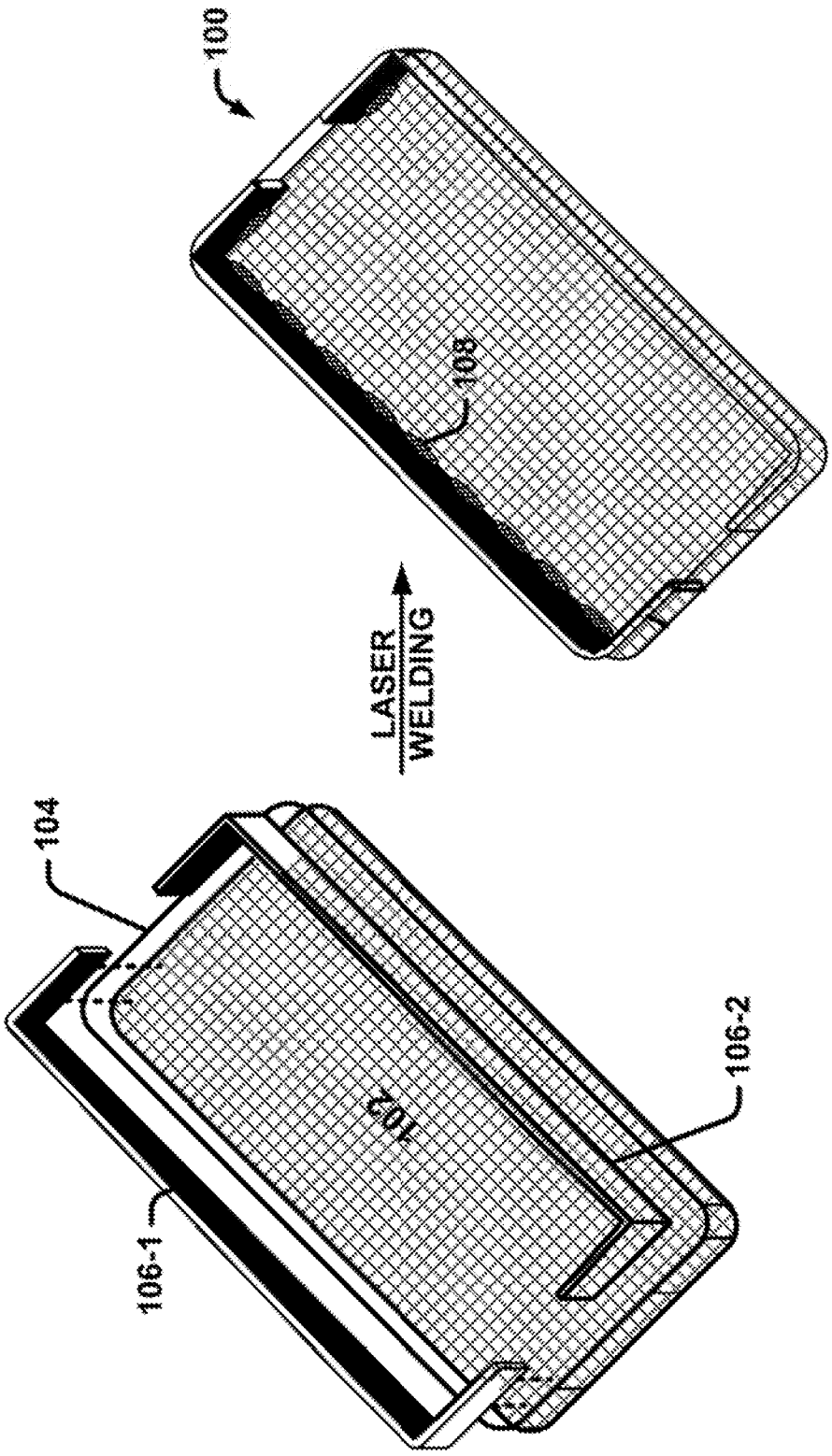

Fig. 2

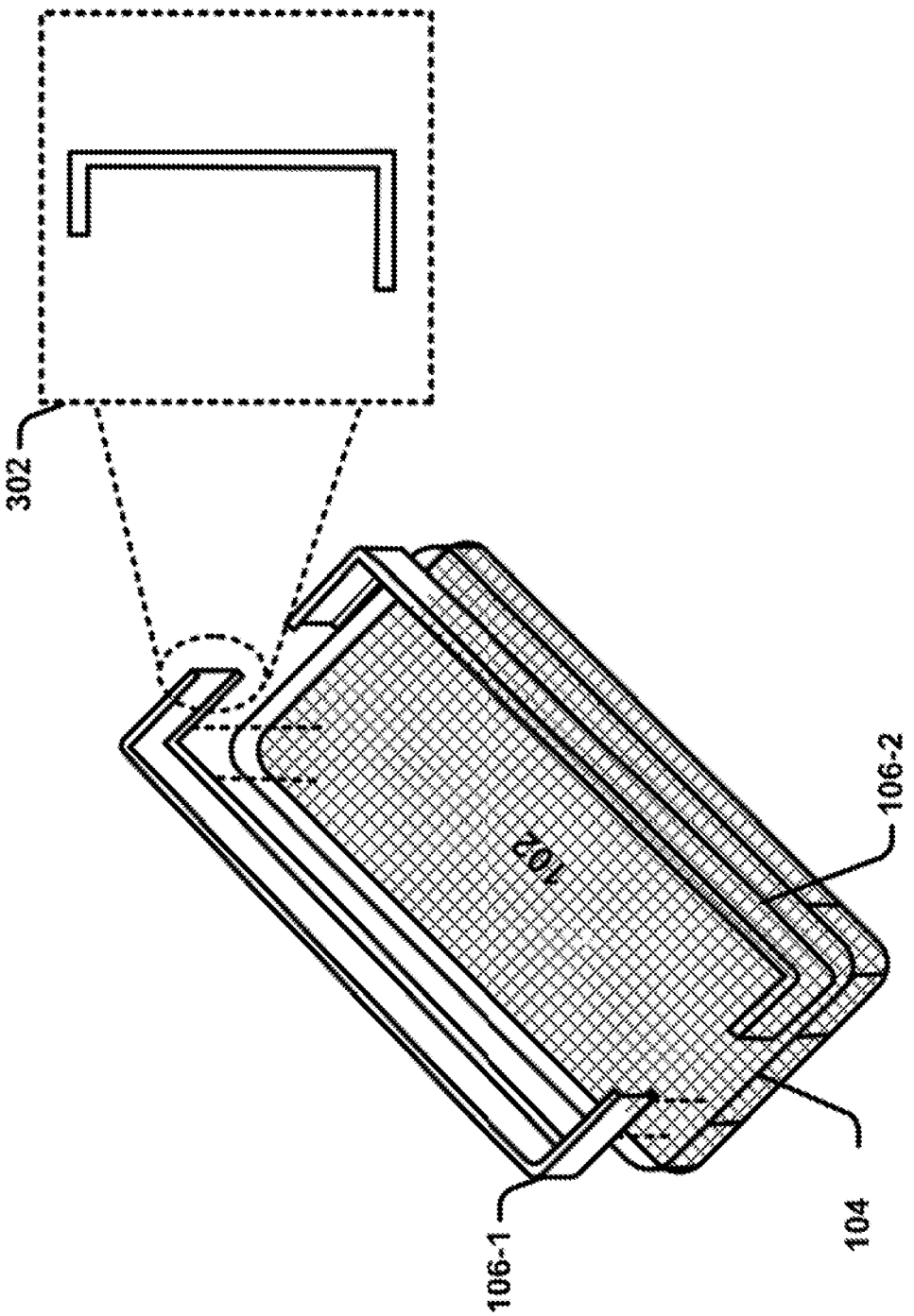

Fig. 3

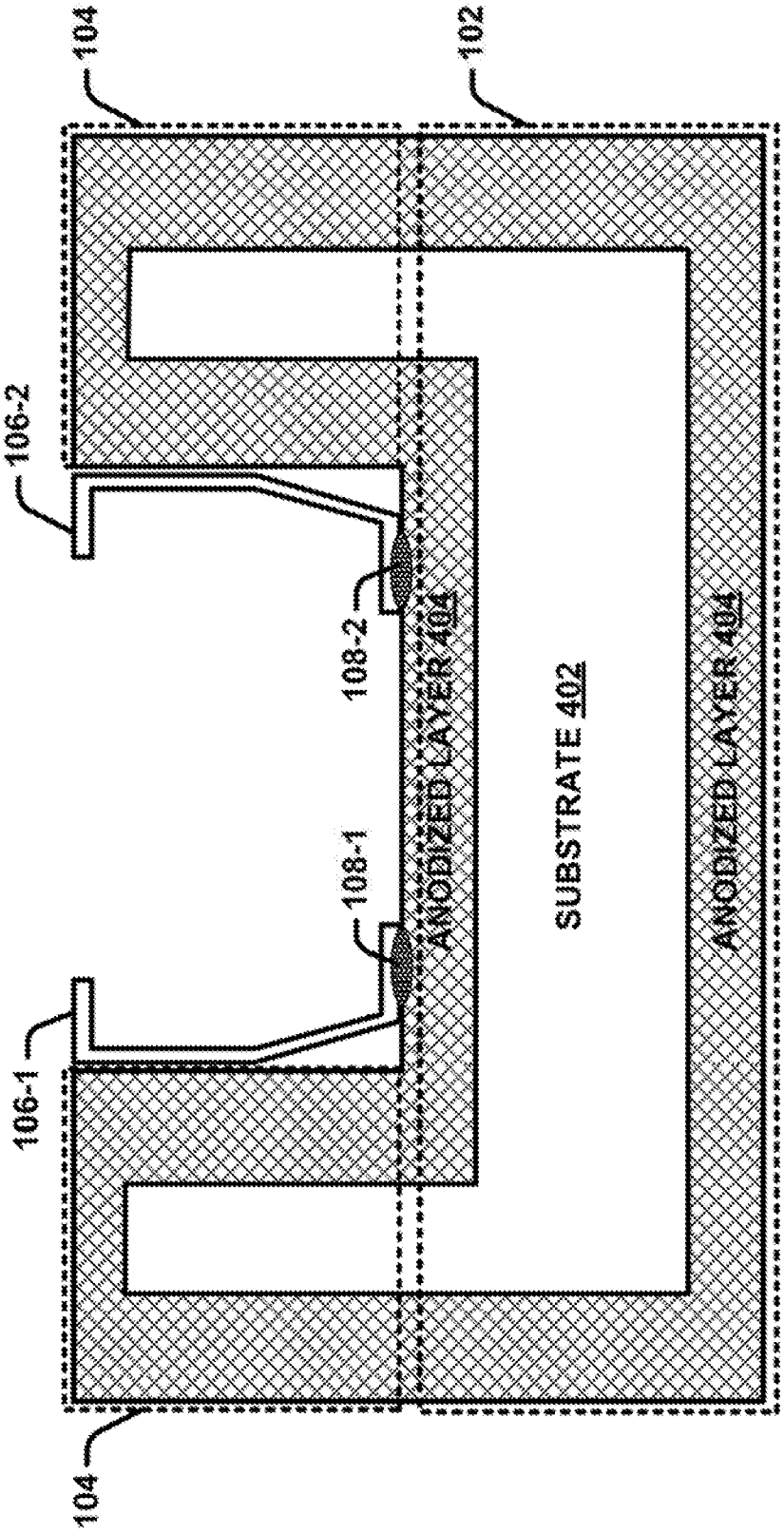
104
102
106-2
108-2
ANODIZED LAYER 404
SUBSTRATE 402
ANODIZED LAYER 404
108-1
106-1
104

Fig. 4

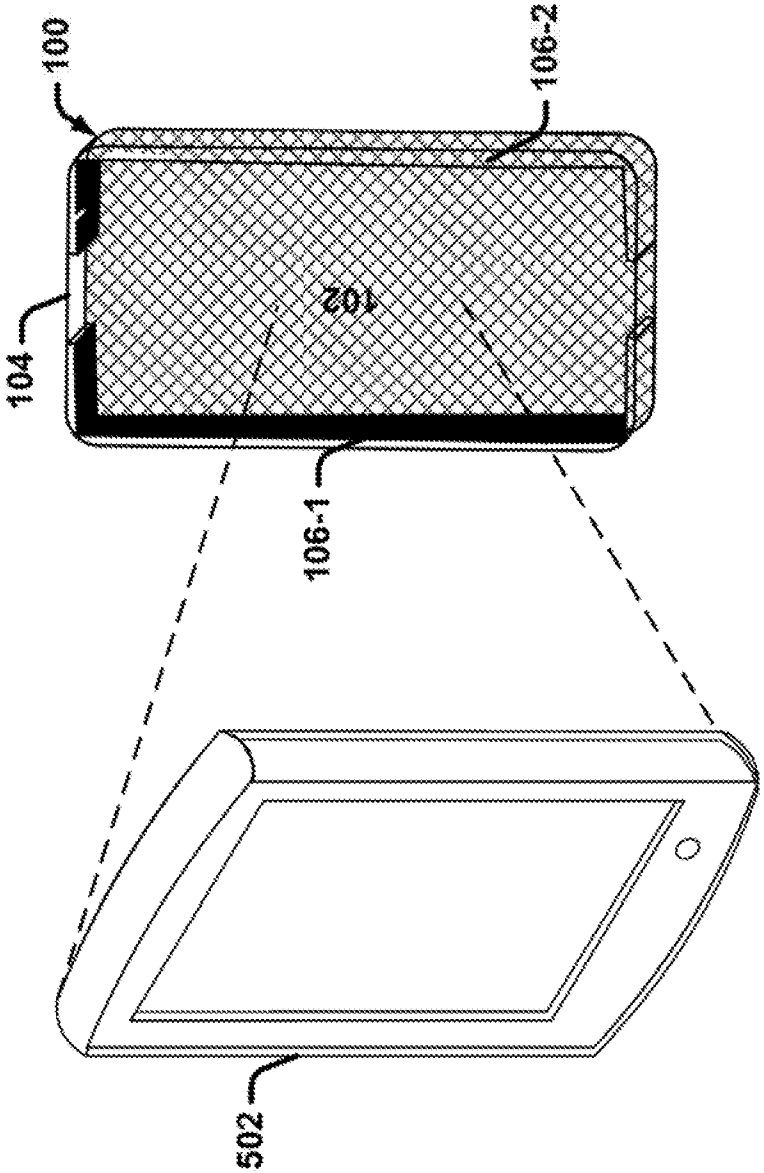

Fig. 5

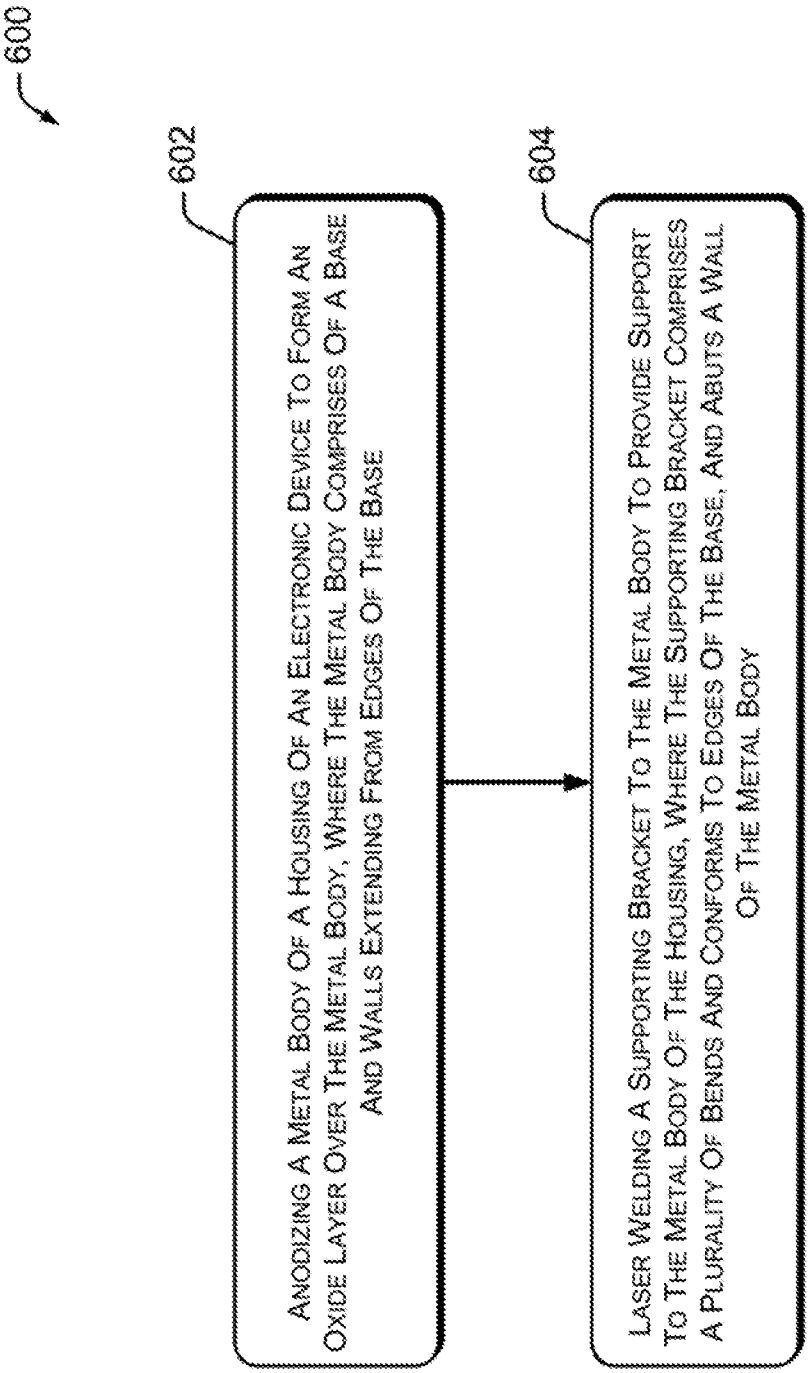
600
602
ANODIZING A METAL BODY OF A HOUSING OF AN ELECTRONIC DEVICE TO FORM AN OXIDE LAYER OVER THE METAL BODY, WHERE THE METAL BODY COMPRISES OF A BASE AND WALLS EXTENDING FROM EDGES OF THE BASE
604
LASER WELDING A SUPPORTING BRACKET TO THE METAL BODY TO PROVIDE SUPPORT TO THE METAL BODY OF THE HOUSING, WHERE THE SUPPORTING BRACKET COMPRISES A PLURALITY OF BENDS AND CONFORMS TO EDGES OF THE BASE, AND ABUTS A WALL OF THE METAL BODY

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2017/027943

A. CLASSIFICATION OF SUBJECT MATTER

H05K 5/04 *(2006.01)*
H05K 7/14 *(2006.01)*
H05K 10/00 *(2006.01)*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H05K 5/04, 7/14, 10/00, B32B 3/00,

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CIPO, DEPATISnet, E-Library, EAPATIS, Esp@cenet, Google, KIPRIS, Patentscope, PatSearch (RUPTO internal), PubMed, RUPTO, Rambler, SCOPUS, SIPO, USPTO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/0077221 A1 (Z124) 28.03.2013, fig. 7, 9, 26-27, abstract, paragraphs [0031], [0124], [0125], [0152], [0243], [0255], [0259], [0261], [0284]	1-7, 13-15
Y		8-12
Y	US 2016/0302319 A1 (APPLE INC.) 13.10.2016, paragraphs [0029], [0035], [0048], [0057]	8-12
Y	EP 2176049 B1 (APPLE INC.) 21.09.2016, paragraph [0033]	9
Y	US 2014/0268598 A1 (APPLE INC) 18.09.2014, paragraphs [0035], [0045]	10

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 November 2017 (15.11.2017)	30 November 2017 (30.11.2017)

Name and mailing address of the ISA/RU:	Authorized officer
Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	O. Ryzhkova Telephone No. (495)531-64-81