

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZHUHAI COSMX BATTERY CO., LTD.,

Petitioner,

v.

NINGDE AMPEREX TECHNOLOGY LIMITED,

Patent Owner.

Case No. IPR2023-00585
U.S. Patent No. 11,329,352

PETITION FOR *INTER PARTES* REVIEW

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LIST OF EXHIBITS

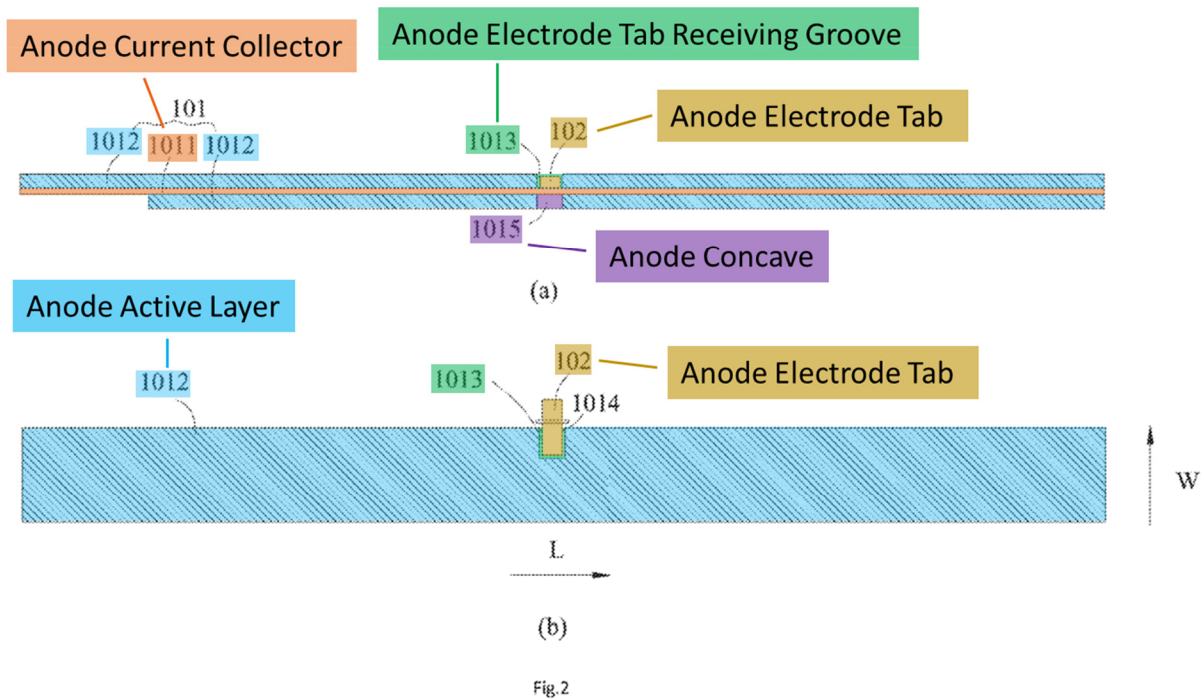
Exhibit	Description
Ex. 1001	U.S. Patent No. 11,329,352 B2 to Guo et al.
Ex. 1002	Declaration of Dr. Ulrich von Sacken
Ex. 1003	Prosecution History of U.S. Pat. No. 11,329,352
Ex. 1004	Chinese Patent App. Pub. No. CN 104157914 A to Wang et al. (“Wang”)
Ex. 1005	Chinese Patent App. Pub. No. CN 101826609 A to Deng et al. (“Deng”)
Ex. 1006	U.S. Patent App. Pub. No. 2011/0159344 to Kobayashi et al. (“Kobayashi”)
Ex. 1007	U.S. Patent App. Pub. No. 2013/0052499 A1 to Hasegawa et al. (“Hasegawa”)
Ex. 1008	Chinese Pat. App. Pub. No. CN 105514352 A to Zhu et al.
Ex. 1009	Olof Ramström, <i>Scientific Background on the Nobel Prize in Chemistry 2019, Lithium-Ion Batteries</i> , The Royal Swedish Academy of Sciences (Oct. 9, 2019).
Ex. 1010	U.S. Patent No. 8,969,756 to Dougherty et al.
Ex. 1011	U.S. Patent App. Pub. No. 2012/0052295 to Iwata et al.
Ex. 1012	U.S. Patent App. Pub. No. 2014/0042121 to Zhang et al.
Ex. 1013	Chinese Patent Publication No. CN 202839841 U to Zhou (“Zhou”)
Ex. 1014	Patent Owner’s Complaint of June 24, 2022, filed in <i>Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co., Ltd.</i> , Civ. No. 2:22-cv-00232-JRG (E.D. Tex.)

Exhibit	Description
Ex. 1015	Docket Control Order dated December 12, 2022, in <i>Ningde Ampere Tech. Ltd. v. Zhuhai CosMX Battery Co., Ltd.</i> , Civ. No. 2:22-cv-00232-JRG (E.D. Tex.)
Ex. 1016	United States District Court Judicial Caseload Profile - Statistics through March 31, 2022

I. INTRODUCTION

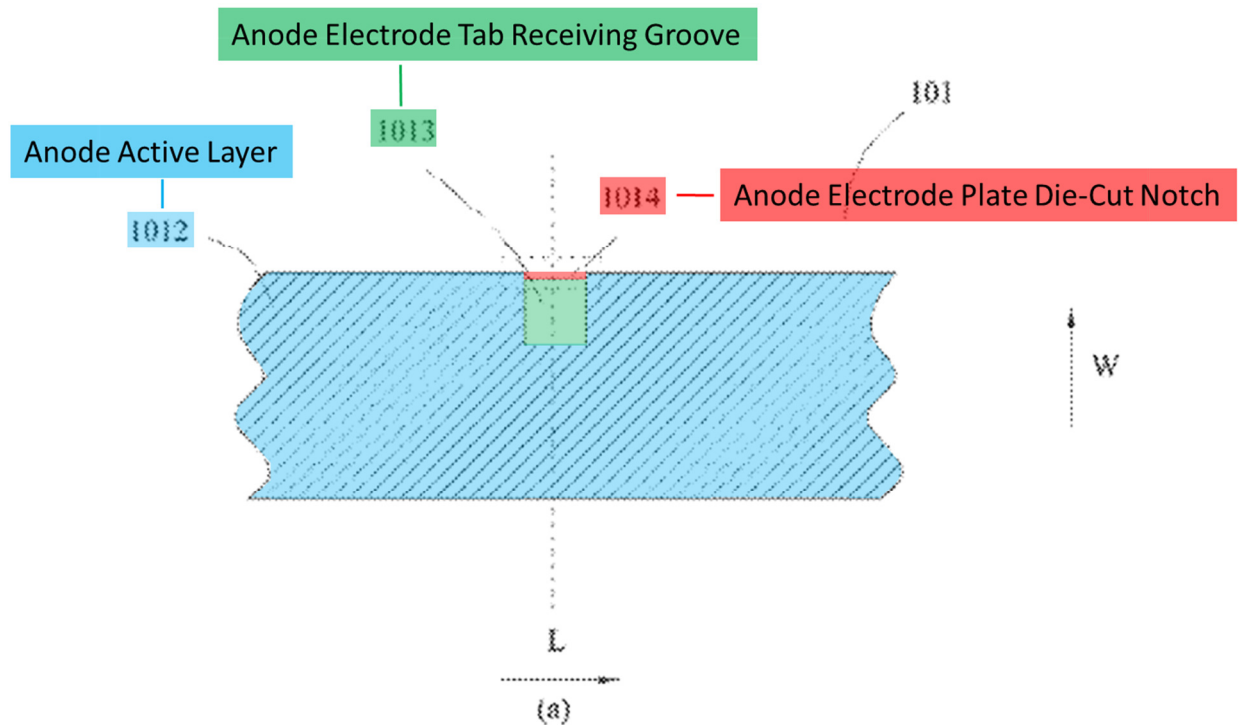
Petitioner Zhuhai CosMX Battery Co., Ltd., requests *inter partes* review of claims 1-3 and 5-12 of U.S. Patent No. 11,329,352 (“the ’352 patent,” Ex. 1001), assigned on its face to Ningde Amperex Technology Ltd.

The ’352 patent relates to a secondary battery with anode and cathode electrode plates that each include a respective current collector, electrode tab, and active material layer. Ex. 1001, 1:43-2:40, Figs. 2a, 2b. These features are shown in the anode electrode plate of annotated ’352 patent Figures 2(a) and 2(b) below. Ex. 1001, Figs. 2a, 2b; Ex. 1002, ¶31.



The anode and cathode electrode plates each include an “electrode tab receiving groove,” through which the electrode tab is electrically connected to the

current collector, and an “electrode plate die-cut notch” located on a side edge of each electrode tab receiving groove. Ex. 1001, 1:43-2:40, Fig. 5(a); Ex. 1002, ¶¶31-32.

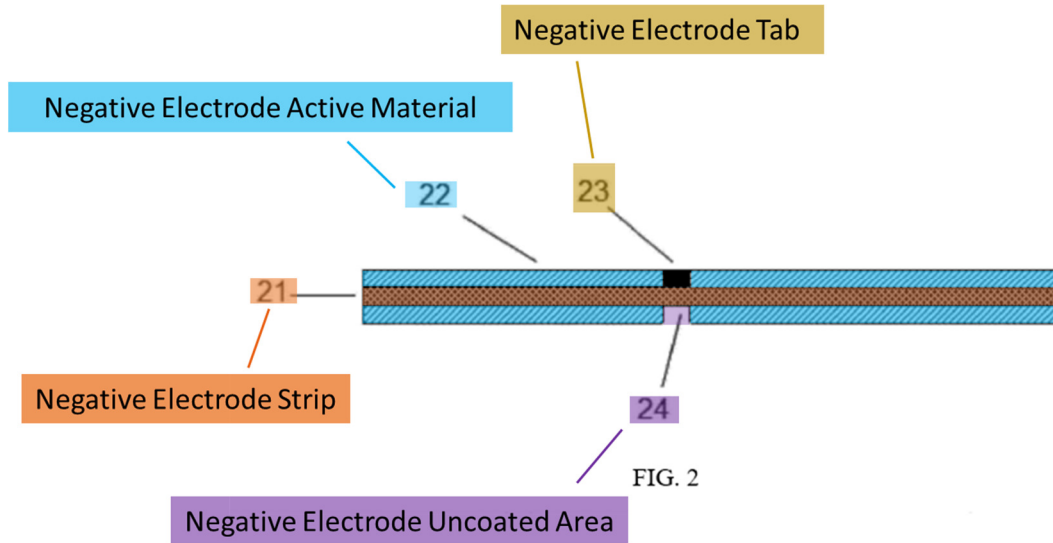


The '352 patent states that its electrode plate notch “remove[s] the burrs formed on the current collector,” thus “effectively preventing the secondary battery from generating internal short circuit, and improving the safety performance of the secondary battery while ensuring a high energy density.” Ex. 1001, 1:43-2:40.

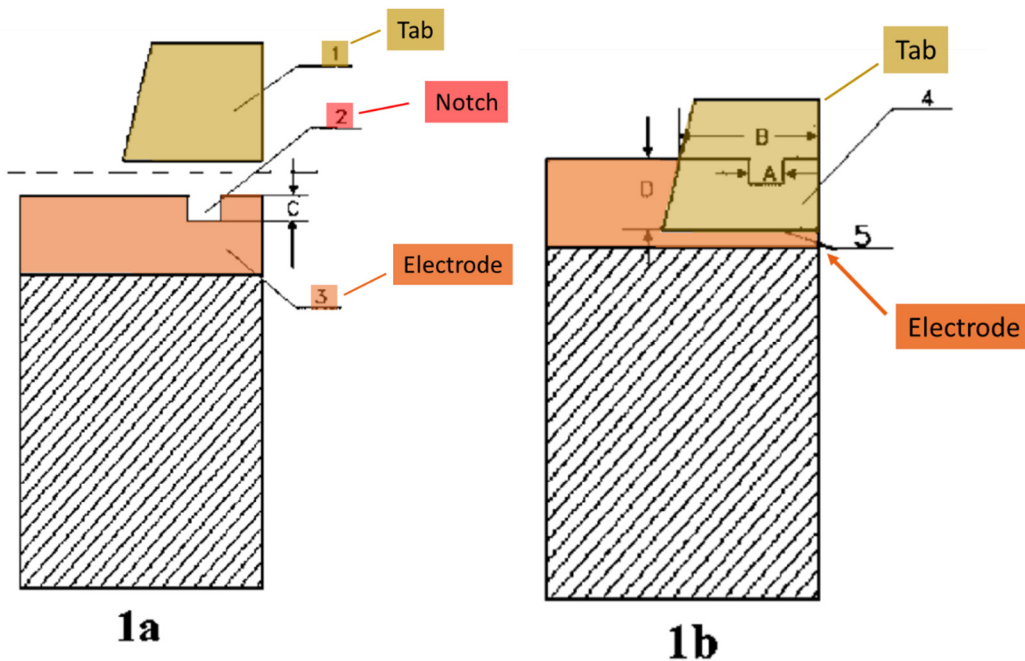
Each battery component and electrode feature claimed in the '352 patent was well known in the art. Ex. 1002, ¶36. For example, Wang discloses anode and cathode current collectors coated in active material with attached electrode tabs

positioned in the same structural arrangements claimed in the '352 patent. Ex.

1004, ¶¶[0032], [0065], Figs. 1, 2; Ex. 1002, ¶[36].



Deng discloses forming a “notch” at the edge of a battery electrode to prevent electrode deformation when the electrode tab is later welded to the electrode. Ex. 1005, ¶[0007], Figs. 1a, 1b; Ex. 1002, ¶[37].



Zhou—like the '352 patent—discloses forming a notch in the edge of an electrode plate to remove electrode burrs on the current collector, including at an “area on the positive electrode current collector” that is “not covered by a positive electrode active material,” as shown in the representative annotated figure below.

Ex. 1013, ¶¶[0015], [0025], Fig. 2; Ex. 1002, ¶¶[38, 152-153.

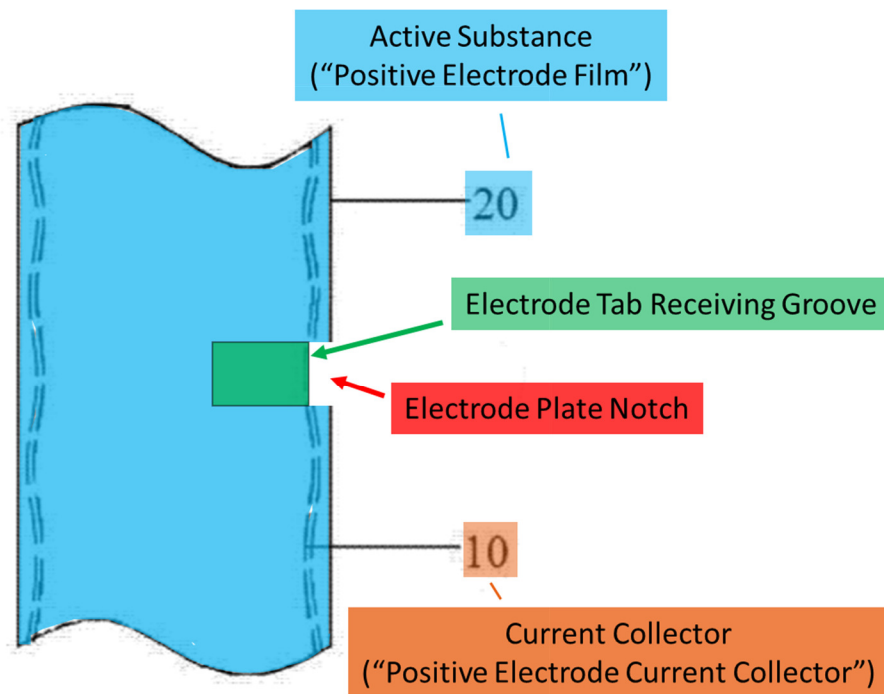


FIG. 2

During prosecution, the Examiner found that, “while the prior art teaches the presence of notches or grooves on various portions of the current collectors, the combination and orientation of the notch and groove together required by the instant claims would not have been obvious to one of ordinary skill in the art as

applicant argues.” Ex. 1003, 658-659. But the Examiner did not consider the combinations of prior art presented in this Petition that render the claims obvious.

As explained below and in the declaration of Dr. Ulrich von Sacken, a specialist in the field of lithium-ion battery design, development, manufacture, and analysis (Ex. 1002, ¶¶4-12), all challenged claims are rendered obvious by the prior-art combinations presented in this Petition. Accordingly, the Board should institute *inter partes* review and cancel the challenged claims of the ‘352 patent.

II. TECHNOLOGY BACKGROUND

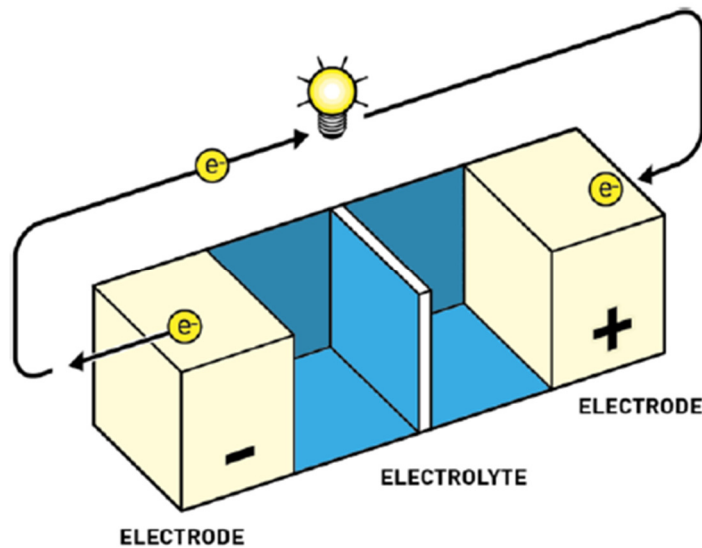
A. Rechargeable Lithium-Ion Batteries

The commercial launch of lithium-ion batteries in 1991 revolutionized the field of energy storage, enabling portable, high capacity, efficient energy storage for a wide variety of applications. Ex. 1009, 2, 10; Ex. 1002, ¶43. A typical lithium-ion battery contains a positive electrode (cathode)¹, a negative electrode (anode), a separator positioned between the two electrodes, and an electrolyte. Ex. 1009, 3, 7; Ex. 1002, ¶43. The cathode includes a current collector, positive electrode active material layer coating the current collector, and an electrode tab that connects the cathode to an external circuit. Ex. 1013, ¶[0003]; Ex. 1004,

¹ The term “cathode” is synonymous with “positive electrode” in the art, and “anode” is synonymous with “negative electrode.” Ex. 1002, ¶43.

¶¶[0011]-[0012]; Ex. 1002, ¶43. The anode includes a current collector coated in a negative electrode active material layer and an electrode tab connecting the anode to an external circuit. Ex. 1013, ¶[0003]; Ex. 1004, ¶¶[0011]-[0012]; Ex. 1002, ¶43. A porous separator, positioned between the cathode and anode, prevents contact between the electrodes that would otherwise cause a short circuit. Ex. 1009, 3; Ex. 1002, ¶43. The electrolyte serves as the medium through which lithium ions travel between the cathode and the anode. Ex. 1009, 3; Ex. 1002, ¶43.

The electrodes are connected to an electrical circuit, and when the battery discharges (providing electricity to the circuit), an oxidation process occurs at the negative electrode, resulting in electrons moving through the circuit to the cathode. Ex. 1009, 3, 7; Ex. 1002, ¶44. In rechargeable batteries, this process can be reversed such that external electricity flowing into the circuit produces corresponding redox reactions at the electrodes, thus charging the battery. Ex. 1009, 3; Ex. 1002, ¶44.



One battery charge-discharge sequence is a “cycle.” Ex. 1002, ¶45. In contrast to “primary” (single-use) batteries, lithium-ion batteries are “secondary” (rechargeable) batteries that can be cycled many times. *Id.*; Ex. 1009, 7.

B. Electrode Burrs

Protrusions from electrodes, such as electrode “burrs,” can damage battery components and cause electrical short circuits. Ex. 1002, ¶46. These issues were well known in the field before Patent Owner applied for the ’352 patent. *Id.* Burrs were known to typically form at cut, slit, or folded edges of metal, such as positive and negative electrode tabs and current collector foils. *Id.*; Ex. 1010, 1:47-49. It was known that burrs on the edge of an electrode could puncture the separator, causing electrical shorts between the cathode and anode, or contact the housing surrounding a lithium-ion electrode assembly. Ex. 1002, ¶46. The latter is especially a problem in the case of pouch cells, which are enclosed with a flexible,

easily damaged laminated aluminum film layer that hermetically seals the electrode assembly. Ex. 1008, ¶[0004]; Ex. 1011, ¶[0003]; Ex. 1006, ¶[0007]; Ex. 1002, ¶46.

Solutions to these problems were known in the art before August 2015. Ex. 1002, ¶47. For example, it was known to remove electrode burrs in several ways, including through mechanical, chemical, and plasma-based methods. *Id.*; Ex. 1012, ¶¶[0002]-[0007]. It was also known to use insulating tapes to protect certain areas of the battery at risk of damage from burrs, including within the electrode assembly, where burrs might puncture the separator; on the outside of the electrode assembly, where burrs might contact the laminated aluminum film enclosure; and on an exposed portion of a current collector that faces the opposite electrode's active material layer. Ex. 1008, ¶[0044]; Ex. 1011, ¶[0004]; Ex. 1006, ¶[0007]; Ex. 1002, ¶¶48-49.

III. PRECISE RELIEF REQUESTED

A. Claims for Which Review Is Requested

Petitioner respectfully requests *inter partes* review under 35 U.S.C. § 311 of claims 1-3 and 5-12 of the '352 patent and cancellation of those claims.

B. Statutory Grounds

Each asserted reference relied upon in this Petition and identified in the table below was filed and published before August 31, 2015, the earliest alleged priority date for the '352 patent, and is prior art under 35 U.S.C. § 102(a).

Prior Art References
Chinese Patent App. Pub. No. CN 104157914 A to Wang et al. (“ Wang ,” Ex. 1004), was filed September 2, 2014, and published November 19, 2014.
Chinese Patent App. Pub. No. CN 101826609 A to Deng et al. (“ Deng ,” Ex. 1005), was filed December 22, 2009, and published September 8, 2010.
U.S. Patent App. Pub. No. 2011/0159344 to Kobayashi et al. (“ Kobayashi ,” Ex. 1006), was filed December 23, 2010, and published June 30, 2011.
U.S. Patent App. Pub. No. 2013/0052499 A1 to Hasegawa et al. (“ Hasegawa ,” Ex. 1007), was filed August 22, 2012, and published February 28, 2013.
Chinese Patent Publication No. CN 202839841 U to Zhou (“ Zhou ,” Ex. 1013), was filed July 31, 2012, and published March 27, 2013.

Claims 1-3 and 5-12 are unpatentable under 35 U.S.C. § 103 based on the

following grounds:

Grounds of Unpatentability	
1	Wang in combination with Deng renders obvious claims 1-3 and 9-12.
2	Wang in combination with Zhou renders obvious claims 1-3 and 9-12.
3	Wang in combination with Deng and Kobayashi renders obvious claims 5-8.
4	Wang in combination with Zhou and Kobayashi renders obvious claims 5-8.
5	Wang in combination with Deng and Hasegawa renders obvious claim 11.
6	Wang in combination with Zhou and Hasegawa renders obvious claim 11.

IV. THE '352 PATENT

Independent claim 1 of the '352 patent recites:

1. A secondary battery, comprising:

a **first electrode tab**;

a first electrode plate, comprising:

a **first current collector**; and

a **first active substance**, disposed on a first surface of the **first current collector** and a second surface of the **first current collector**, wherein the second surface is opposite to the first surface;

a **first electrode tab receiving groove**, defined by an exposed portion of the first surface of the **first current collector** and the **first active substance** on a periphery of the **first electrode tab receiving groove**, the **first electrode tab receiving groove** receiving the **first electrode**

tab, wherein the **first electrode tab** is electrically connected with the **first current collector** through the **first electrode tab receiving groove**;

a **first recess** that is opposite to the **first electrode tab receiving groove**, defined by a corresponding portion of the second surface of the **first current collector** and the **first active substance** on a periphery of the **first recess**;

a **first electrode plate notch** disposed on a side edge of the **first electrode tab receiving groove** and extending through the second surface and the first surface of the **first current collector**; and

the **first electrode tab receiving groove** is formed by the **first current collector** and at least two **first active substance** walls;

wherein the secondary battery is a wound-type secondary battery.

Ex. 1001, 15:2-30; Ex. 1002, ¶30.

As shown in annotated Figures 2(a) and 2(b) below, the '352 patent discloses a secondary battery containing an “anode electrode plate 101” that includes an “**anode current collector 1011**” and an “**anode active layer 1012**” disposed on the current collector; an “**anode electrode tab receiving groove 1013**” through which an “**anode electrode tab 102**” is electrically connected to the anode current collector; and an “**anode concave 1015**” (recited in the claims as a “recess”) on the opposite side of the current collector from the anode electrode tab receiving groove. Ex. 1001, 3:14-41, 4:49-60, 15:1-30, Figs. 2a, 2b; Ex. 1002, ¶31.

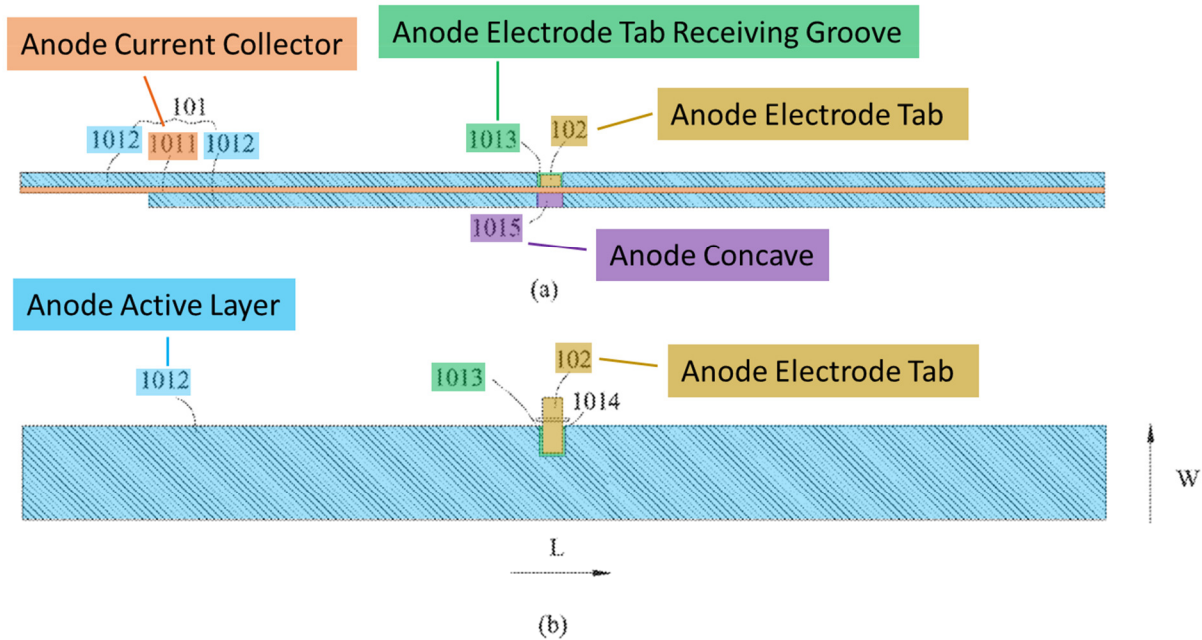
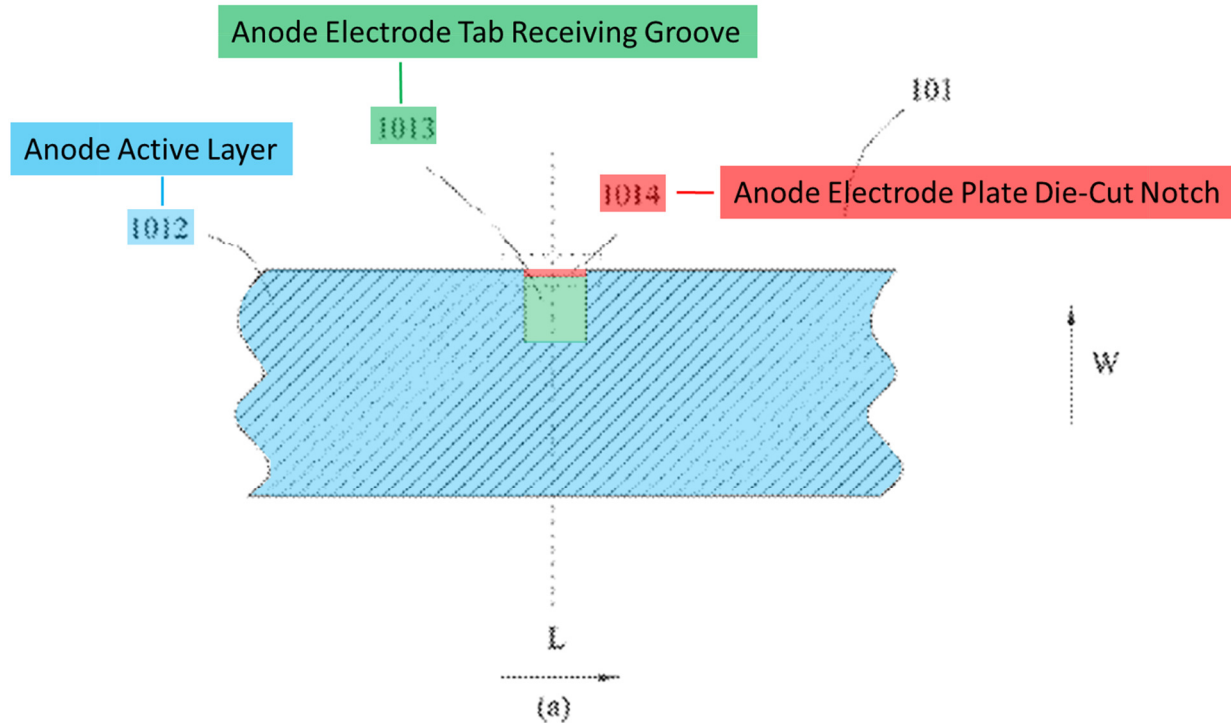


Fig. 2

The '352 patent further discloses an “**anode electrode plate die-cut notch 1014**, located on the side edge of the anode electrode tab receiving groove 1013 and extending through the anode electrode plate 101.” Ex. 1001, 3:42-45, Fig. 5(a); Ex. 1002, ¶32. The notch allegedly “can remove the burrs formed on the current collector 1011 of the edge part of the anode electrode tab receiving groove 1013 during formation,” thus “effectively preventing the secondary battery 1 from generating internal short circuit, and in turn improving the safety performance of the secondary battery 1 while ensuring a high energy density.” Ex. 1001, 3:50-65, Fig. 5(a); Ex. 1002, ¶32. Unlike the specification, the claims of the '352 patent recite first and second “electrode plate notches” but do not state that the notches are “die-cut.” Ex. 1001, 15:2-16:58.



The '352 patent discloses similar structural features on a cathode electrode and claims a cathode electrode plate that includes a cathode current collector and a cathode active layer disposed on the current collector; a cathode electrode tab receiving groove through which a cathode electrode tab is electrically connected to the cathode current collector; and a cathode concave on the opposite side of the current collector from the cathode electrode tab receiving groove. Ex. 1001, 3:22-41, 4:61-5:3. Like the anode electrode, the cathode electrode plate includes a cathode electrode plate notch located on the side edge of the cathode electrode tab receiving groove and extending through the cathode electrode plate. *Id.*, 3:46-65, Fig. 3(a), 3(b); Ex. 1002, ¶33.

V. LEVEL OF SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) at the time of the alleged invention, August 31, 2015, would have had a bachelor’s degree from an accredited institution in a discipline relating to lithium-ion secondary batteries, including but not limited to electrical engineering, mechanical engineering, physics, materials science, chemistry, or chemical engineering, as well as three or more years of academic or industry experience in the field of batteries, including battery design. Ex. 1002, ¶¶39-41.

VI. CLAIM CONSTRUCTION

The Board construes claims in accordance with 37 C.F.R. § 42.100(b) and *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Claims only need to be construed to the extent necessary to resolve a controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). No claim terms of the ’352 patent require construction because the claims encompass the prior-art mappings provided below under any construction consistent with *Phillips*.² Ex. 1002 ¶42.

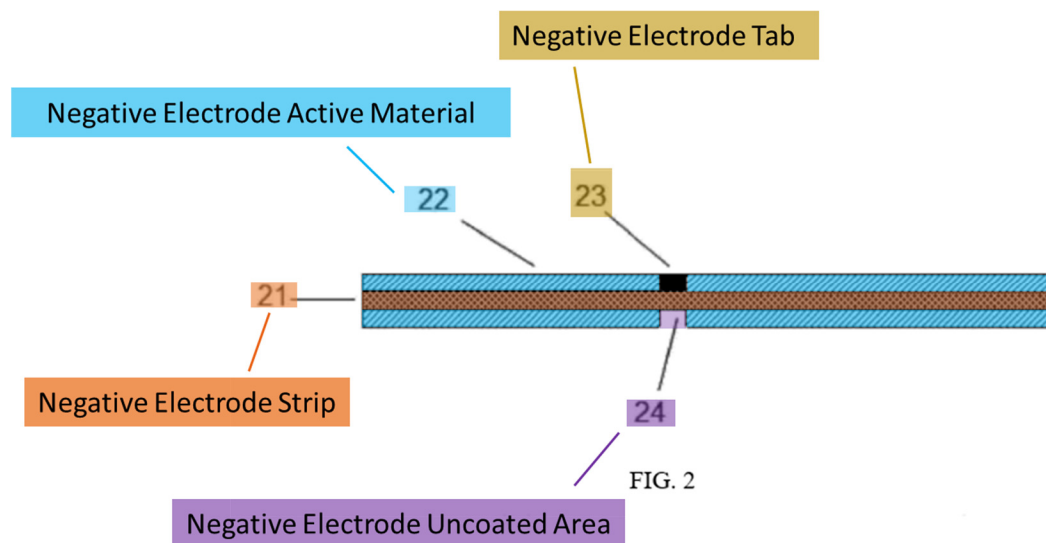
² Because the IPR procedure does not permit challenges under 35 U.S.C. § 112, Petitioner has not included any indefiniteness arguments herein, but may present such arguments in other proceedings.

VII. CLAIMS 1-3 AND 5-12 OF THE '352 PATENT ARE UNPATENTABLE

A. Ground 1: Wang and Deng Render Obvious Claims 1-3 and 9-12

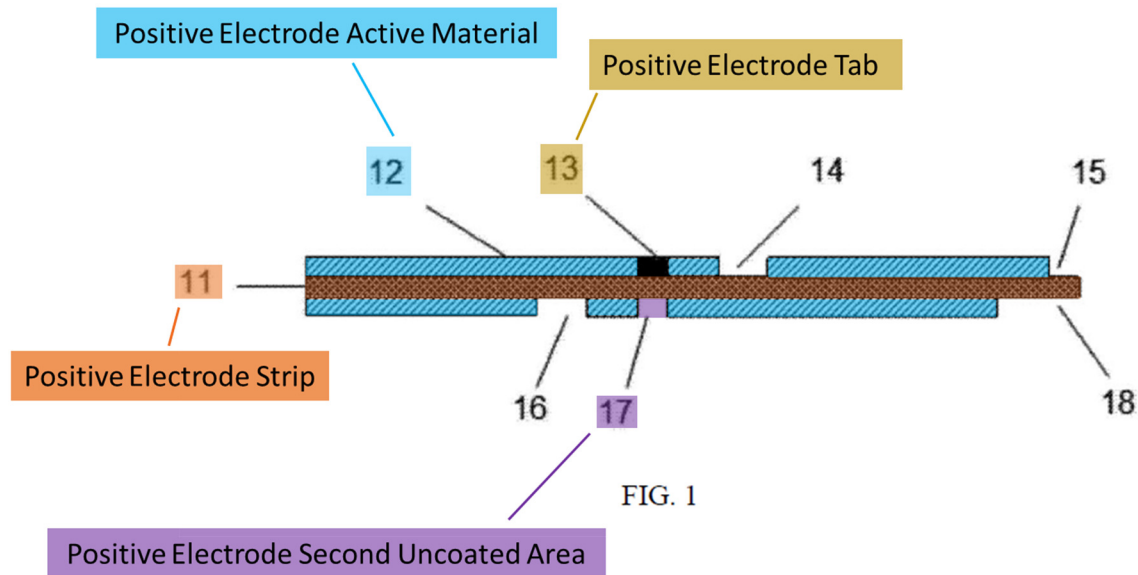
1. Disclosure of Wang

Wang discloses a “high-power soft pack lithium-ion battery” that includes negative and positive electrodes. Ex. 1004, ¶¶[0001], [0010]; Ex. 1002, ¶52. The negative electrode includes a negative electrode strip, a negative electrode active material disposed on two sides of the negative electrode strip, a negative electrode tab welded to the negative electrode strip, and a negative electrode uncoated area disposed in a middle area of the negative electrode strip. Ex. 1004, ¶¶[0032], [0065], Fig. 2; Ex. 1002, ¶52.



The positive electrode includes a positive electrode strip, a positive electrode active material disposed on two sides of the positive electrode strip, a positive electrode tab, and a positive electrode second uncoated area positioned in the

middle area of the positive electrode strip on an opposite side of the positive electrode strip relative to the positive electrode tab. Ex. 1004, ¶[0064], Fig. 1; Ex. 1002, ¶53.

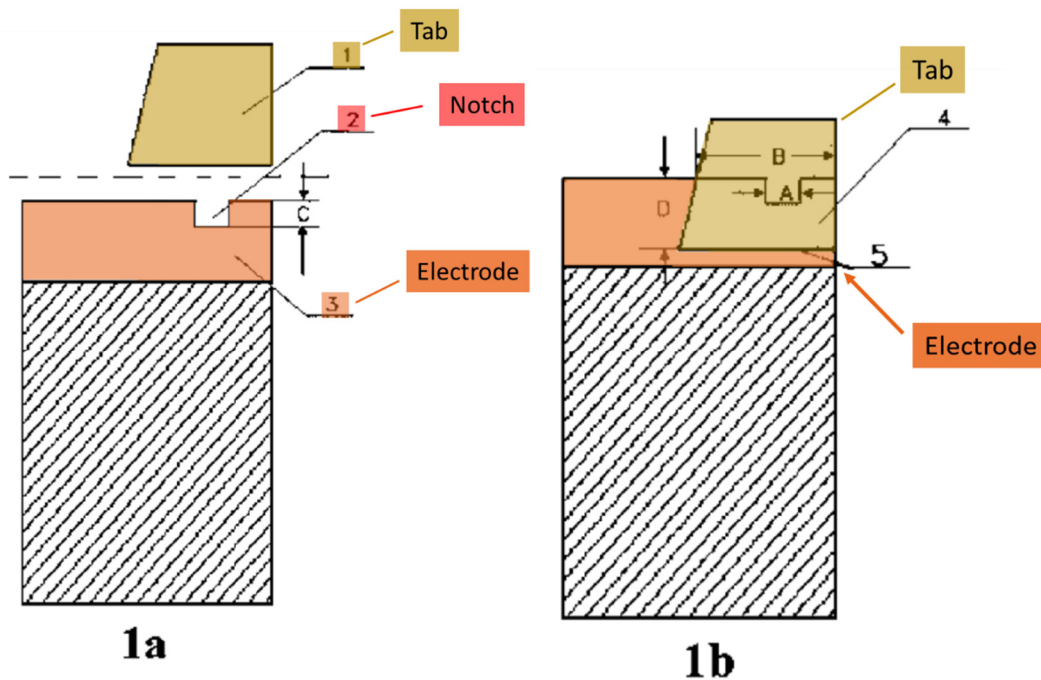


The positive and negative electrode tabs are positioned in middle areas of their respective electrode strips, thus reducing the internal resistance of the battery and the amount of heat generated during battery discharge. Ex. 1004, ¶[0051]; Ex. 1002, ¶54.

2. Disclosure of Deng

Deng discloses a method of connecting a battery electrode and electrode tab. Ex. 1005, ¶[0001]. Deng states that, during the process of welding a tab to an electrode, the electrode may be deformed by accumulated heat and stress. *Id.*, ¶[0002]. To solve this problem, Deng discloses forming a notch in a “to-be-welded area” of the electrode. *Id.*, ¶[0004]. The notch “changes the structure of a welding

area” of the electrode “so that the welding area is discontinuous, and heat or deformation is also discontinuous and stops at the notch rather than accumulates into the next section. As a result, accumulation of heat in the welding is reduced, and accumulation of warping is also reduced.” *Id.*, ¶[0007]. Deng’s pre- and post-weld electrode structures are shown below, respectively, in annotated Figs. 1a and 1b. *Id.*, Figs. 1a, 1b; Ex. 1002, ¶55.



3. Independent Claim 1

As discussed below, the combination of Wang and Deng renders obvious each element of claim 1. Ex. 1002, ¶¶56-84.

1(pre): A secondary battery, comprising:

If the preamble is limiting, Wang discloses a secondary (i.e., rechargeable) lithium-ion battery. Ex. 1004, ¶¶[0001], [0003]; Ex. 1002, ¶57.

1(a): a first electrode tab;

Wang discloses a first electrode tab (e.g., negative electrode tab). Ex. 1004, ¶[0065], Fig. 2; Ex. 1002, ¶58.

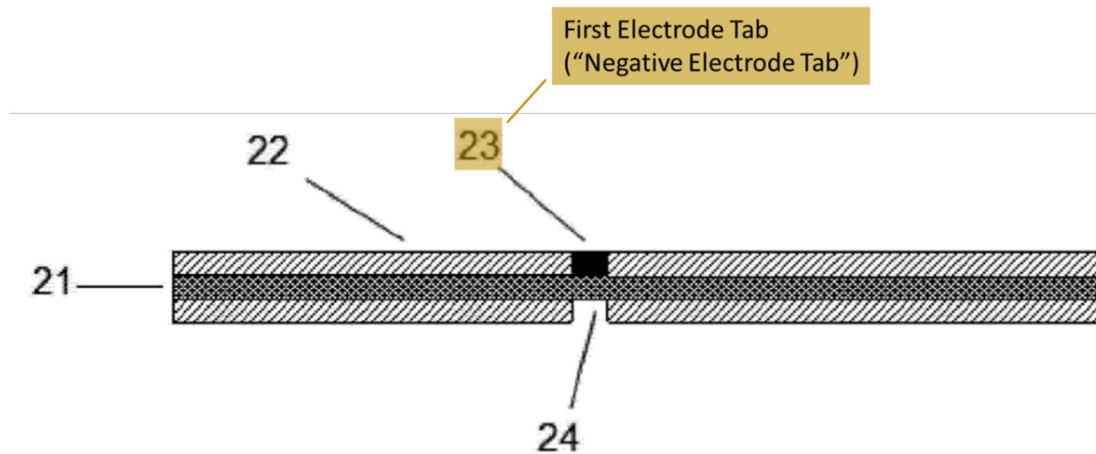


FIG. 2

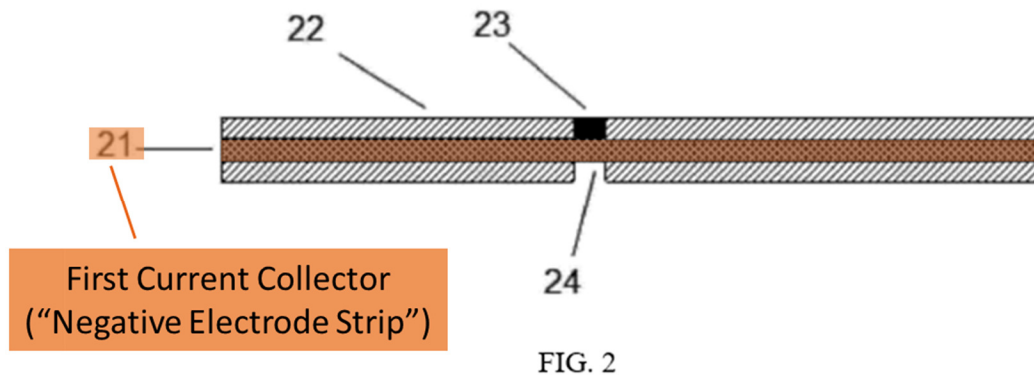
1(b): a first electrode plate, comprising:

Wang discloses a first electrode plate (e.g., negative electrode) that includes a negative electrode strip 21 and negative electrode active material 22 that is “evenly disposed on two sides of the negative electrode strip 21.” Ex. 1004, ¶¶[0010], [0065]; Ex. 1002, ¶58.

1(c): a first current collector; and

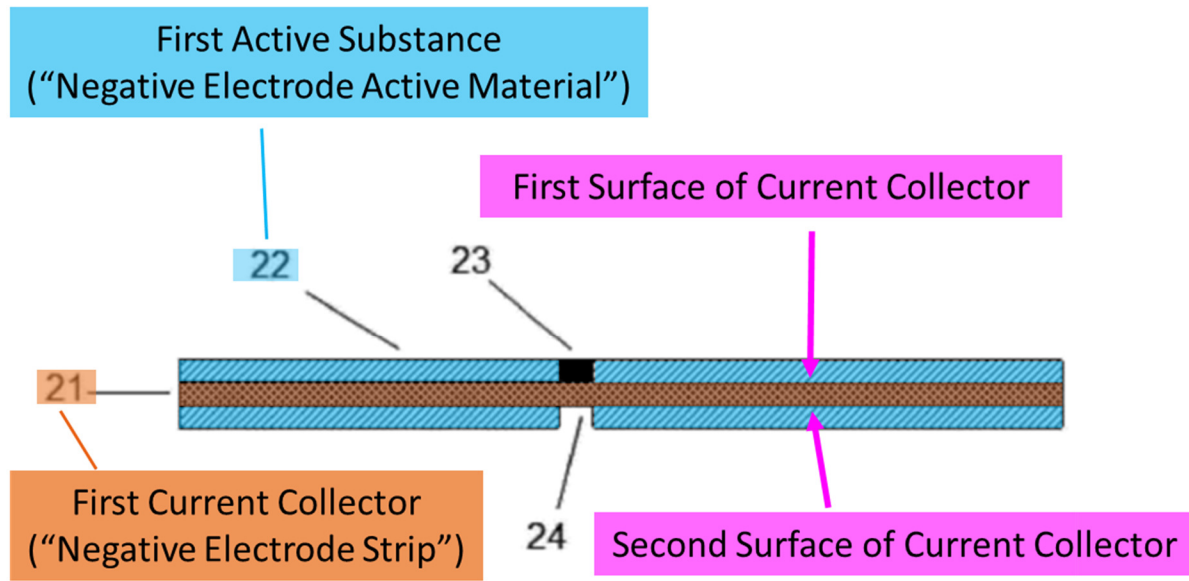
Wang discloses a first current collector (e.g., negative electrode strip). Ex. 1004, ¶[0065], Fig. 2; Ex. 1002, ¶60. A POSITA would have understood that Wang’s “negative electrode strip” is a current collector due to at least its material composition (copper foil, Ex. 1004 ¶[0071])—which is a standard anode current

collector material commonly used in the art—as well as the electrode strip’s structural relationship to the other elements of the negative electrode, including the active material layers and negative electrode tab. Ex. 1002, ¶¶60.



1(d): a first active substance, disposed on a first surface of the first current collector and a second surface of the first current collector, wherein the second surface is opposite to the first surface;

Wang discloses a first active substance (e.g., negative electrode active material) disposed on both a first surface of the first current collector (e.g., the current collector surface to which the negative electrode tab is attached) and a second surface of the first current collector (e.g., the current collector surface opposite to the surface on which the negative electrode is attached). Ex. 1004, ¶¶[0024], [0065] (describing “negative electrode active material 22 being evenly disposed on two sides of the negative electrode strip 21”), Fig. 2; Ex. 1002, ¶¶61.



Claim 1(e):

1(e)(i): a first electrode tab receiving groove, defined by an exposed portion of the first surface of the first current collector and the first active substance on a periphery of the first electrode tab receiving groove,

Wang discloses a first electrode tab (e.g., negative electrode tab) disposed in the middle area of a first current collector (e.g., negative electrode strip). Ex. 1004, ¶¶0065], Fig. 2; Ex. 1002, ¶62. In preparing the surface of the current collector to which the negative electrode tab is later attached, Wang describes first coating the “negative electrode active material 22 onto the surfaces” of “a negative electrode strip 21” where “an area of [the] negative electrode tab 23” on the negative electrode strip is “not coated with the negative electrode active material 22.” Ex.

1004, ¶[0101]. The negative electrode tab is later welded to the uncoated area. Ex. 1004, ¶[0106].

A POSITA would have understood that the “area” of the negative electrode tab that is “not coated with the negative electrode active material 22” (Ex. 1004, ¶[0101]) is an exposed portion of the surface of the negative electrode current collector to which the electrode tab is later welded and electrically connected, and is thus the claimed “first electrode tab receiving groove.” Ex. 1002, ¶63. A POSITA would have further understood that this area is bounded on each side (i.e., around its periphery) by the negative electrode active material 22, as shown in Wang’s Figure 2 below. Ex. 1002, ¶63. While Wang does not include a figure showing the structure of the negative electrode before the negative electrode tab is attached to the negative electrode strip, a POSITA would have understood that the electrode would appear, for example, as shown in annotated Figure 2 below. Ex. 1004, Fig. 2; Ex. 1002, ¶63.

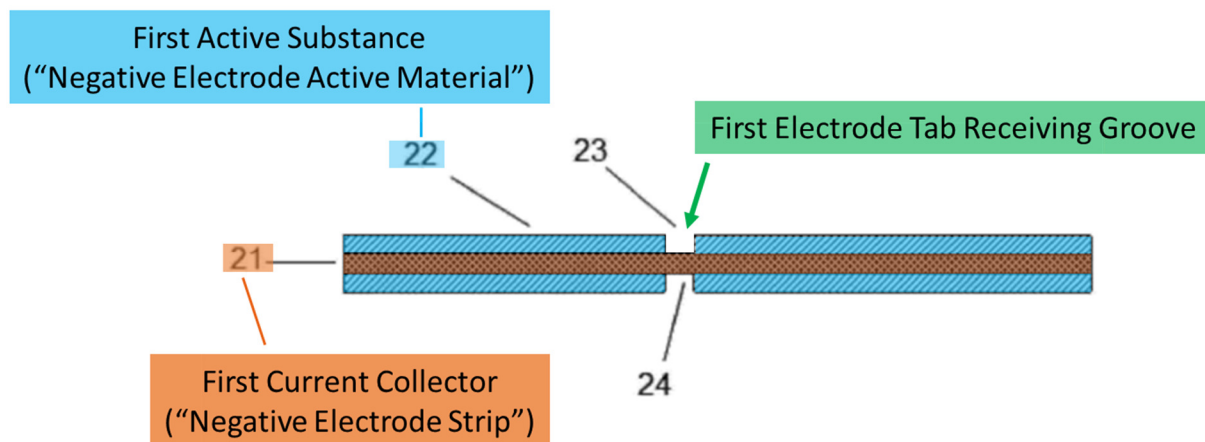
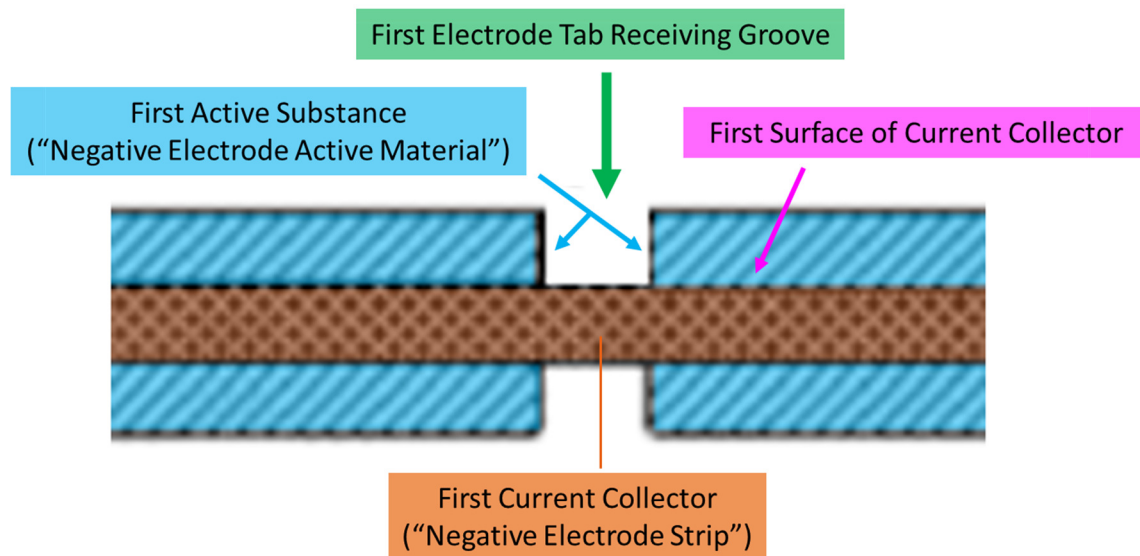
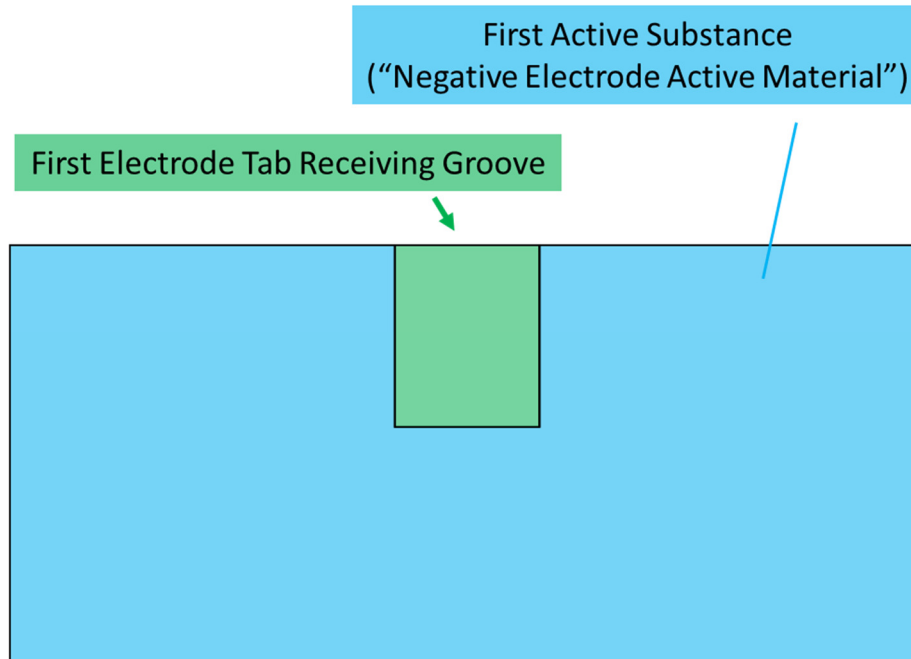


FIG. 2

As shown in the magnified excerpt of annotated Figure 2 below, modified to remove the negative electrode tab to illustrate the first electrode tab receiving groove, the electrode tab receiving groove is defined by an exposed portion of the first surface of the first current collector and the first active substance on a periphery of the electrode tab receiving groove. Ex. 1002, ¶¶64.

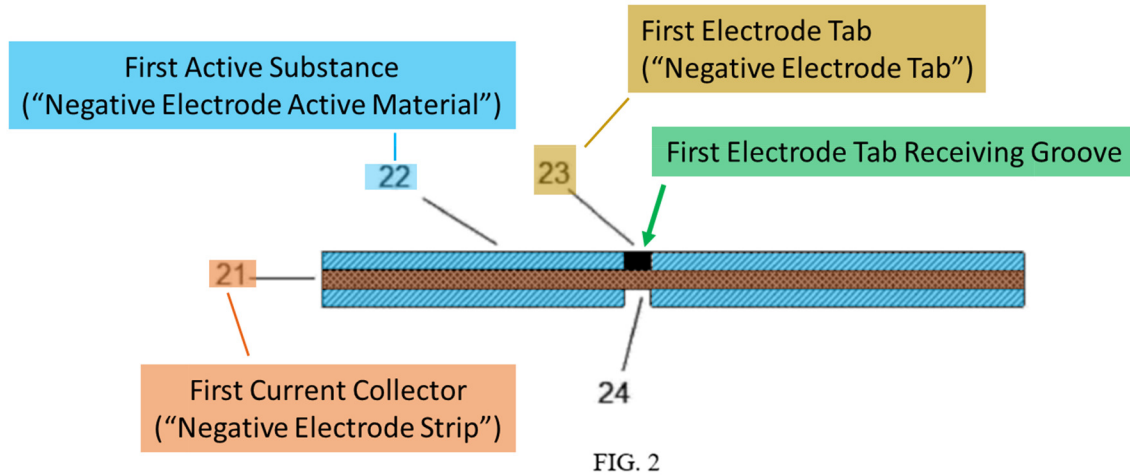


Wang does not provide a top-down perspective view of its negative electrode, but based on Wang's disclosure, a POSITA would have understood that Wang's first electrode tab receiving groove (oriented so that the electrode tab receiving groove is at the top of the figure) would appear in a top-down view as shown in the figure below. Ex. 1002, ¶¶65-66.

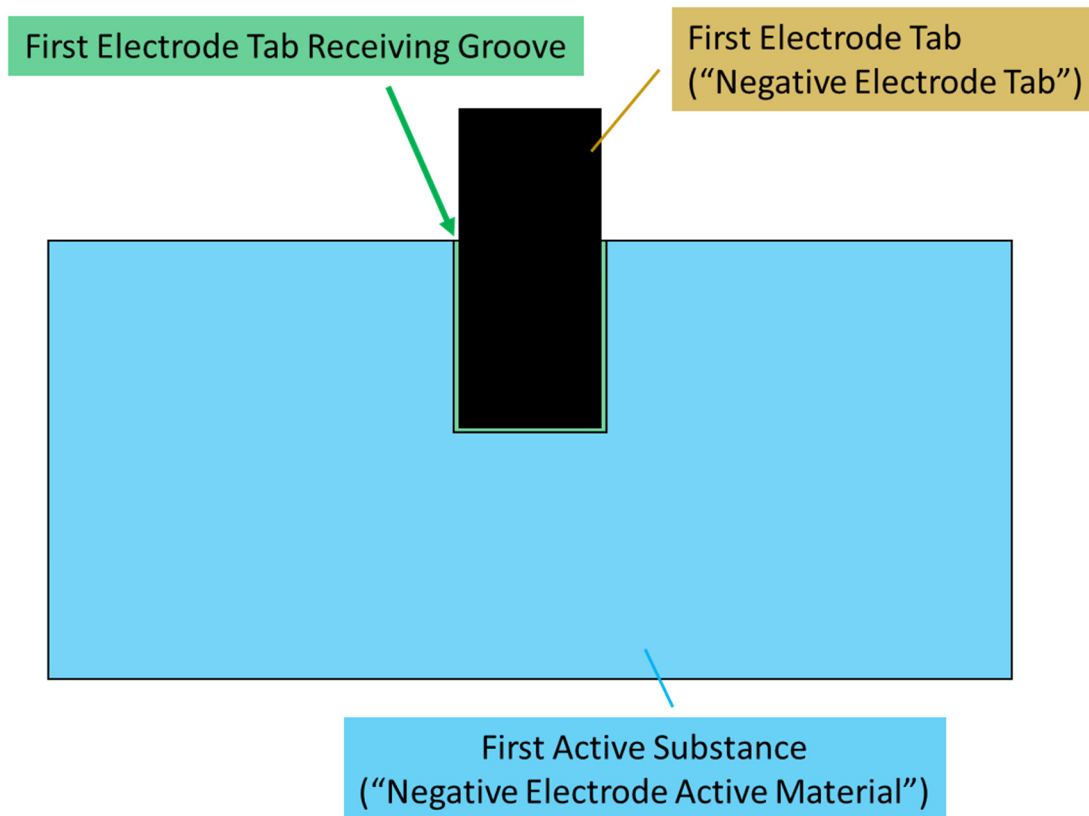


1(e)(ii): the first electrode tab receiving groove receiving the first electrode tab,

As discussed above in claim 1(e)(i), Wang discloses a first electrode tab receiving groove. Ex. 1002, ¶67. Wang further discloses that the first electrode tab receiving groove receives the first electrode tab, as shown in annotated Figure 2 below. Ex. 1004, ¶¶[0032] (describing welding an electrode tab to the tab area of the electrode strip), [0065], [0101] (describing “an area of a negative electrode tab 23” on the negative electrode strip as “not coated with the negative electrode active material 22”), Fig. 2; Ex. 1002, ¶67.



Based on Wang's disclosure, a POSITA would have understood that Wang's first electrode tab of Fig. 2 would appear in a top-down view as shown in the figure below. Ex. 1002, ¶68.

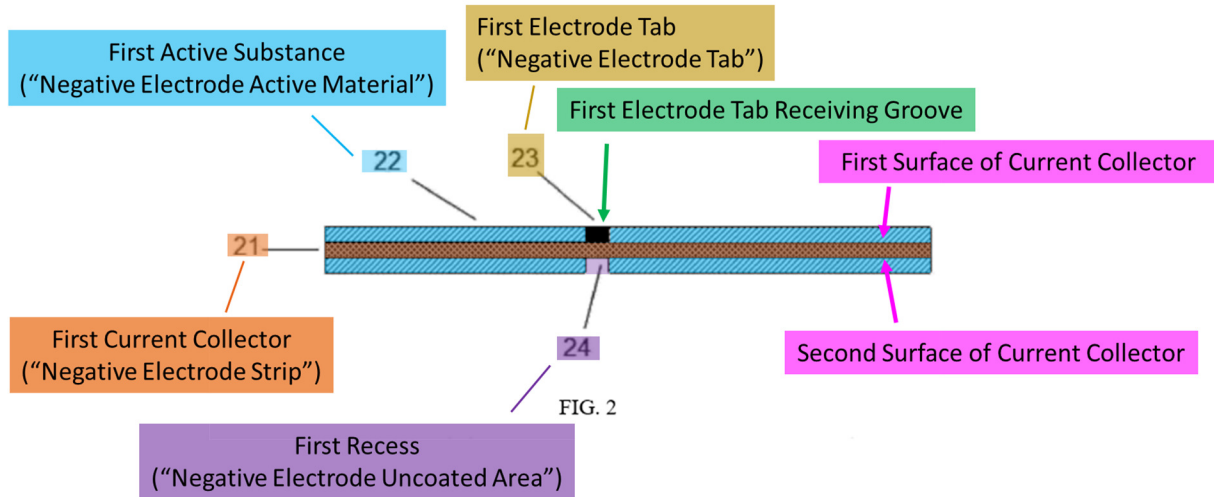


1(e)(iii): wherein the first electrode tab is electrically connected with the first current collector through the first electrode tab receiving groove;

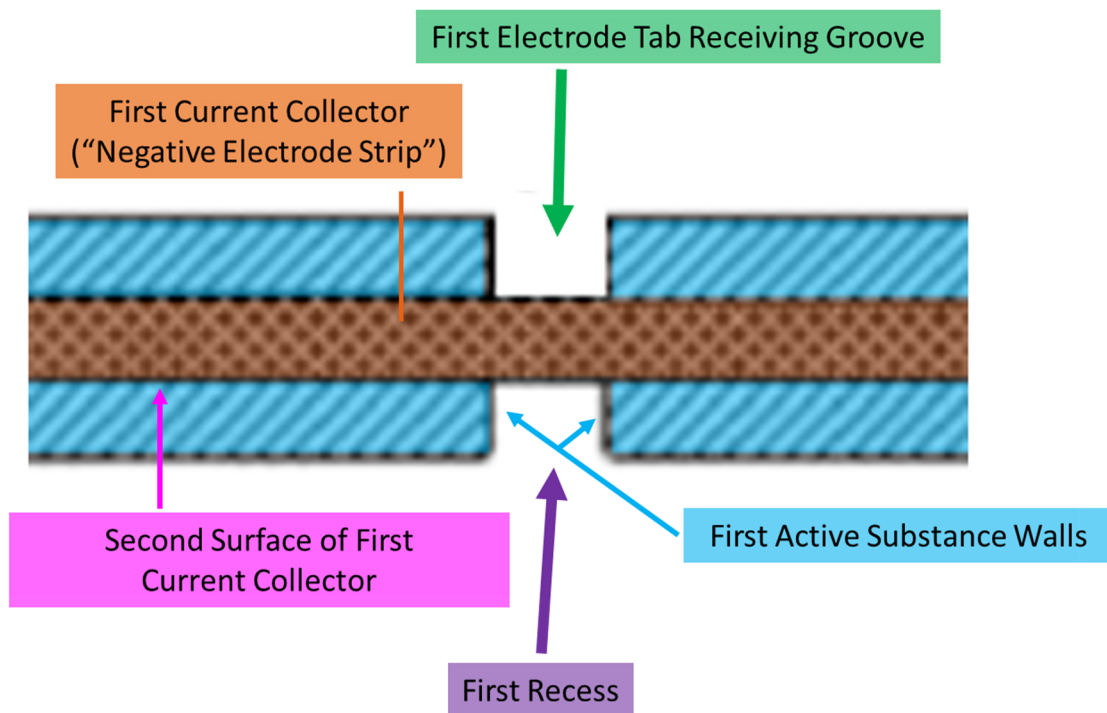
Wang discloses a first electrode tab (e.g., negative electrode tab) that is electrically connected with the first current collector (e.g., negative electrode strip) via welding through the first electrode tab receiving groove (e.g., the “area of a negative electrode tab 23” on the negative electrode strip that is “not coated with the negative electrode active material 22.”). Ex. 1004, ¶¶[0032], [0065], [0101], Fig. 2; Ex. 1002, ¶69. A POSITA would have understood that the connection between the electrode tab and current collector is an electrical connection at least because that is a fundamental, well-understood structural feature of a lithium-ion battery required for the battery to function. Ex. 1002, ¶69. A POSITA would have further understood that welding is the preferred method of producing reliable, low impedance electrical connections between electrode tabs and current collector foils, and that Wang’s disclosure of welding the negative electrode tab to an exposed surface of the negative electrode strip would create an electrical connection at least because both structural components are each made of a conductive material (e.g., copper). *Id.*; Ex. 1004, ¶¶[0018], [0019].

1(f): a first recess that is opposite to the first electrode tab receiving groove, defined by a corresponding portion of the second surface of the first current collector and the first active substance on a periphery of the first recess;

Wang discloses a first recess (e.g., negative electrode uncoated area) that is opposite to the first electrode tab receiving groove, wherein the first recess is defined by a corresponding portion of the second surface of the first current collector and the first active substance on a periphery of the first recess. Ex. 1004, ¶¶[0065] (describing “negative electrode tab 23 and a negative electrode uncoated area 24” that are “disposed opposite each other on two sides and in a middle area of the negative electrode strip 21.”), [0101] (“[N]egative electrode uncoated area 24 [is] not coated with the negative electrode active material 22.”), Fig. 2; Ex. 1002, ¶70. As shown in annotated Figure 2 below, the first recess is defined by a corresponding portion of the second surface of Wang’s negative electrode strip opposite to the first electrode tab receiving groove, and is further defined by the first active substance on the periphery of the first recess. Ex. 1004, Fig. 2; Ex. 1002, ¶70.



The magnified excerpt of annotated Figure 2 below, modified to remove negative electrode tab 23 to illustrate the electrode tab receiving groove, shows the first recess is opposite to the first electrode tab receiving groove and is defined by a corresponding portion of the second surface of the first current collector and the first active substance on a periphery of the first recess. Ex. 1002, ¶71.



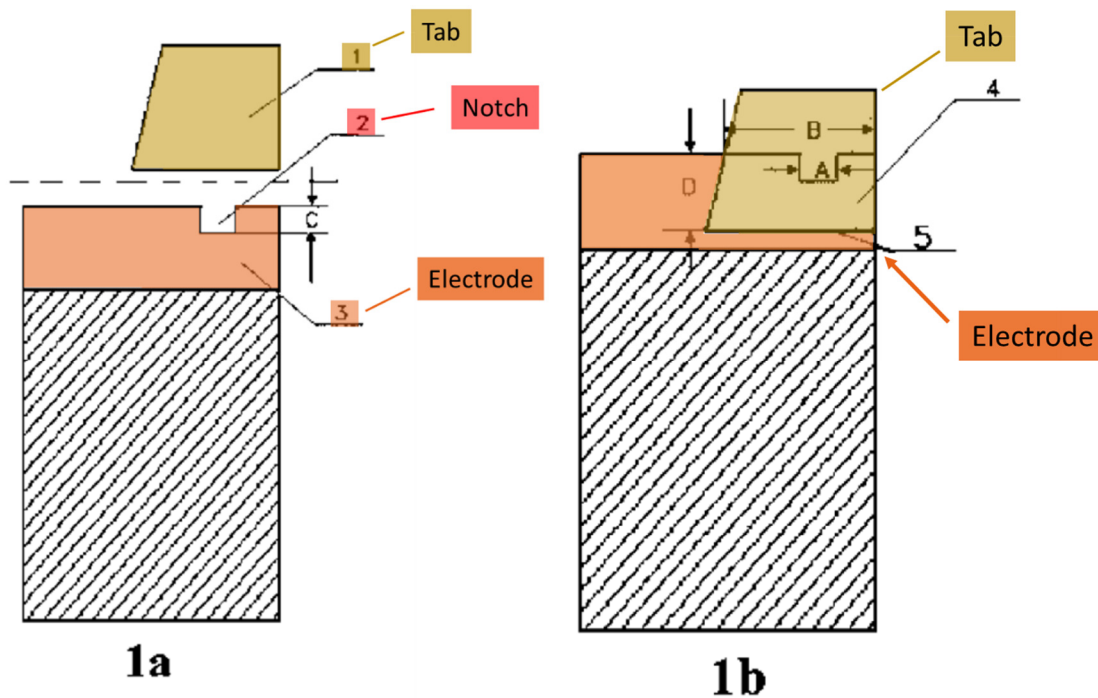
1(g): a first electrode plate notch disposed on a side edge of the first electrode tab receiving groove and extending through the second surface and the first surface of the first current collector; and

Wang does not expressly disclose a first electrode plate notch. Ex. 1002, ¶72. This claim element would have been obvious, however, in view of Wang in combination with Deng. *Id.*

As discussed above in Section VII.A.2, Deng discloses making a notch through the edge of an electrode plate in a “to-be-welded area” of the electrode before the tab is welded to the electrode. Ex. 1005, ¶¶[0004], [0014]. Deng discloses doing so because welding the electrode tab to the electrode “results in deformation caused by heat and stress accumulation,” which “will lead to serious warping of the tab or wrinkling of the welding area of the electrode, and such deformation is detrimental to electrical performance of the battery.” *Id.*, ¶[0002]. Deng’s notch “changes the structure of a welding area of the tab” on the electrode so that “the welding area is discontinuous, and heat or deformation is also discontinuous and stops at the notch rather than accumulates into the next section. As a result, accumulation of heat in the welding is reduced, and accumulation of warping is also reduced.” *Id.*, ¶[0007]. This “enables reduction of warping of the current collector to a very large extent, demonstrates good results, and improves

outcome of battery cell assembly, thereby enhancing electrical performance of batteries.” *Id.*; Ex. 1002, ¶73.

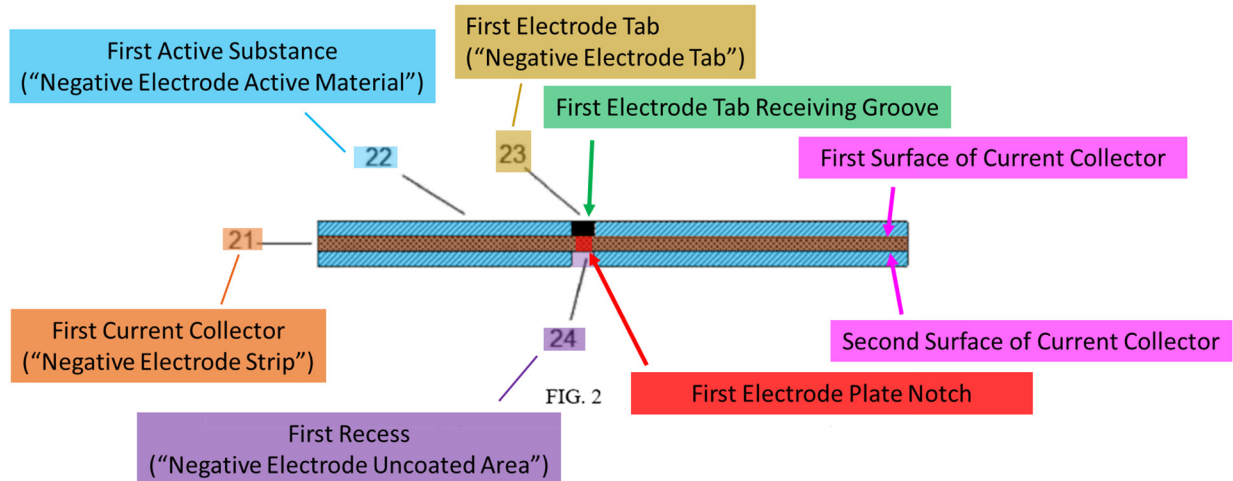
The position of an exemplary notch relative to the electrode tab and edge of the current collector (e.g., “electrode 3”), both before and after welding, is shown below in annotated Deng Figures 1a and 1b, respectively. *Id.*, ¶[0014], Figs. 1a, 1b; Ex. 1002, ¶74.



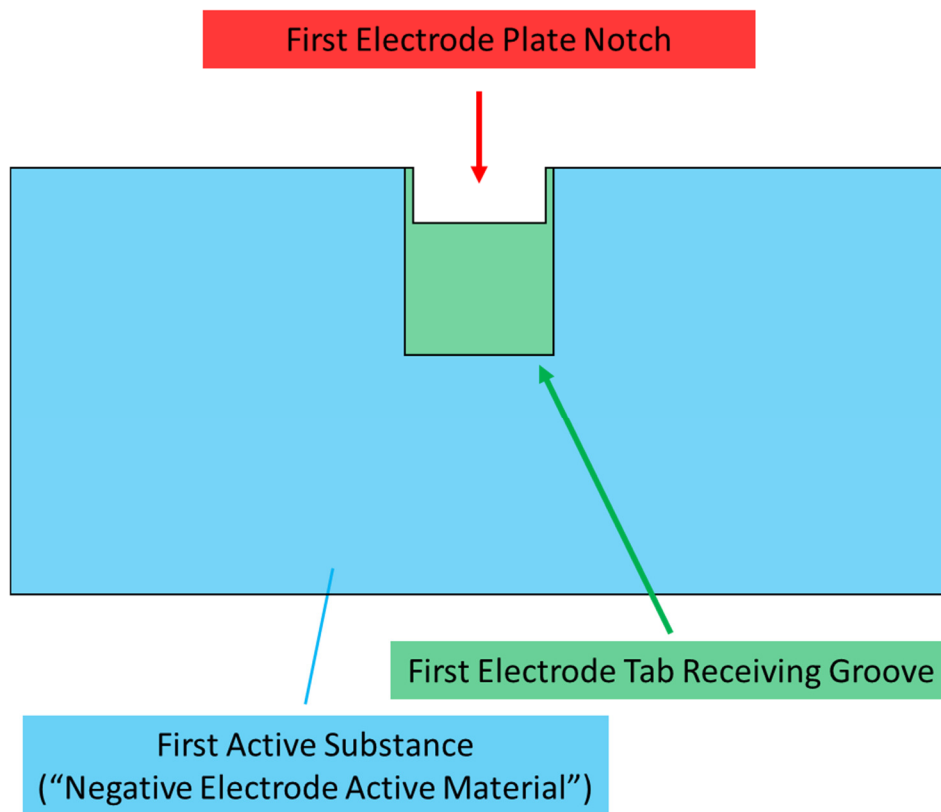
A POSITA would have understood that Deng’s notch passes entirely through the electrode (i.e., is a through hole) at least because Deng does not depict the notch in its figures as being bounded at its upper edge by any electrode structure. Ex. 1002, ¶75. A POSITA would have also understood that Deng’s notch extends entirely through the current collector foil in view the notch’s purpose of

preventing deformation/warping of the electrode in the region of the notch. *Id.* If the notch did not extend entirely through the edge of the electrode, a POSITA would have understood that the notch would not be as effective for its stated purpose because the region of the electrode near the notch would not be able to readily accommodate deformation caused by welding and thus avoid forming wrinkles (Ex. 1005, ¶ [0014]). Ex. 1002, ¶75. A POSITA would have further understood that Deng's notch, because it extends fully through the current collector, extends through both a first (e.g., front face) and second (e.g., back face) surface of the current collector (e.g., electrode 3) shown in Figs. 1a and 1b. Ex. 1005, Figs. 1a, 1b; Ex. 1002, ¶75.

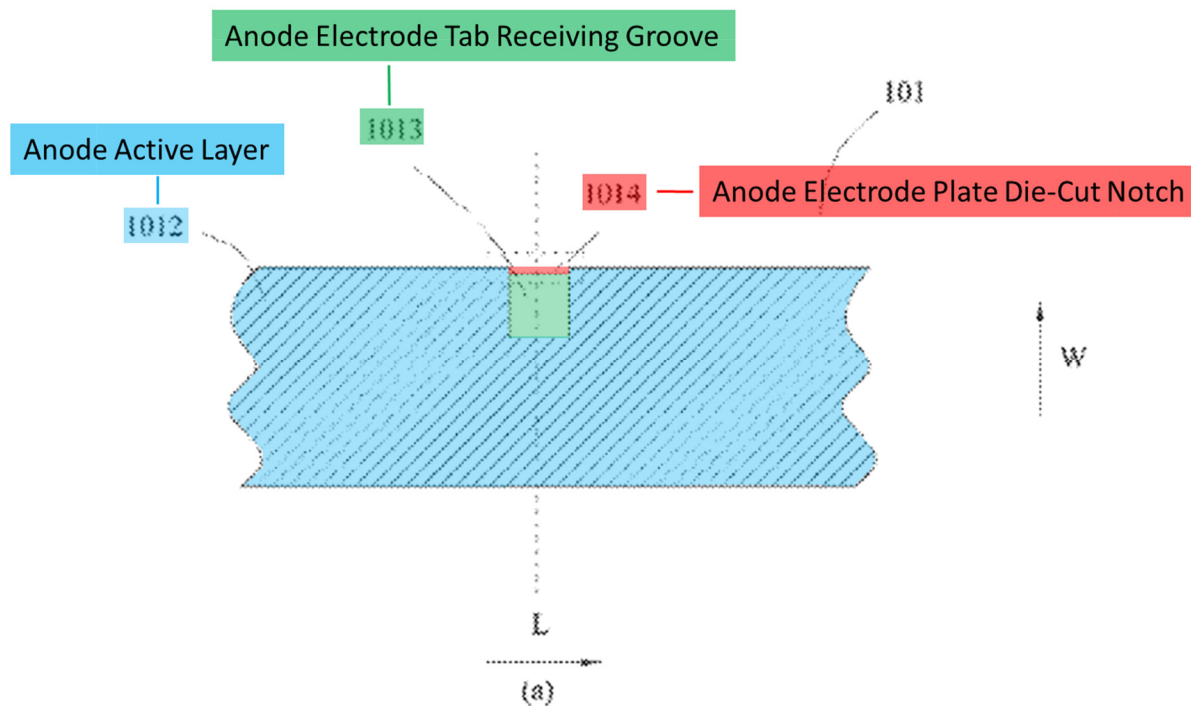
Both Wang and Deng disclose attaching an electrode tab to an electrode current collector via welding. Ex. 1004, ¶[0032]; Ex. 1005, ¶[0004]. In view of Deng's stated benefits of its electrode notch, such as to reduce the accumulation of heat and the resulting deformation and/or warping of the electrode to which the tab is welded, a POSITA would have been motivated to modify Wang's negative electrode to include a notch on the current collector where the first (e.g., anode) electrode tab will be welded. Ex. 1002, ¶76. Annotated Wang Figure 2 below depicts where a POSITA would have positioned the notch in the negative electrode of Wang based on Deng's teachings. Ex. 1004, Fig. 2; Ex. 1002, ¶76.



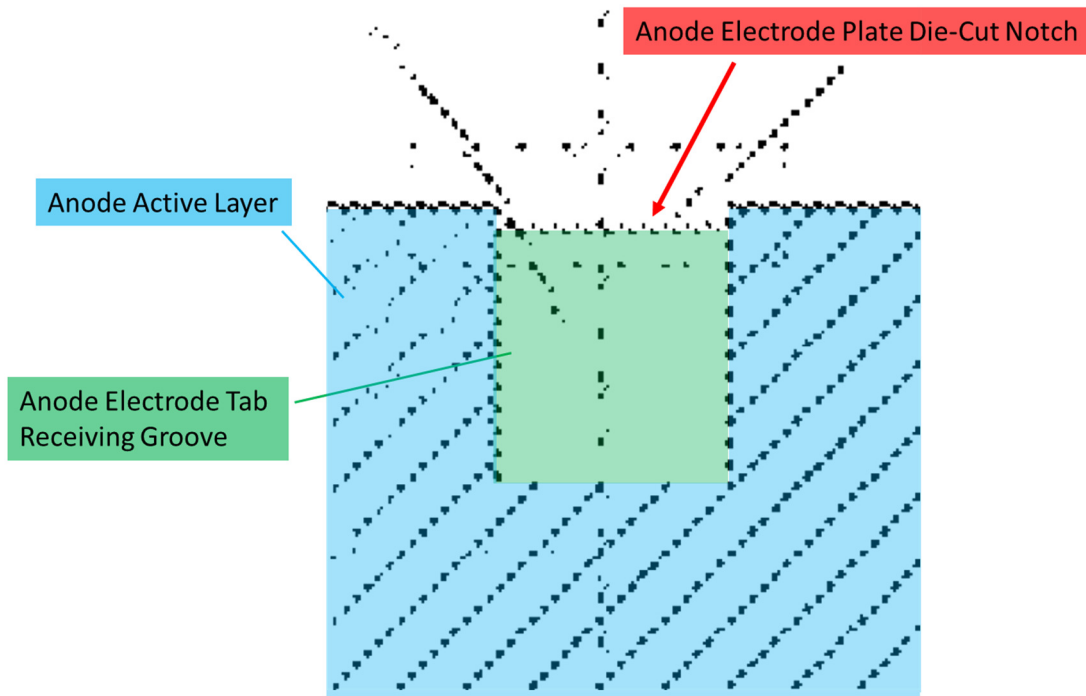
Based on Wang's disclosure, a POSITA would have understood that the notch in the modified Wang negative electrode would appear in a top-down view as shown in the figure below. Ex. 1002, ¶77.



The first electrode plate notch of the modified Wang anode would be disposed on a “side edge” of the first electrode tab receiving groove—the upper edge of the electrode tab receiving groove shown above—just as the ’352 patent’s “anode electrode plate die-cut notch 1014” is on a “side edge” of “anode electrode tab receiving groove 1013” in annotated ’352 patent Figure 5(a) below. Ex. 1001, 3:14-45, Fig. 5a; Ex. 1002, ¶¶78.



The shape of the ’352 patent’s notch is shown in the magnified excerpt of annotated ’352 Fig. 5a below. Ex. 1001, Fig. 5a; Ex. 1002, ¶¶79-80.



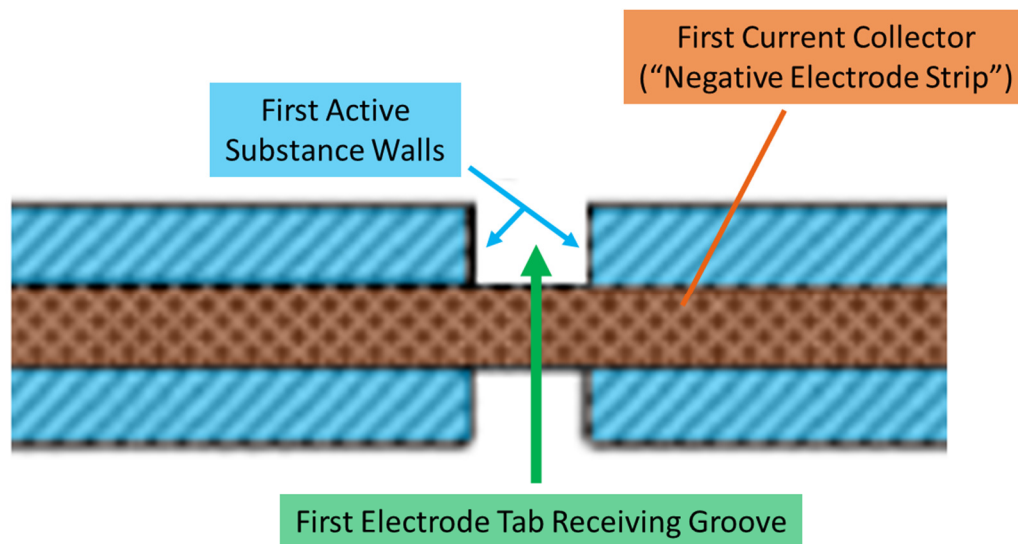
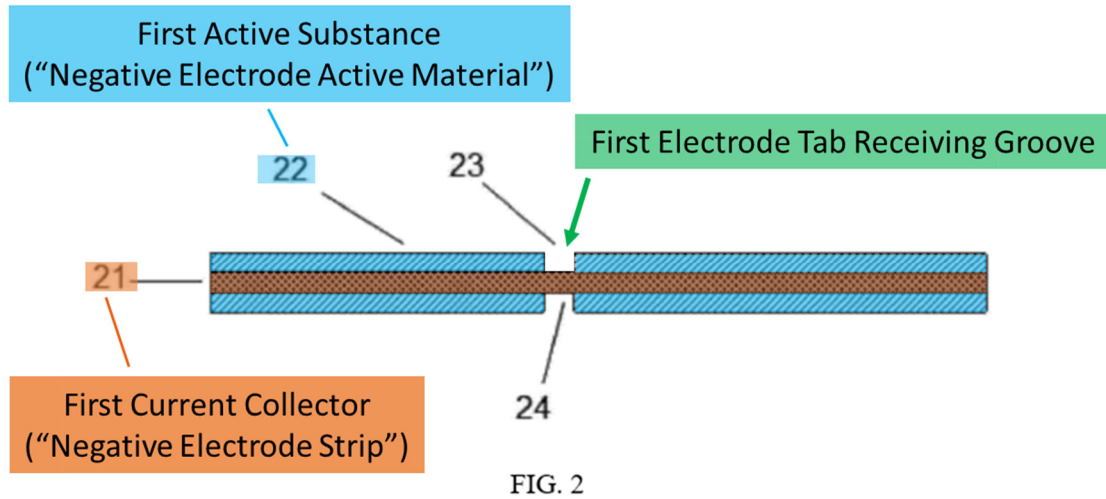
Deng teaches that its notch is a through hole in the current collector (Ex. 1002, ¶75), and a POSITA would have made a notch through Wang’s negative electrode (including through the current collector’s first and second surfaces) for substantially the same reasons. Ex. 1002, ¶¶75, 81.

Modifying Wang’s negative electrode to include Deng’s notch would have been well within a POSITA’s capability, requiring only routine skill, knowledge, and standard production and machining techniques. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416-417, 421 (2007) (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”); Ex. 1002, ¶82. It would also have yielded predictable results—a negative electrode including a notch in the area where the electrode tab

attaches to the current collector—with a reasonable expectation of success. *KSR*, 550 U.S. at 416-417, 421; Ex. 1002, ¶82.

1(h): the first electrode tab receiving groove is formed by the first current collector and at least two first active substance walls;

As discussed above for claim 1(e)(i), Wang discloses a first electrode tab receiving groove (e.g., the “area of [the] negative electrode tab 23” on the negative electrode strip that is “not coated with the negative electrode active material 22.”). Ex. 1004, ¶[0101]; Ex. 1002, ¶83. A POSITA would have understood that Wang’s first electrode tab receiving groove is formed by the first current collector and at least two active substance side walls because the tab receiving groove is an exposed portion of the current collector (e.g., negative electrode strip) that is surrounded on two sides by the negative electrode active material, as shown in annotated original Wang Figure 2 and the magnified excerpt below. Ex. 1004, ¶¶[0065], [0101]; Ex. 1002, ¶83.



1(i): wherein the secondary battery is a wound-type secondary battery.

Wang discloses a secondary battery that is a wound-type secondary battery.

Ex. 1004, ¶¶[0009]-[0010]; Ex. 1002, ¶84.

4. Claim 2:

As discussed below, the combination of Wang and Deng renders obvious each element of claim 2. Ex. 1002, ¶¶85-102.

**2(pre): The secondary battery according to claim 1,
further comprising:**

See claim 1 analysis. Ex. 1002, ¶¶86.

2(a): a second electrode tab;

Wang discloses a second electrode tab (e.g., positive electrode tab). Ex. 1004, ¶[0064], Fig. 1; Ex. 1002, ¶¶87.

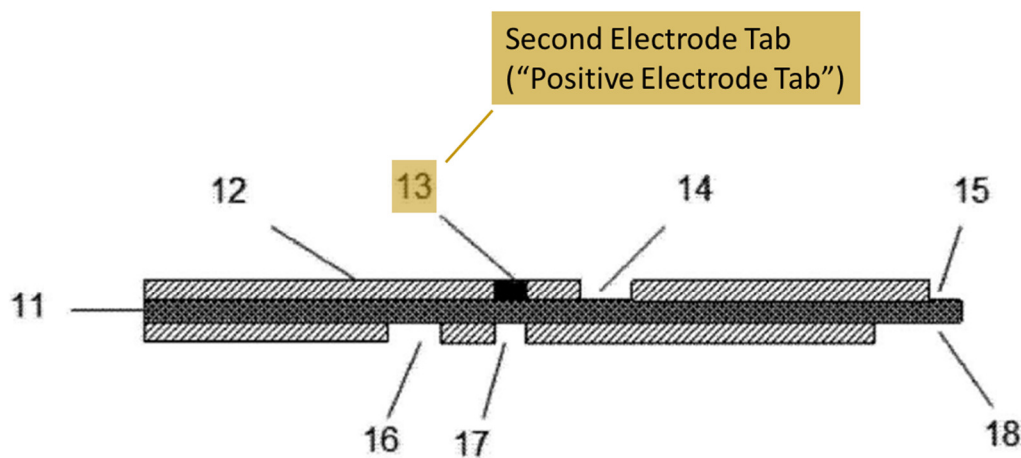


FIG. 1

2(b): a second electrode plate, comprising:

Wang discloses a second electrode plate (e.g., positive electrode). Ex. 1004, ¶¶[0010], [0064]; Ex. 1002, ¶¶88.

2(c): a second current collector; and

Wang discloses a second current collector (e.g., positive electrode strip). Ex. 1004, ¶[0064], Fig. 1; Ex. 1002, ¶¶89.

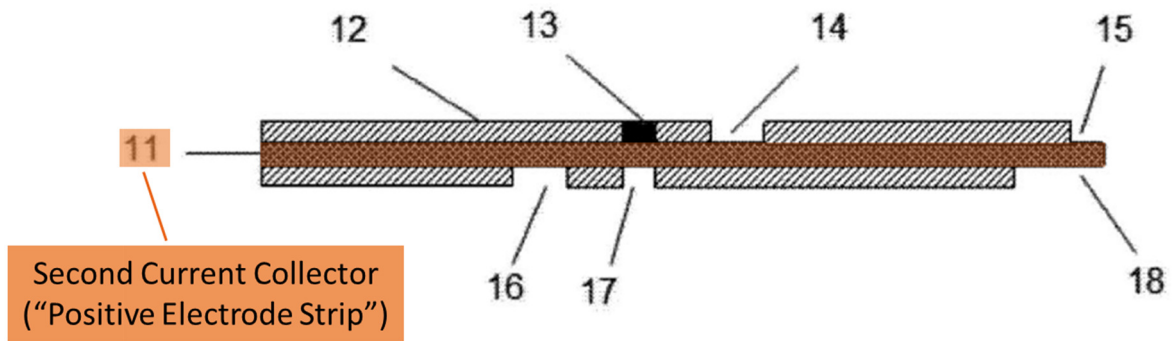


FIG. 1

2(d): a second active substance, disposed on a surface of the second current collector;

Wang discloses a second active substance (e.g., positive electrode active material) disposed on a surface of the second current collector (e.g., positive electrode strip). Ex. 1004, ¶¶[0024], [0064] (“[A] positive electrode active material 12 [is] evenly disposed on two sides of the positive electrode strip 11”), Fig. 1; Ex. 1002, ¶90.

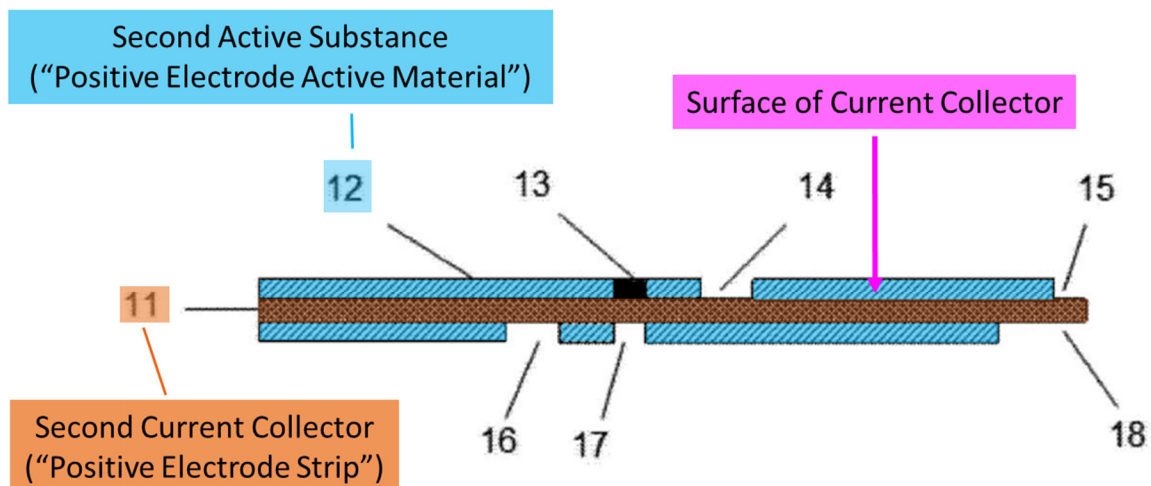
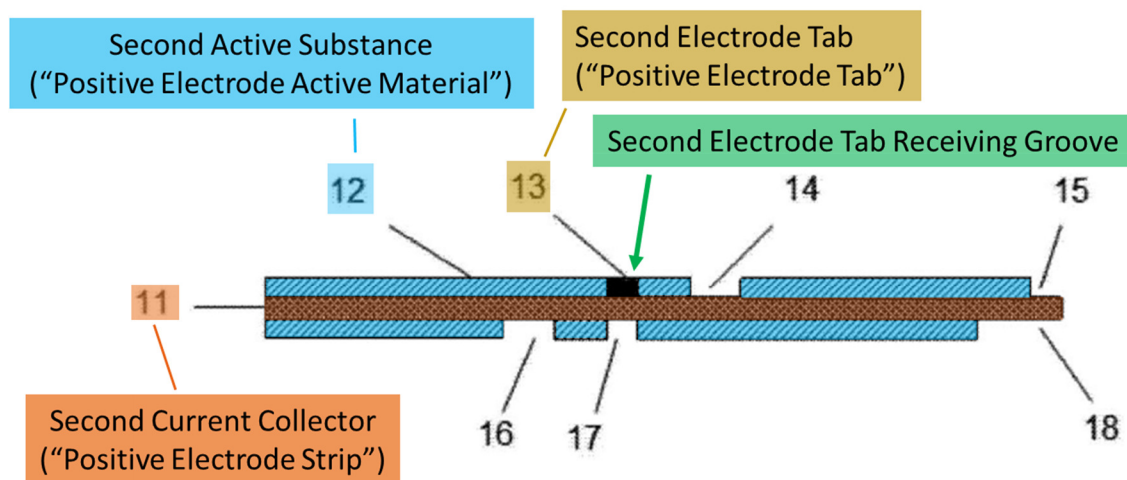


FIG. 1

Claim 2(e):

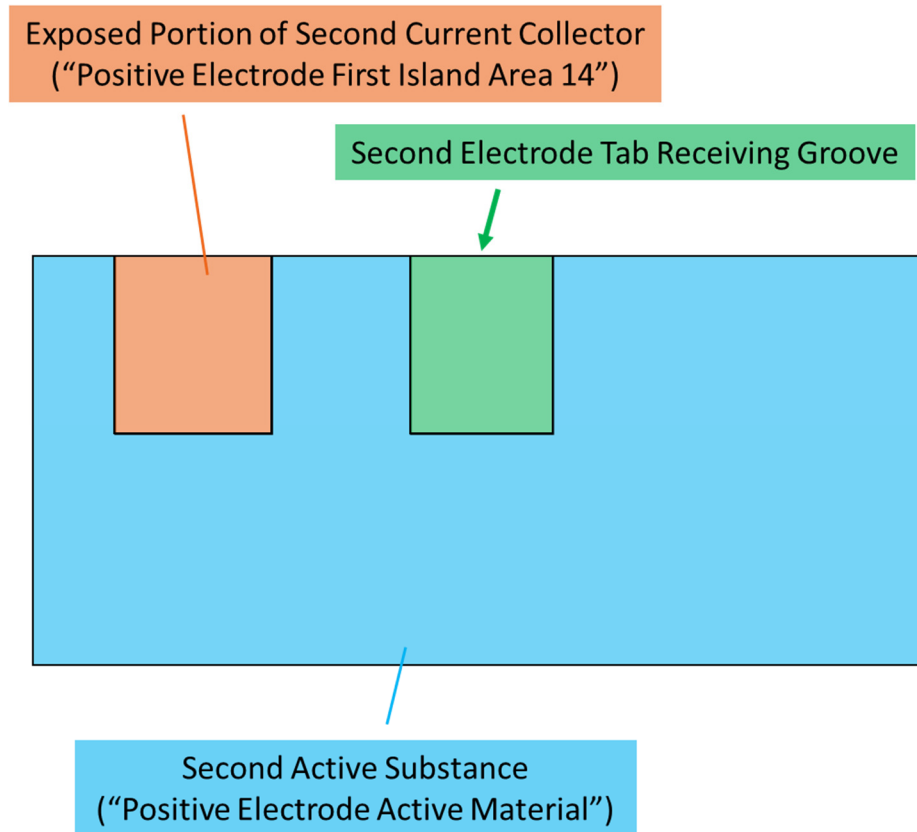
2(e)(i): a second electrode tab receiving groove, configured to receive the second electrode tab,

Wang discloses a second electrode tab receiving groove (e.g., “area of the positive electrode tab” on the positive electrode strip that is “not coated with the positive electrode active material”) configured to receive the second electrode tab (e.g., positive electrode tab). Ex. 1004, ¶¶[0032], [0064], [0101], Fig. 1; Ex. 1002, ¶91.



Wang does not provide a top-down perspective view of its positive electrode, but based on Wang’s disclosure, a POSITA would have understood that Wang’s positive electrode tab receiving groove would appear in a top-down view (oriented so that the electrode tab receiving groove is at the top of the figure) as shown in the figure below. Ex. 1002, ¶92. Wang’s “positive electrode first island

area” (e.g., element 14 in Fig. 1 above) is labeled in the figure below for clarity but is not otherwise relevant to this claim. Ex. 1004, ¶¶[0049], [0056]; Ex. 1002, ¶93.

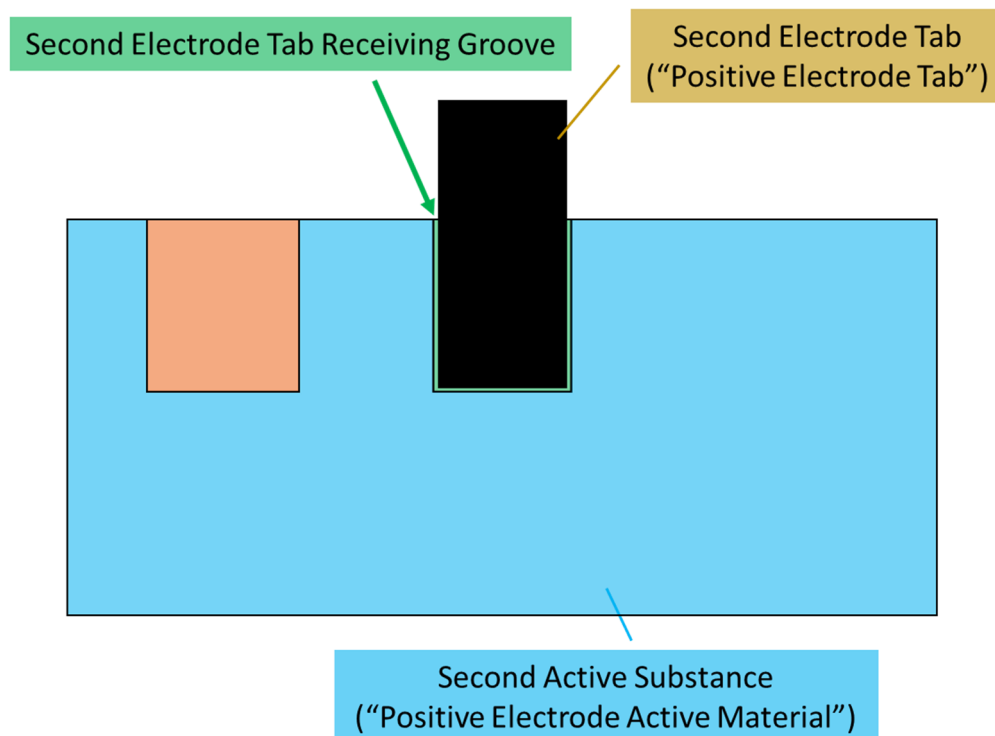


2(e)(ii): wherein the second electrode tab is electrically connected with the second current collector through the second electrode tab receiving groove; and

Wang discloses that the second electrode tab (e.g., positive electrode tab) is electrically connected with the second current collector (e.g., positive electrode strip) through the second electrode tab receiving groove (e.g., “area of the positive electrode tab” on the positive electrode strip that is “not coated with the positive electrode active material”). Ex. 1004, ¶¶[0032], [0064], [0101], Fig. 2; Ex. 1002,

¶94. A POSITA would have understood that Wang's positive electrode tab and positive electrode strip are electrically connected because that is a fundamental, well-understood structural feature of a lithium-ion battery, and Wang's battery would not function without such a connection. Ex. 1002, ¶94. A POSITA would have further understood that Wang's disclosure of welding the positive electrode tab to an exposed surface of the positive electrode strip would create an electrical connection at least because both structural components are each made of a conductive material (e.g., aluminum). Ex. 1004, ¶¶[0018]-[0019]; Ex. 1002, ¶94.

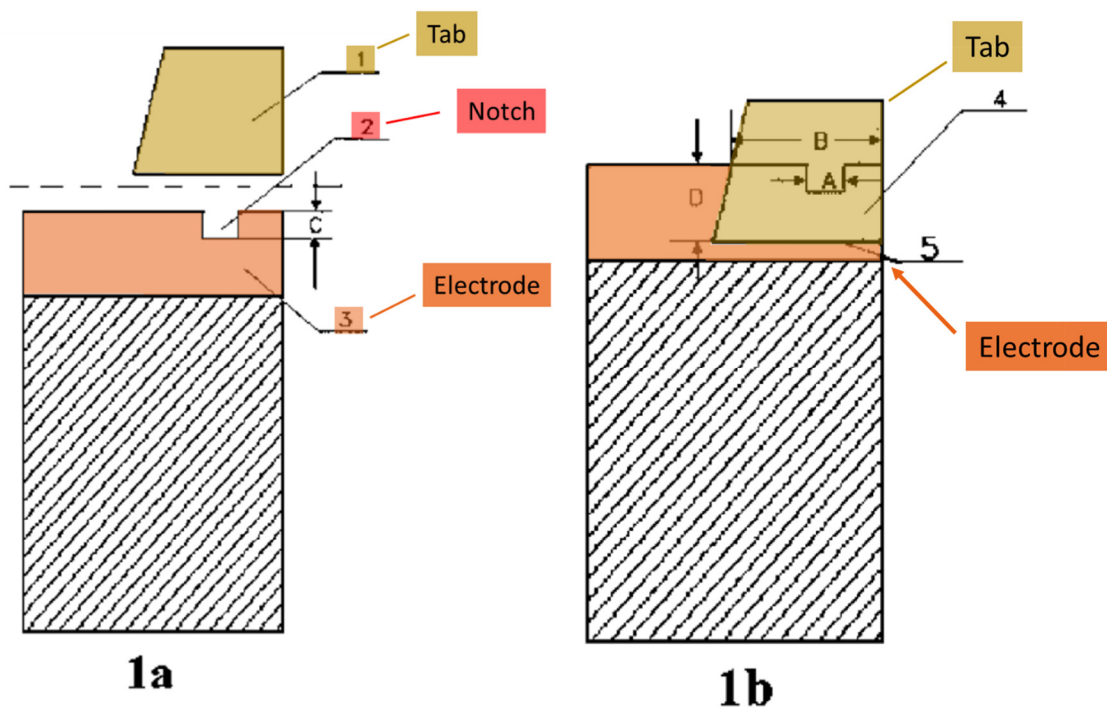
Based on Wang's disclosure, a POSITA would have understood that Wang's second electrode tab of Fig. 1 would appear in a top-down view as shown in the figure below. Ex. 1002, ¶95.



2(f): a second electrode plate notch disposed on a side edge of the second electrode tab receiving groove and extending through the surface of the second current collector.

Wang does not expressly disclose a second electrode plate notch. Ex. 1002, ¶¶96. This claim element would have been obvious, however, in view of Wang in combination with Deng. *Id.*

As discussed above in Section VII.A.2 and for claim 1(g), Deng discloses forming a notch through the edge of an electrode plate in a “to-be-welded area” of the electrode, before the tab is attached to the electrode, to prevent deformation of the current collector during welding. Ex. 1005, ¶¶[0002], [0004], [0007], [0014], Figs. 1a, 1b; Ex. 1002, ¶¶97.



As also discussed above, a POSITA considering Deng would have understood that its notch extends entirely through the surface of the edge of the electrode (i.e., at the edge of the current collector) in view of Deng's stated purpose of using the notch to prevent deformation/warping of the electrode in the region of the notch. Ex. 1005, ¶[0014], Figs. 1a, 1b; Ex. 1002, ¶98.

In view of Deng's disclosed benefits of using a notch in an area of a current collector to which an electrode tab is welded, such as to reduce the accumulation of heat and the resultant warping of the electrode to which the tab is attached, a POSITA would have been motivated to modify Wang's battery to include a notch in the positive electrode current collector. Ex. 1002, ¶99. This notch on Wang's second electrode plate would be positioned beneath the second electrode tab, disposed on a side edge of Wang's second electrode tab receiving groove, and extend through the surface of the second current collector. *Id.* Annotated Wang Figure 1 below depicts where a POSITA would have positioned the notch in the positive electrode of Wang based on Deng's teachings. *Id.*; Ex. 1004, Fig. 2.

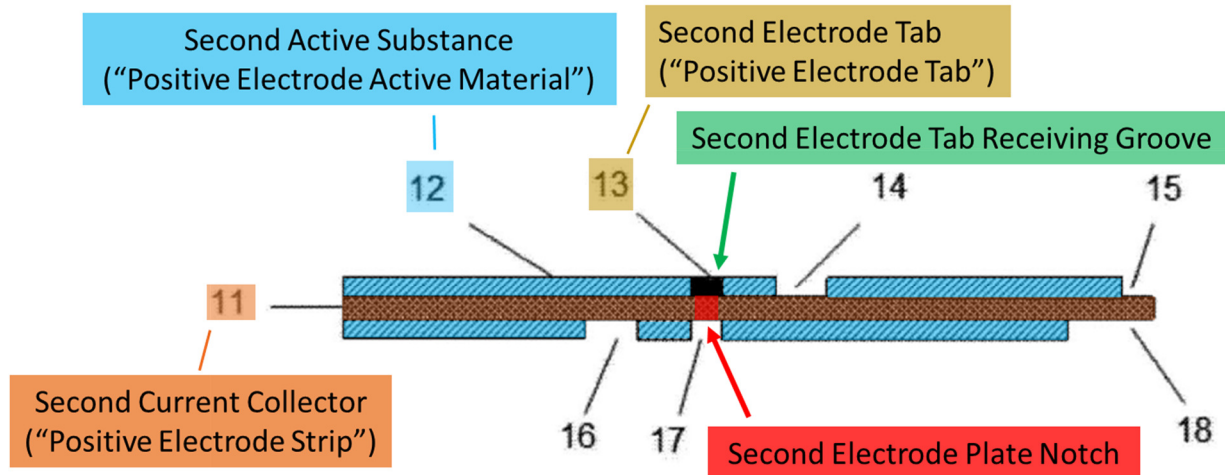
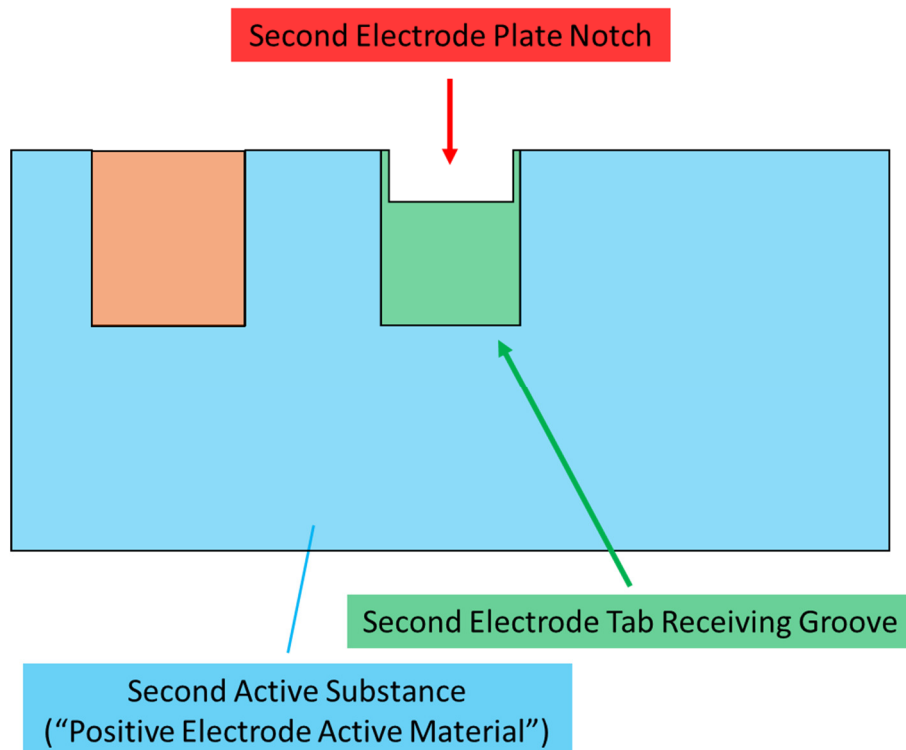
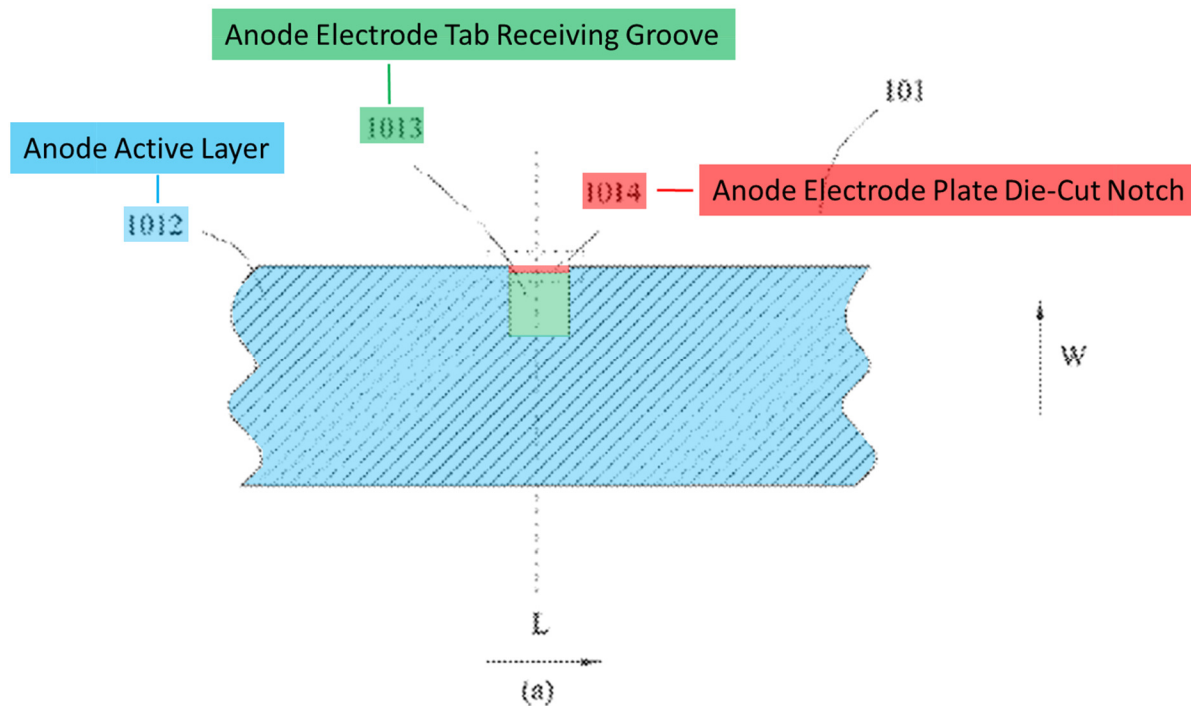


FIG. 1

Based on Wang's disclosure, a POSITA would have understood that the notch in the modified Wang positive electrode would appear in a top-down view as shown in the figure below. Ex. 1002, ¶100.



As discussed above for claim 1(g), the second electrode plate notch of the modified Wang positive electrode is disposed on a “side edge” of the second electrode tab receiving groove (i.e., the upper edge of the second electrode tab receiving groove shown above) in the same manner that the ’352 patent’s “anode electrode plate die-cut notch 1014” is on a side edge of an “anode electrode tab receiving groove 1013,” as shown in ’352 patent Figure 5(a) below. Ex. 1001, 3:14-45, Fig. 5a; Ex. 1002, ¶101. The same is true for the “cathode electrode plate die-cut notch 1034,” which is “located on the side edge of the cathode electrode tab receiving groove 1033” in the similar electrode notch structure of Fig. 5(b). Ex. 1001, 3:42-49, Fig. 5(b); Ex. 1002, ¶101.



The notch in the modified Wang positive electrode would also extend through the surface of the second current collector in view of the aforementioned teachings of Deng that its notch is a through hole in the current collector. Ex. 1002, ¶¶75, 102. A POSITA would have made a notch in Wang's positive electrode that is a through hole for substantially the same reasons taught by Deng. *Id.* Modifying Wang's positive electrode to include the notch disclosed by Deng would have been well within the skill of a POSITA and would have required only routine skill, knowledge, and the use of standard production and machining techniques, and would have yielded predictable results with a reasonable expectation of success, i.e., a positive electrode including a notch in an area to which the positive electrode tab is attached on the positive electrode strip. *KSR*, 550 U.S. at 416-417, 421; Ex. 1002, ¶102.

5. Claim 3:

As discussed below, Wang renders claim 3 obvious in combination with Deng. Ex. 1002, ¶¶103-117.

3(pre): The secondary battery according to claim 2, wherein:

See claim 2 analysis. Ex. 1002, ¶104.

3(a): the first electrode plate is an anode electrode plate;

As discussed above in claim 1(b), Wang discloses that the first electrode plate is an anode (negative) electrode plate. Ex. 1004, ¶¶[0010], [0065]; Ex. 1002, ¶105.

3(b): the first current collector is an anode current collector;

As discussed above in claim 1(c), Wang discloses a first current collector that is an anode (negative electrode) current collector. Ex. 1004, ¶[0065]; Ex. 1002, ¶106.

3(c): the first active substance is an anode active substance;

As discussed above in claim 1(d), Wang discloses a first active substance that is an anode (negative electrode) active substance. Ex. 1004, ¶¶[0024], [0065]; Ex. 1002, ¶107.

3(d): the first electrode tab is an anode electrode tab;

As discussed above in claim 1(a), Wang discloses a first electrode tab that is an anode (negative) electrode tab. Ex. 1004, ¶¶[0065], [0101]; Ex. 1002, ¶108.

3(e): the first electrode tab receiving groove is an anode electrode tab receiving groove;

As discussed above in claim 1(e)(i), Wang discloses a first electrode tab receiving groove that is an anode (negative) electrode tab receiving groove. Ex. 1004, ¶¶[0065], [0101]; Ex. 1002, ¶109.

3(f): the first recess is an anode recess;

As discussed above in claim 1(f), Wang discloses a first recess that is an anode (negative electrode) recess. Ex. 1004, ¶¶[0065], [0101]; Ex. 1002, ¶110.

3(g): the first electrode plate notch is an anode electrode plate notch;

As discussed above in claim 1(g), the combination of Wang and Deng renders obvious a first electrode plate notch that is an anode (negative) electrode plate notch. Ex. 1002, ¶111.

3(h): the second electrode plate is a cathode electrode plate;

As discussed above in claim 2(b), Wang discloses a second electrode plate that is a cathode (positive) electrode plate. Ex. 1004, ¶¶[0010], [0064]; Ex. 1002, ¶112.

3(i): the second current collector is a cathode current collector;

As discussed above in claim 2(c), Wang discloses a second current collector that is a cathode (positive electrode) current collector. Ex. 1004, ¶¶[0064]; Ex. 1002, ¶113.

3(j): the second active substance is a cathode active substance;

As discussed above in claim 2(d), Wang discloses a second active substance that is a cathode (positive electrode) active substance. Ex. 1004, ¶¶[0024], [0064]; Ex. 1002, ¶114.

3(k): the second electrode tab is a cathode electrode tab;

As discussed above in claim 2(a), Wang discloses a second electrode tab that is a cathode (positive) electrode tab. Ex. 1004, ¶[0064]; Ex. 1002, ¶115.

3(l): the second electrode tab receiving groove is a cathode electrode tab receiving groove; and

As discussed above in claim 2(e)(i), Wang discloses a second electrode tab receiving groove that is a cathode (positive) electrode tab receiving groove. Ex. 1004, ¶¶[0032], [0064], [0101]; Ex. 1002, ¶116.

3(m): the second electrode plate notch is a cathode electrode plate notch.

As discussed above in claim 2(f), the combination of Wang and Deng renders obvious a second electrode plate notch that is a cathode (positive) electrode plate notch. Ex. 1002, ¶117.

6. Claim 9:

As discussed below, the combination of Wang and Deng renders obvious claim 9. Ex. 1002, ¶¶118-121.

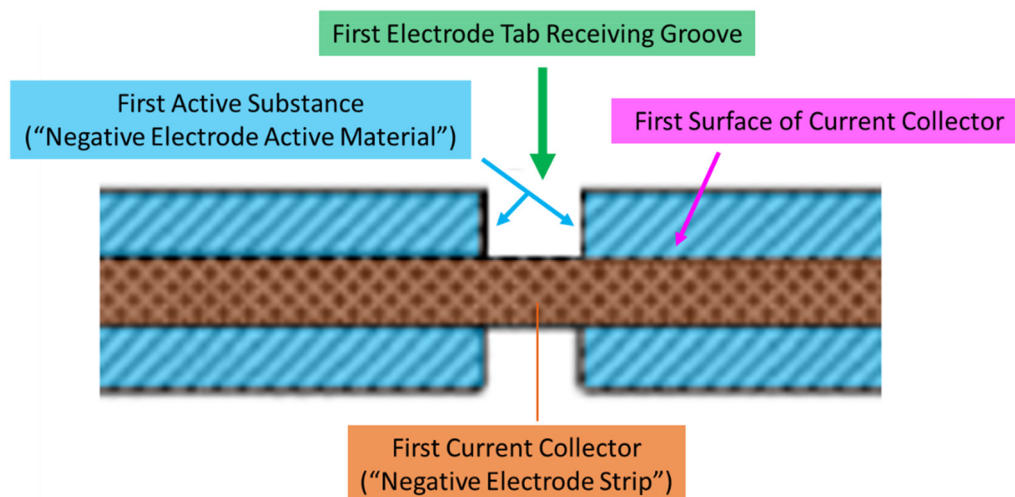
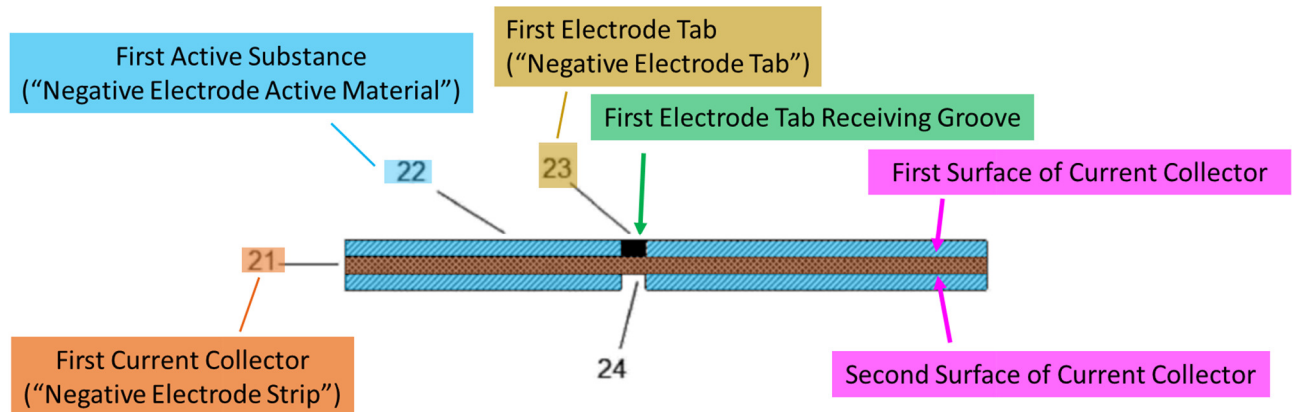
9(pre): The secondary battery according to claim 1, wherein:

See claim 1 analysis. Ex. 1002, ¶119.

9(a): the first electrode tab receiving groove is defined by the first active substance and extends to the first surface of the first current collector; and

As discussed above for claim 1(e)(i), Wang discloses a first electrode tab receiving groove defined by an exposed portion of the first surface of the first current collector and the first active substance on a periphery of the first electrode tab receiving groove. Ex. 1002, ¶120. As shown below in annotated Wang Figure 2 and a magnified excerpt, the first electrode tab receiving groove is defined by the first active substance (e.g., negative electrode active material) and extends to the first surface of the first current collector (e.g., the exposed surface of negative

electrode strip 21 to which negative electrode tab 23 is connected). Ex. 1004, ¶¶[0065], [0101], Fig. 2; Ex. 1002, ¶120.



9(b): the first electrode plate notch extends through the first current collector from the first surface of the first current collector.

As discussed above for claim 1(g), the negative electrode of Wang, modified in view of Deng, includes a notch that extends through the first and second surfaces of the first current collector. Ex. 1002, ¶121. For the same reasons, the modified Wang negative electrode includes a first electrode plate notch that

extends through the first current collector from the first surface of the first current collector. Ex. 1002, ¶121.

7. Claim 10:

As discussed below, the combination of Wang and Deng renders obvious claim 10. Ex. 1002, ¶122.

10(pre): The secondary battery according to claim 2, wherein:

See claim 2 analysis. Ex. 1002, ¶123.

10(a): the second electrode tab receiving groove is defined in the second active substance and extends to the surface of the second current collector; and

As discussed above for claim 2(e)(i), Wang discloses a second electrode tab receiving groove. Ex. 1002, ¶124. As shown below in annotated Wang Figure 1, as well as a magnified excerpt with Wang's second (e.g., positive) electrode tab removed to show the second electrode tab receiving groove, the second electrode tab receiving groove is defined in the second active substance (e.g., positive electrode active material) and extends to the surface of the second current collector (e.g., the exposed surface of positive electrode strip 11 to which positive electrode tab 13 is connected). Ex. 1004, ¶¶[0065], [0101], Fig. 1; Ex. 1002, ¶124.

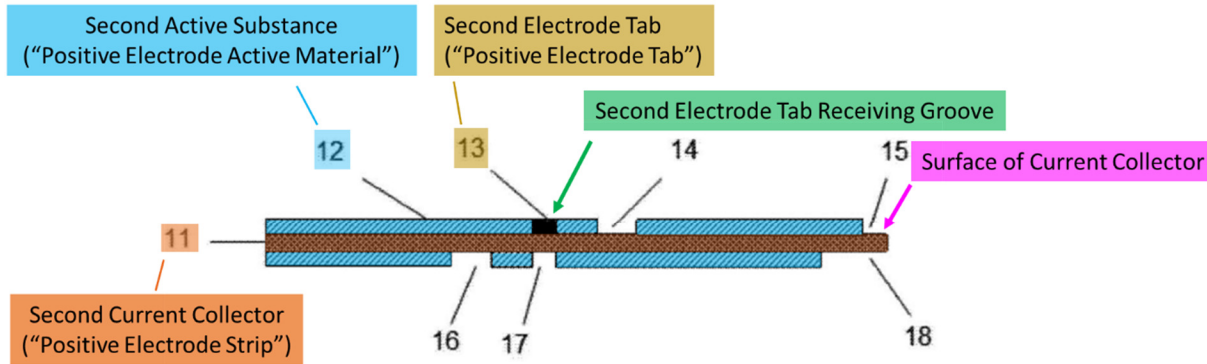
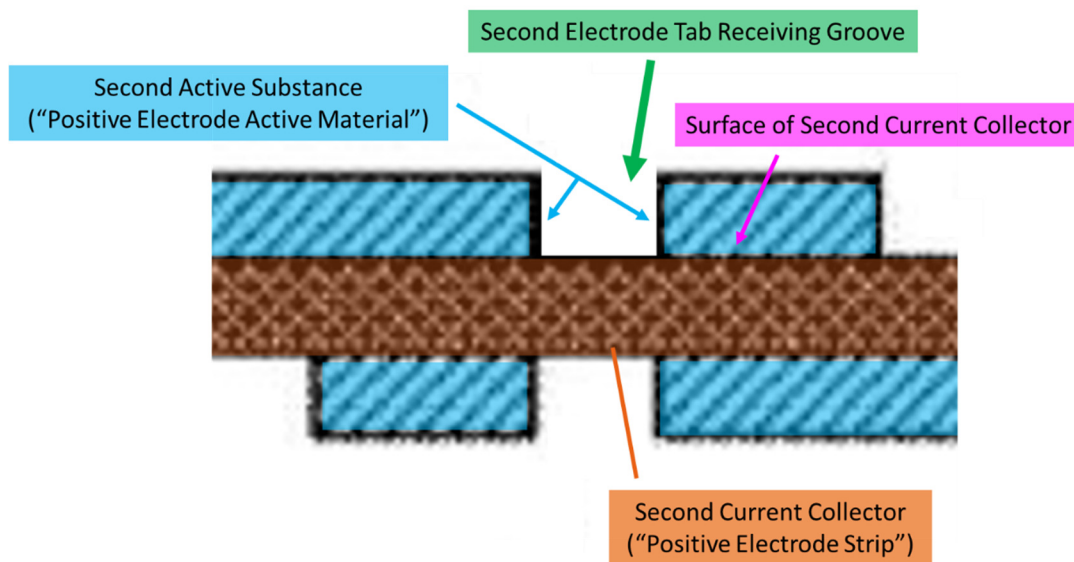


FIG. 1



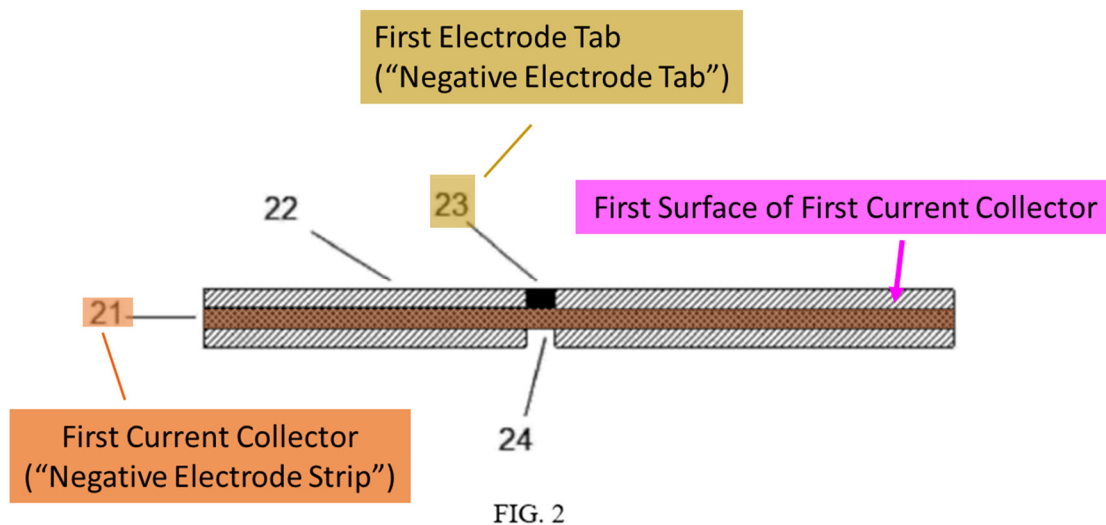
10(b): the second electrode plate notch extends through the second current collector from the surface of the second current collector.

As discussed above for claim 2(f), the positive electrode of Wang, modified in view of Deng, includes a second electrode plate notch that extends through the surface of the second current collector. Ex. 1002, ¶125. For the same reason, the modified Wang positive electrode includes a second electrode plate notch that

extends through the second current collector from the surface of the second current collector. Ex. 1002, ¶125.

8. Claim 11: The secondary battery according to claim 1, wherein a whole of the first electrode tab is parallel with the first surface of the first current collector.

As shown in annotated Fig. 2 below, Wang discloses a first (e.g., negative) electrode tab that lies parallel to the first surface of the current collector. Ex. 1004, Fig. 2; Ex. 1002, ¶126.



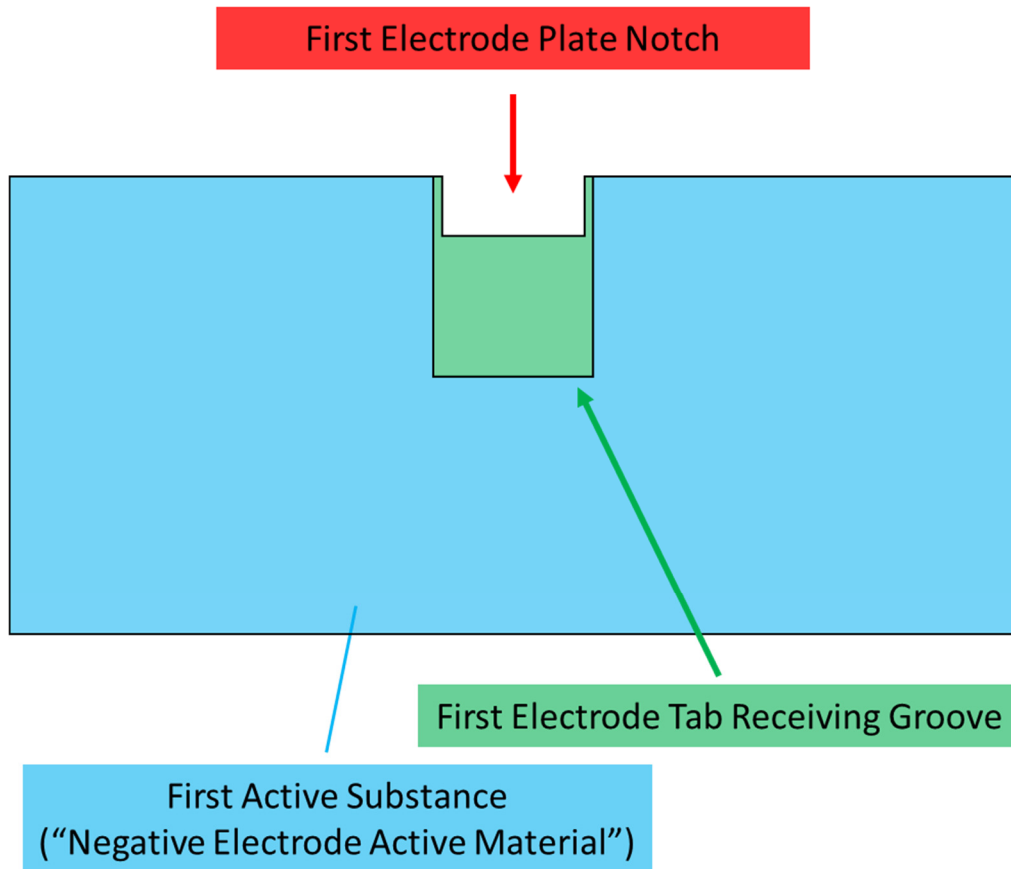
A POSITA, reading Wang’s disclosure, would have understood that the whole negative electrode tab is parallel with the first surface of the current collector. Ex. 1002, ¶127. This tab structure is well known in the field and is the most common tab shape and positioning for several reasons. *Id.* For example, it was known that using a flat electrode tab, lying parallel to the current collector, maximizes the surface area of contact between the electrode tab and current

collector, thus improving the electrical conductivity between the components. Ex. 1002, ¶127. This tab shape and positioning would also have been expected to provide a more secure connection between the electrode tab and the current collector because it allows for an easier, more efficient, and durable weld than a non-flat electrode tab. Ex. 1002, ¶127. Such electrode tab designs have been known in the art for decades. Ex. 1002, ¶128.

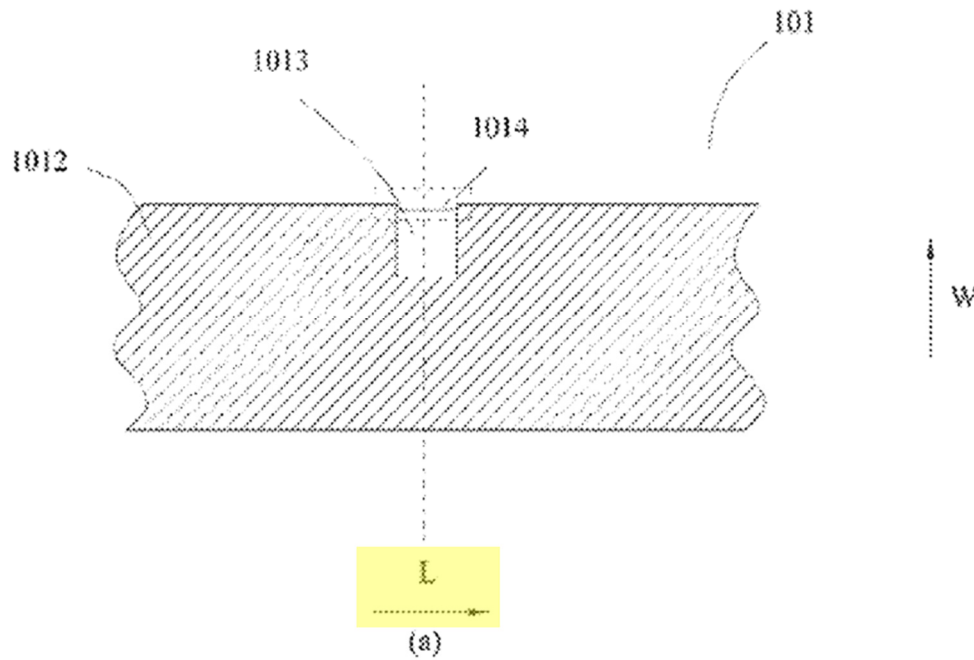
The combination of Wang and Deng thus renders obvious this claim. Ex. 1002, ¶129.

- 9. Claim 12: The secondary battery according to claim 1, wherein a bottom of the first electrode plate notch is located between the first active substance disposed on two opposite sides of the first electrode tab receiving groove in the length direction of the first electrode plate.**

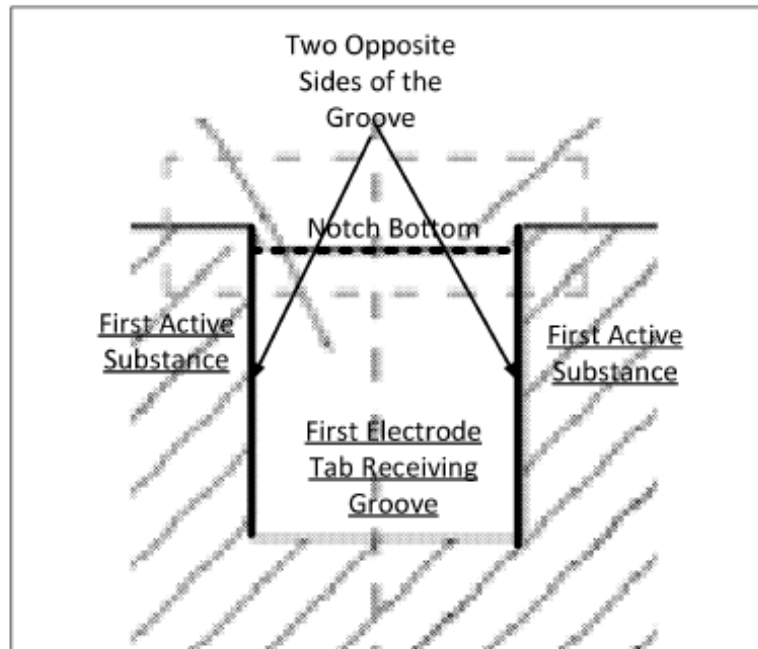
As discussed above for claim 1(g), the combination of Wang and Deng renders obvious a first electrode including a first electrode plate notch that would have been positioned on Wang's electrode as shown in the figure below. Ex. 1002, ¶130.



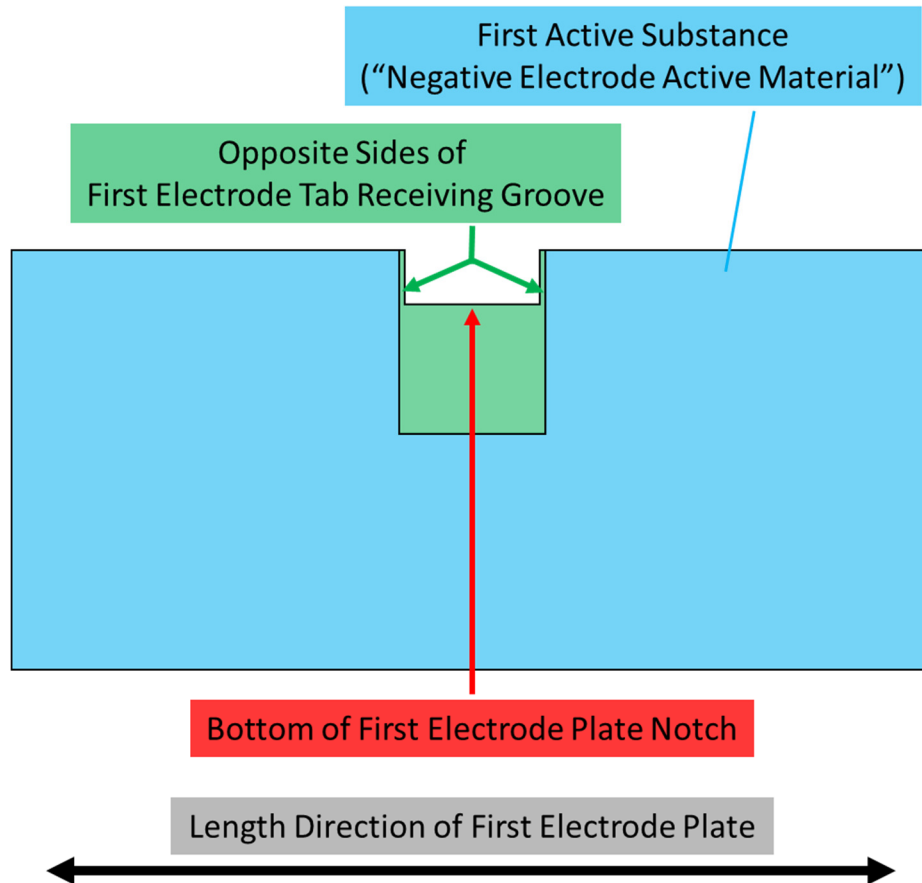
The '352 patent explains that the claimed “length direction of the first electrode plate” is the left-to-right direction in the perspective of the top-down perspective figures of the '352 patent, including Figure 5(a) below. Ex. 1001, 4:1-8 (describing “length direction L”), Fig. 5(a); Ex. 1002, ¶131.



During prosecution of this claim, the Applicant stated that the annotated figure below “depicts” the claimed “bottom of the first electrode plate notch” that “is located between the first active substance disposed on two opposite sides of the first electrode tab receiving groove in the length direction of the first electrode plate.” Ex. 1003, 610-611.



As shown in the annotated figure below, Wang's modified negative electrode similarly includes a bottom of the first electrode plate notch that is located between the first active substance disposed on two opposite sides of the first electrode tab receiving groove in the length direction of the first electrode plate. Ex. 1002, ¶¶132-133.



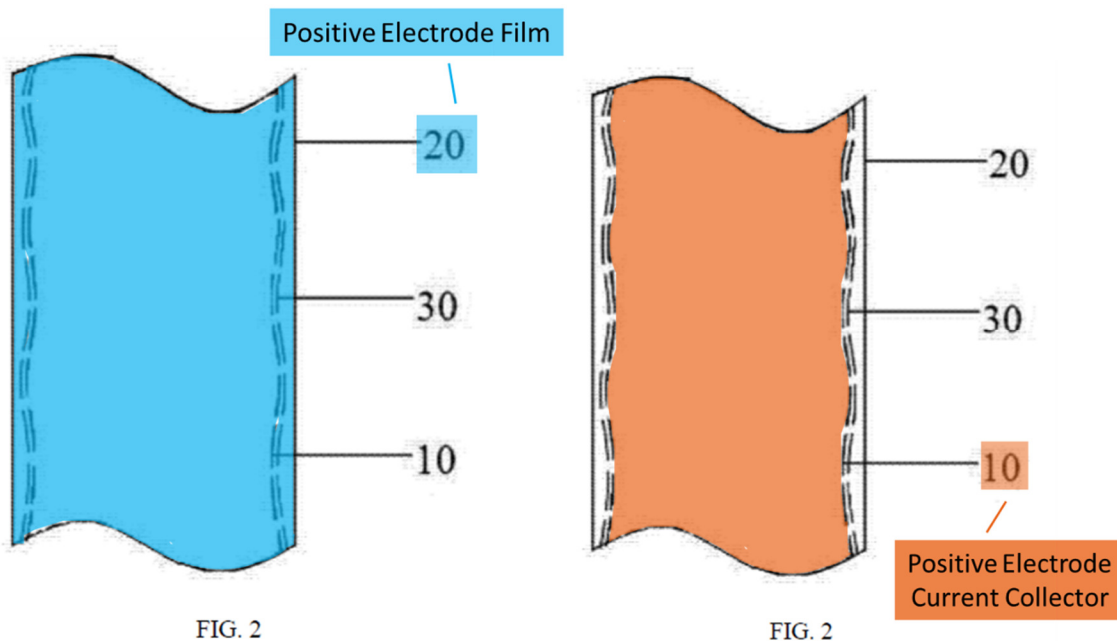
The combination of Wang and Deng thus renders this claim obvious. Ex. 1002, ¶134.

B. Ground 2: Wang and Zhou Render Obvious Claims 1-3 and 9-12

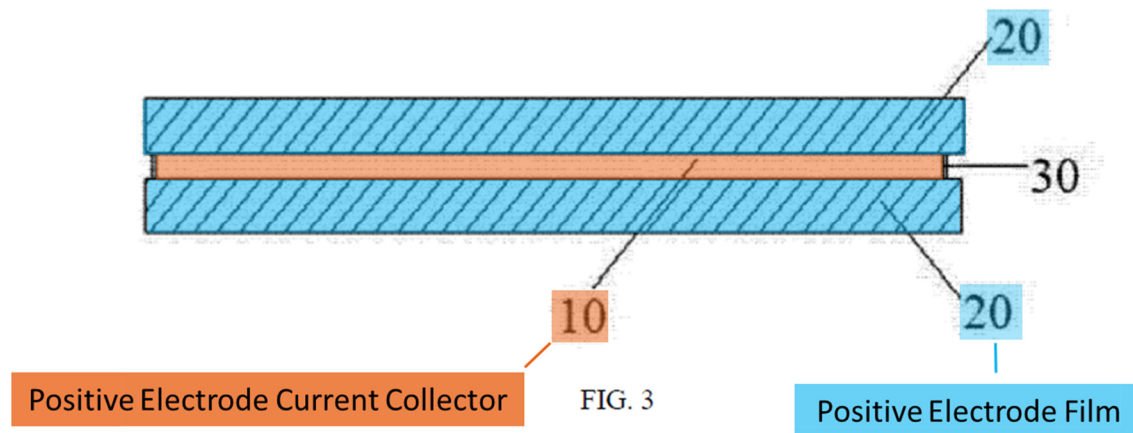
1. Disclosure of Zhou

Zhou discloses that the preparation of a typical lithium-ion battery includes numerous production steps, including cutting an electrode. Ex. 1013, ¶[0004]. The edges of a cut electrode, such as a cathode, may have burrs that pierce through an adjacent separator, leading to a short circuit that can cause the battery to catch fire or even explode. *Id.*

To mitigate the danger of electrode burrs at the cut edge of an electrode, Zhou discloses treating the electrode edge with gas plasma etching to remove electrode burrs from the current collector. Ex. 1013, ¶¶[0001], [0007], [0008], [0015]. Etching the positive electrode current collector in this manner creates an “indented” current collector, in which the width of the current collector is less than the width of adjacent positive electrode films (active material layers), without otherwise affecting the shape or integrity of the positive electrode. *Id.*, ¶[0015]. As shown in annotated Figure 2 below, Zhou’s positive electrode includes a positive electrode film 20 disposed on an underlying current collector 10, as well as a thin oxide layer 30 disposed at an edge of the current collector. Ex. 1013, ¶[0021], Fig. 2; Ex. 1002, ¶¶135-136.



As shown in both Figure 2 above and Figure 3 below, the width of the “indented” current collector, after gas plasma etching, is less than the width of the positive electrode film 20. Ex. 1013, ¶¶[0015], [0021]. Figs. 2, 3; Ex. 1002, ¶137. Zhou states that a preferred distance between the outermost edges of the current collector and positive electrode film is 30 microns. Ex. 1013, ¶[0027].



While Zhou describes its current collector etching process primarily with respect to a positive electrode, it notes that its description of etching the positive electrode “does not exclude the use of a similar dry treatment method to perform etching treatment on the negative electrode to remove burrs at an edge of the negative electrode after current collector cutting.” Ex. 1013, ¶[0038]. A POSITA would have therefore understood that Zhou’s etching process would also be applicable to a negative electrode. Ex. 1002, ¶138.

1. Independent Claim 1

As discussed in Ground 1, Wang discloses claim elements 1(pre), 1(a), 1(b), 1(c), 1(d), 1(e), 1(f), and 1(h). Ex. 1002, ¶139.

The combination of Wang and Zhou renders obvious claim 1(g), as discussed below, and thus renders obvious claim 1. *Id.*

1(g): a first electrode plate notch disposed on a side edge of the first electrode tab receiving groove and extending through the second surface and the first surface of the first current collector; and

As discussed above in Section VII.B.1, Zhou discloses a method of removing electrode burrs at the edge of an electrode current collector using gas plasma etching. Ex. 1013, ¶¶[0008], [00015], Ex. 1002, ¶140. As shown in annotated Zhou Figs. 2 and 3 below, this etching results in a current collector with an “indented” structure having a width that is less than the width of the electrode film (i.e., active substance) on the surfaces of the current collector. Ex. 1013, ¶[0008], [0015], Figs. 2, 3; Ex. 1002, ¶140.

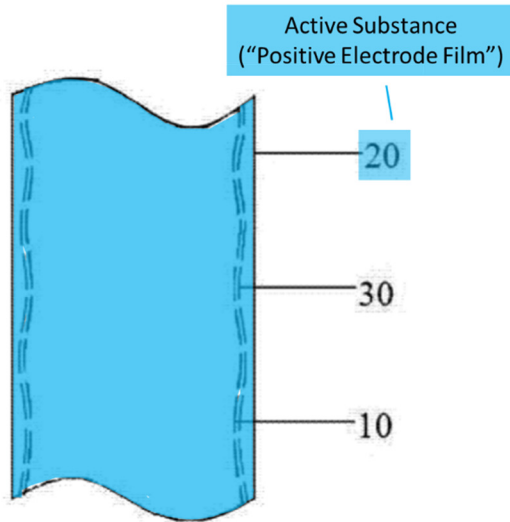


FIG. 2

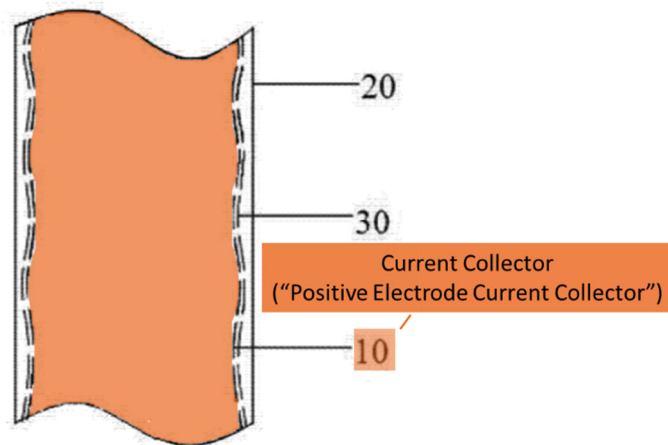


FIG. 2

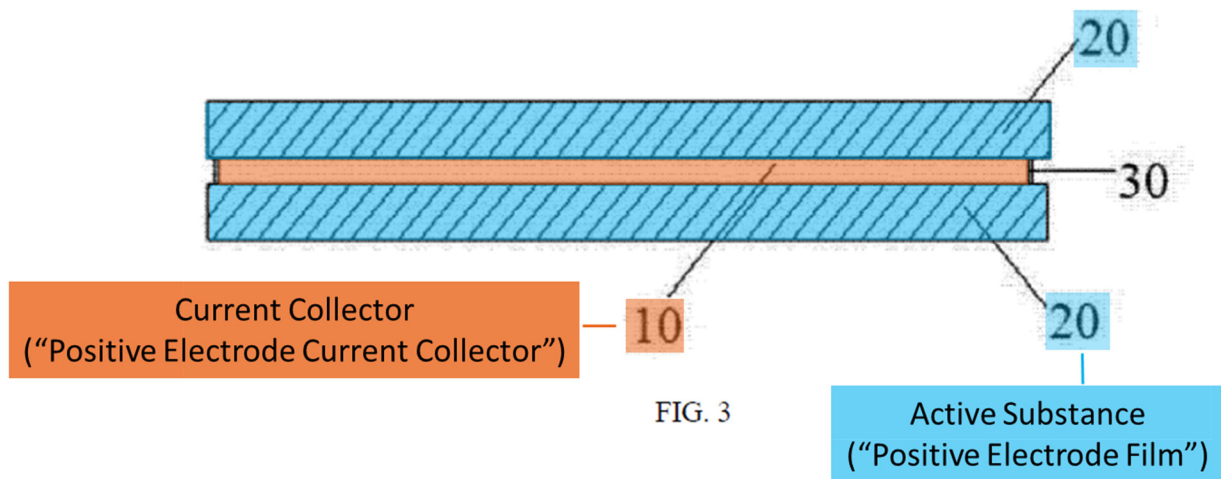


FIG. 3

Zhou describes etching the current collector, and thus creating the electrode plate notch, at an exposed area of the current collector where an electrode tab will later be welded to the current collector (the claimed “electrode tab receiving groove”). Ex. 1013, ¶[0025] (cautioning against making the current collector etch depth “too great,” which “will cause unnecessary damage to an area on the positive electrode current collector 10 that is not covered by a positive electrode active

material, thereby affecting tab welding in a subsequent step.”); Ex. 1002, ¶141.

Zhou does not show the electrode tab receiving groove (e.g., the “area on the positive electrode current collector 10 that is not covered by a positive electrode active material”) in its figures, but based on Zhou’s disclosure, a POSITA would have understood that Zhou’s electrode tab receiving groove would appear in a top-down view, for example, as shown in annotated Figure 2 below. Ex. 1013, ¶[0025], Fig. 2; Ex. 1002, ¶141.

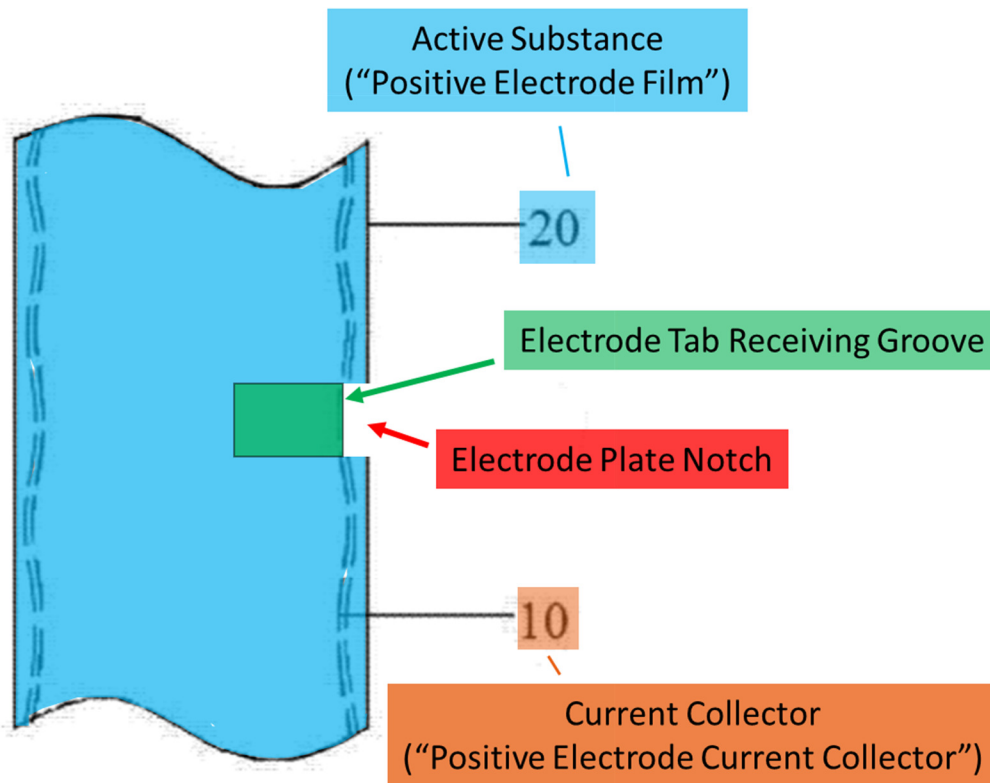
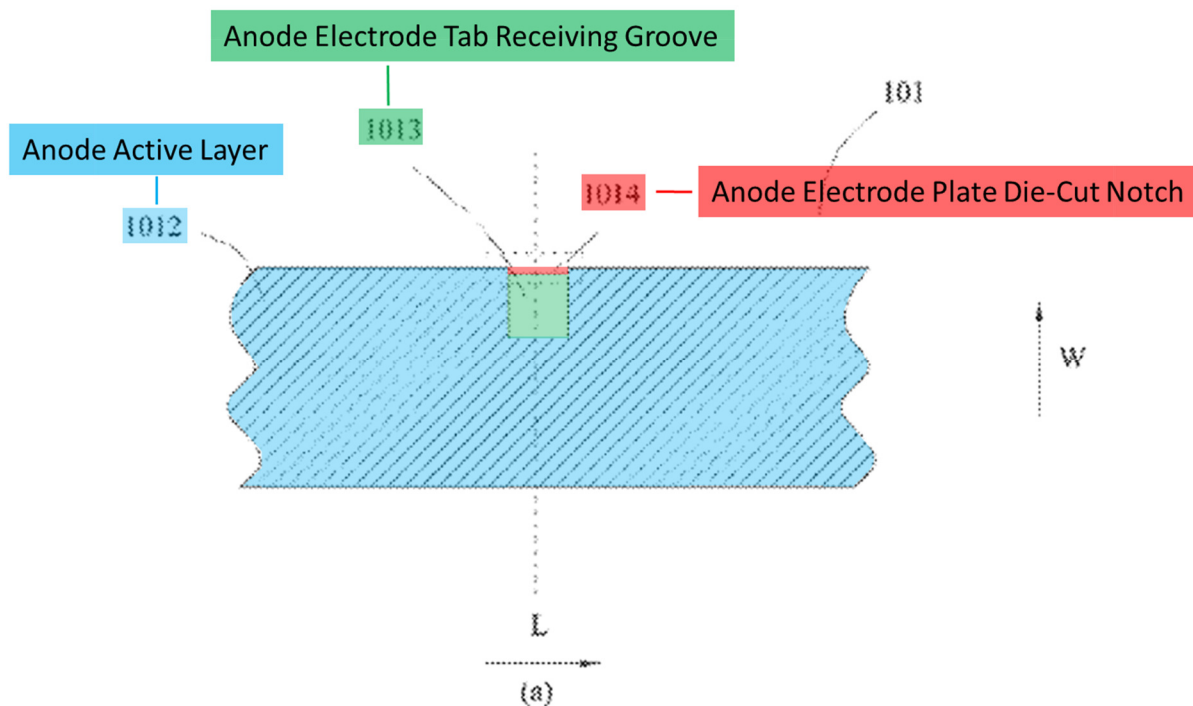


FIG. 2

As shown in the figure above, as a result of Zhou’s current collector etching process, Zhou’s electrode tab receiving groove includes an electrode plate notch

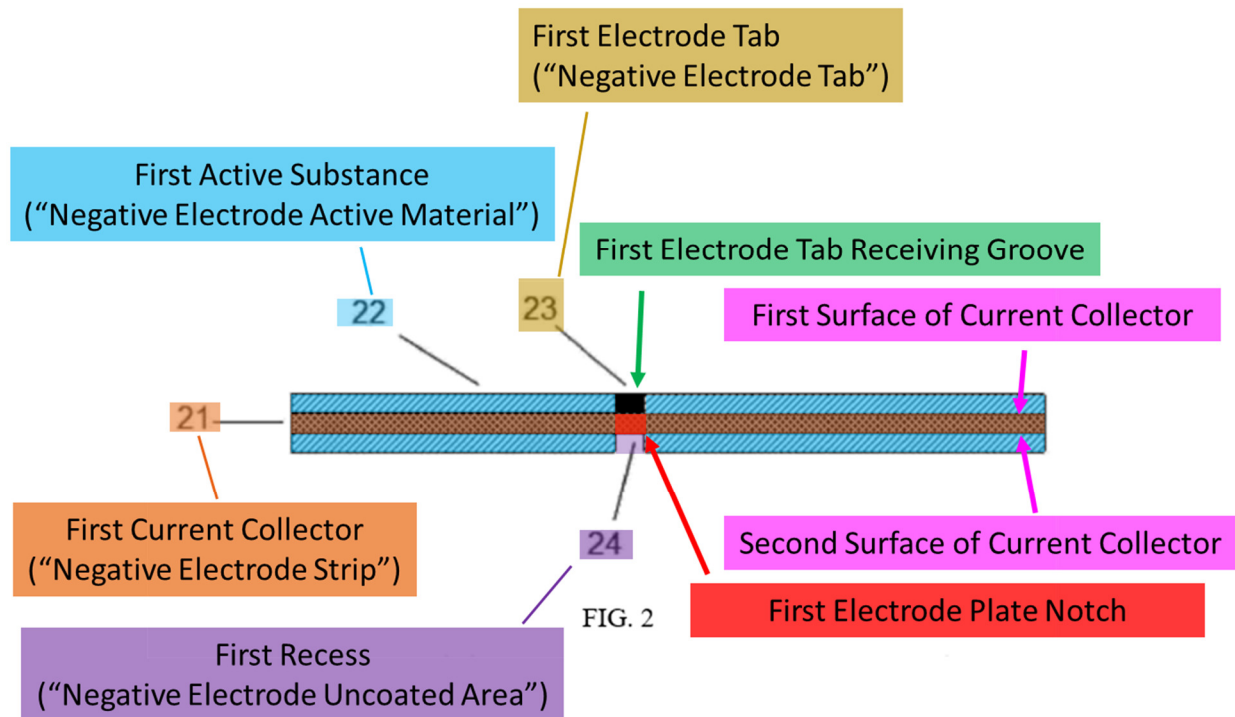
disposed on a side edge of the electrode tab receiving groove in the same manner that the '352 patent's "anode electrode plate die-cut notch 1014" is disposed on a "side edge" of an "anode electrode tab receiving groove 1013," as shown in '352 patent Figure 5(a) below. Ex. 1001, 3:14-45, Fig. 5a; Ex. 1002, ¶142. Moreover, as shown in annotated Zhou Figures 2 and 3 above, Zhou's notch extends entirely through the current collector (e.g., in a top-to-bottom direction in Figure 3), and thus extends through the current collector's first and second surfaces. Ex. 1002, ¶142.



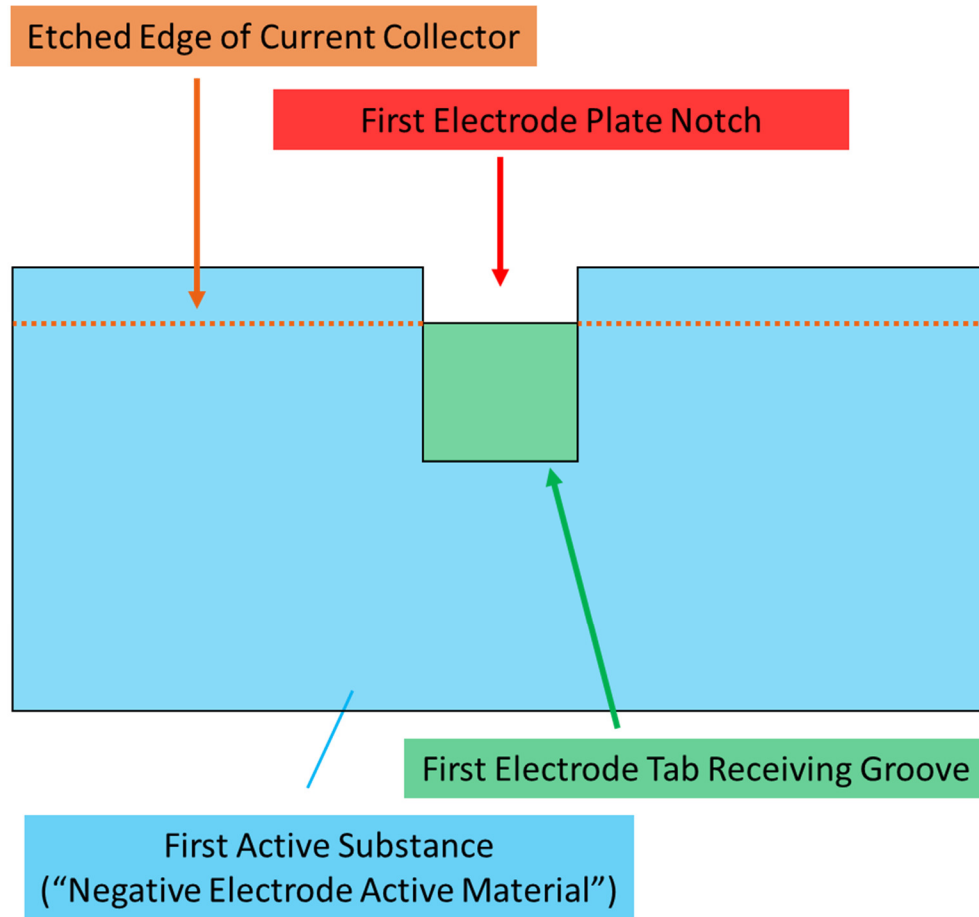
While Zhou discloses this structure with respect to an exemplary positive electrode, it states that its "description does not exclude the use of a similar dry treatment method to perform etching treatment on the negative electrode to remove

burrs at an edge of the negative electrode after current collector cutting.” Ex. 1013, ¶¶0038]. A POSITA would have thus understood that Zhou’s plasma etching technique for burr removal would also be applicable to an anode (negative electrode) at least because electrode burrs were a well-known problem on both anodes and cathodes. *See* Section II.B above; Ex. 1002, ¶143. A POSITA would have similarly understood that a negative electrode, like a positive electrode, includes an exposed portion of the current collector to which the negative electrode tab is welded (e.g., an electrode tab receiving groove), and would have understood that applying Zhou’s etching technique to a negative electrode would result in a similar electrode plate notch structure described above. Ex. 1002, ¶143.

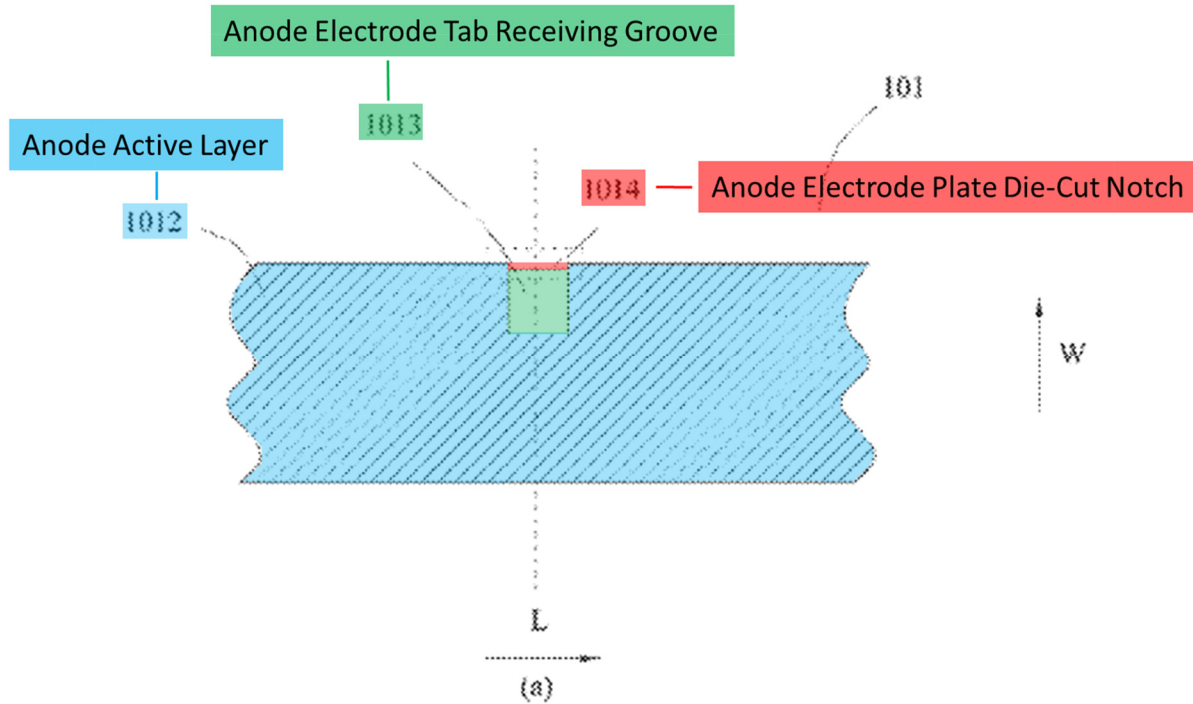
Modifying Wang’s first (e.g., negative) electrode by applying the gas plasma etching process of Zhou would result in a negative electrode plate notch disposed on a side edge of Wang’s negative electrode tab receiving groove and extending through the negative electrode current collector’s first and second surfaces. Ex. 1002, ¶144. Annotated Wang Figure 2 below depicts where this notch would be positioned on Wang’s modified negative electrode based on the teachings of Zhou. Ex. 1004, Fig. 2; Ex. 1002, ¶144.



Based on the disclosures of Wang and Zhou, a POSITA would have understood that a notch in the modified Wang negative electrode would appear in a top-down view as shown in the figure below. Ex. 1002, ¶145.



Wang’s modified anode, like Zhou’s electrode (as discussed above), includes a notch disposed on a “side edge” of the first electrode tab receiving groove (i.e., the upper edge of the first electrode tab receiving groove shown above) in the same manner that the ’352 patent’s “anode electrode plate die-cut notch 1014” is on a “side edge” of an “anode electrode tab receiving groove 1013,” as shown in ’352 patent Figure 5(a) below. Ex. 1001, 3:14-45, Fig. 5a; Ex. 1002, ¶146.



In view of Zhou's stated benefits of plasma etching the current collector to remove electrode burrs that could damage the battery (Ex. 1013, ¶¶[0007]-[0008], [0015]), a POSITA would have been motivated to similarly modify Wang's electrode, including by etching a region of the current collector to which the tab of the first (e.g., anode) electrode is to be welded to the current collector. Ex. 1002, ¶147. Indeed, Zhou's rationale for plasma etching the current collector is identical to the rationale the '352 patent provides for its notch: burr removal. *Compare* Ex. 1001, 2:26-40 ("[T]he anode electrode plate die-cut notch can remove the burrs formed on the current collector on the edge part of the anode electrode tab receiving groove during formation.") *with* Ex. 1013, ¶¶[0007], [0015] (stating that

the gas plasma etching “can remove cutting burrs on the positive electrode current collector.”).

Modifying Wang’s negative electrode to include a gas plasma etched current collector would have been well within the skill of a POSITA and would have only required the use of well-known electrode processing and production techniques, including techniques for plasma etching that were known in the field and disclosed in the prior art to the ’352 patent (*see generally, e.g.,* Exs. 1012, 1013). *KSR*, 550 U.S. at 416-417, 421; Ex. 1002, ¶¶148-149. The modification of Wang’s negative electrode would have yielded predictable results with a reasonable expectation of success, i.e., a negative electrode including a notch along the side edge of the anode tab receiving groove where Wang’s negative electrode tab is attached to the negative electrode strip. *KSR*, 550 U.S. at 416-417, 421 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”); Ex. 1002, ¶¶148-149.

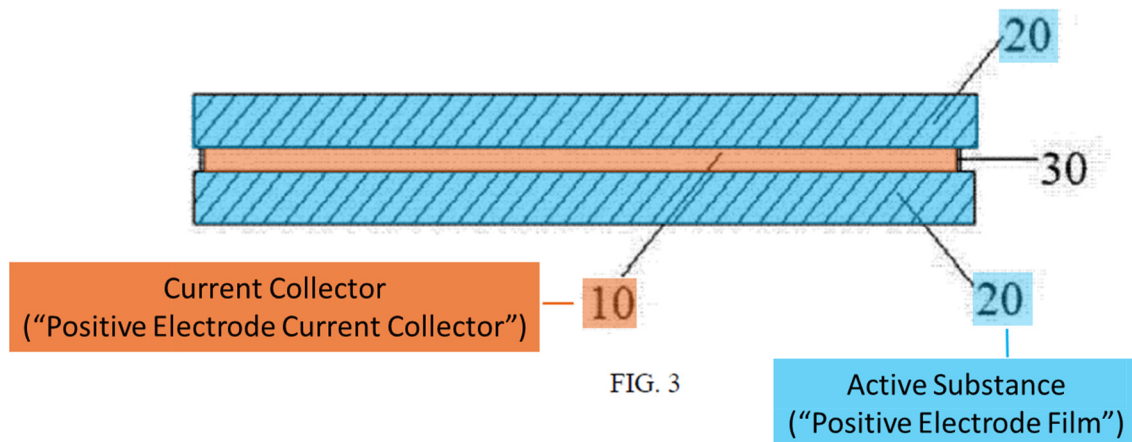
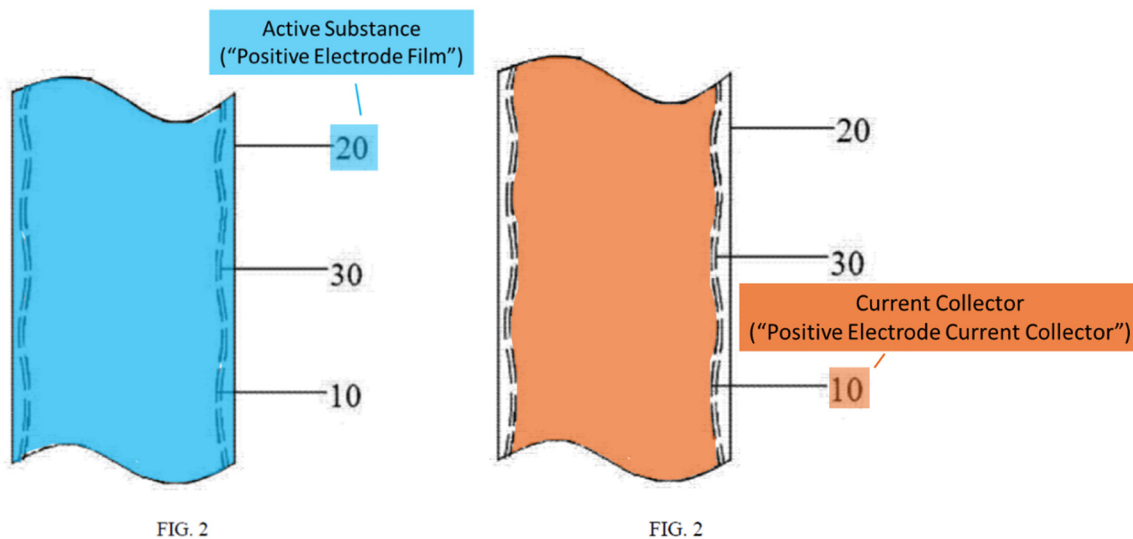
2. Claim 2:

As discussed in Ground 1, Wang discloses claim elements 2(pre), 2(a), 2(b), 2(c), 2(d), and 2(e). Ex. 1002, ¶150.

The combination of Wang and Zhou renders obvious claim 2(f), as discussed below, and thus renders obvious claim 2. *Id.*

2(f): a second electrode plate notch disposed on a side edge of the second electrode tab receiving groove and extending through the surface of the second current collector.

As discussed above in Section VII.B.1 and for claim 1(g), Zhou discloses using gas plasma etching to remove burrs at the edge of the current collector that could damage adjacent components of the battery, thus forming a positive electrode with an “indented” current collector structure. Ex. 1013, ¶¶[0008], [0015], Figs. 2, 3; Ex. 1002, ¶151.



Zhou describes etching the current collector, and thus creating the electrode plate notch, at an exposed area of the current collector where an electrode tab is later welded to the current collector (the claimed “electrode tab receiving groove”). Ex. 1013, ¶[0025]; Ex. 1002, ¶152. Zhou does not show the electrode tab receiving groove (e.g., the “area on the positive electrode current collector 10 that is not covered by a positive electrode active material”) in its figures, but based on Zhou’s disclosure, a POSITA would have understood that Zhou’s positive electrode tab receiving groove would appear in a top-down view, for example, as shown in annotated Figure 2 below. Ex. 1013, ¶[0025], Fig. 2; Ex. 1002, ¶152.

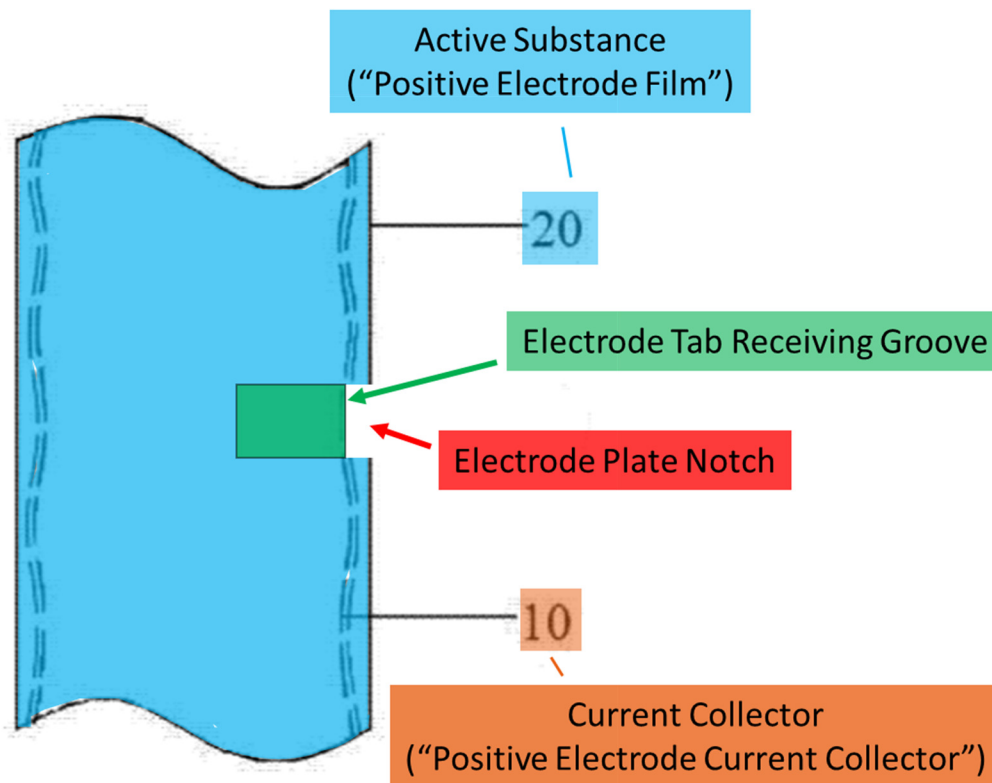
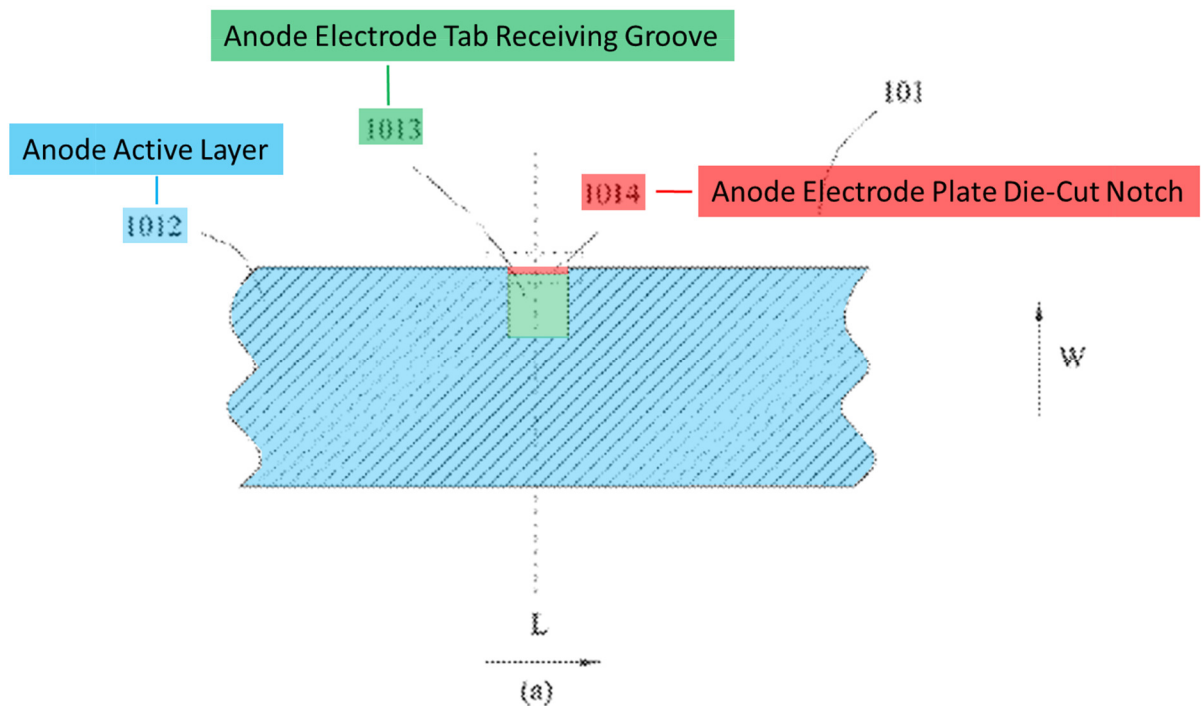


FIG. 2

As shown in the figure above, as a result of Zhou's current collector etching process, Zhou's electrode tab receiving groove includes an electrode plate notch disposed on a side edge of the electrode tab receiving groove in the same manner that the '352 patent's "anode electrode plate die-cut notch 1014" is on a "side edge" of an "anode electrode tab receiving groove 1013," as shown in '352 patent Figure 5(a) below. Ex. 1001, 3:14-45, Fig. 5a; Ex. 1002, ¶153.



The same is true for the '352 patent's "cathode electrode plate die-cut notch 1034," which is "located on the side edge of the cathode electrode tab receiving groove 1033" in the similar electrode notch structure of Fig. 5(b). Ex. 1001, 3:42-49, Fig. 5(b); Ex. 1002, ¶154. Moreover, as shown in annotated Zhou Figures 2 and 3 above, Zhou's notch extends entirely through the current collector (e.g., in a

top-to-bottom direction in Figure 3), and thus extends through the current collector surface. Ex. 1002, ¶154.

Modifying Wang's second (e.g., positive) electrode by applying the gas plasma etching process of Zhou would result in a positive electrode plate notch disposed on a side edge of Wang's second electrode tab receiving groove and extending through the surface of the second current collector. Ex. 1002, ¶155.

Annotated Wang Figure 2 below depicts where the notch in Wang's modified positive electrode would be produced by the gas plasma etching process disclosed by Zhou. Ex. 1004, Fig. 2; Ex. 1002, ¶155.

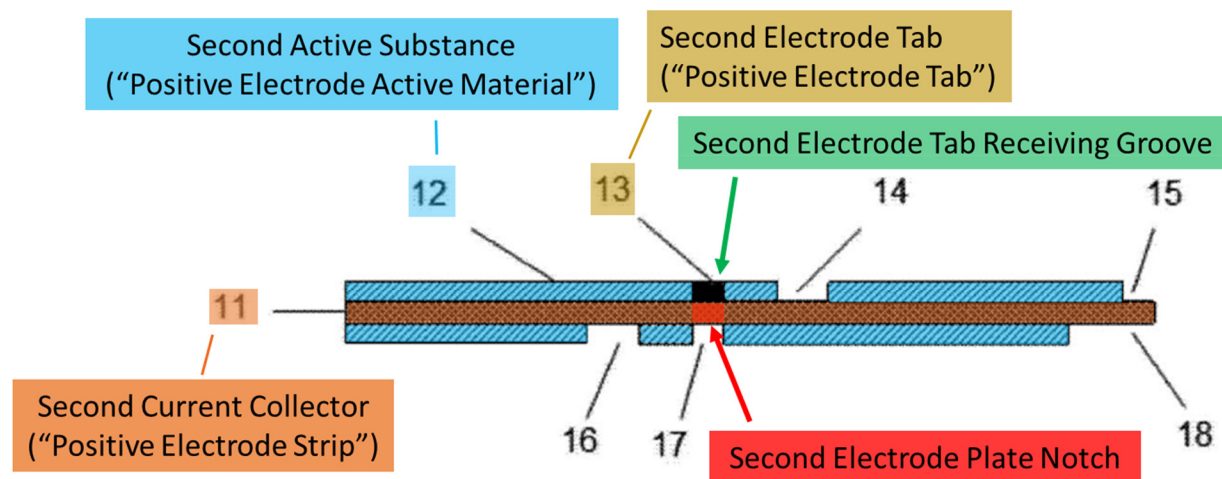
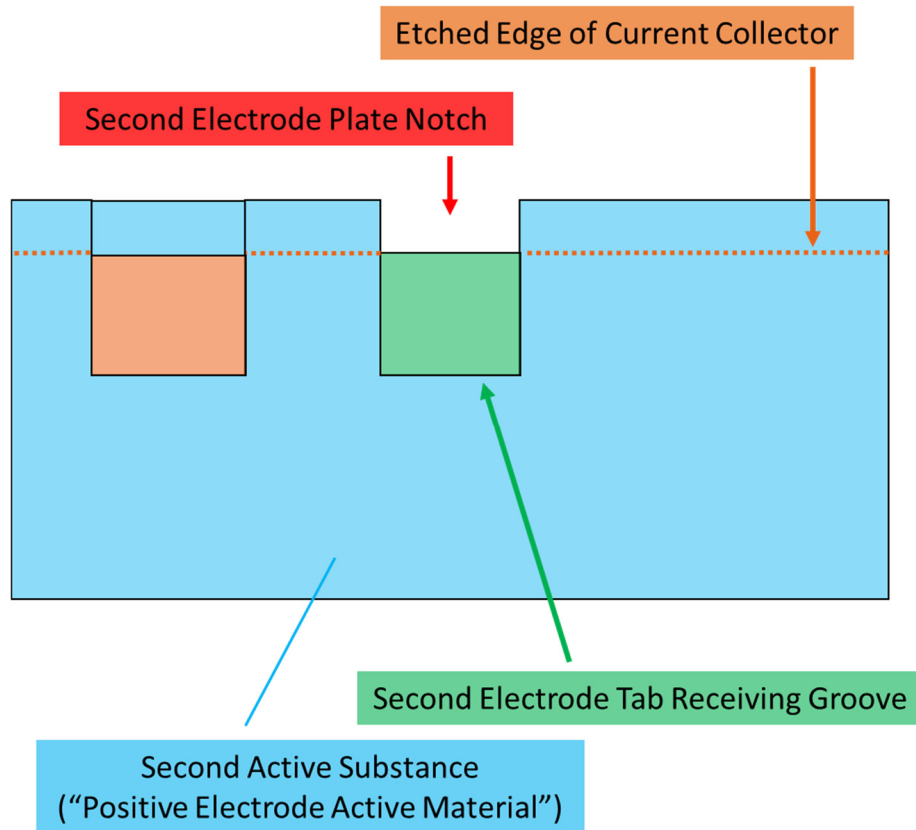
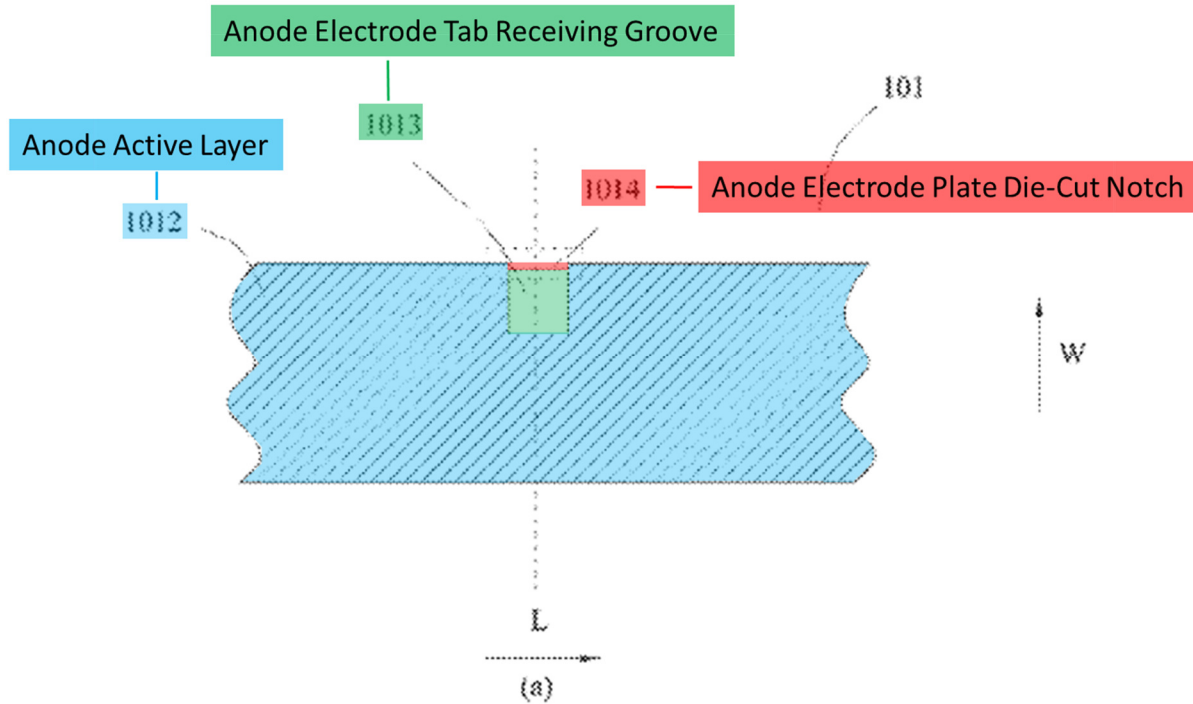


FIG. 1

Based on the disclosures of Wang and Zhao, a POSITA would have understood that the notch in the modified Wang positive electrode would appear, in a top-down view, as shown in the figure below. Ex. 1002, ¶156.



Wang's modified positive electrode, like Zhou's positive electrode (as discussed above), includes a notch disposed on a "side edge" of the second electrode tab receiving groove (i.e., the upper edge of the second electrode tab receiving groove shown above) in the same manner that the '352 patent's anode and cathode notches are on a "side edge" of a respective tab receiving groove. Ex. 1001, 3:14-49, Figs. 5a, 5b; Ex. 1002, ¶157.



In view of Zhou's stated benefits of plasma etching the current collector to remove electrode burrs that could damage the battery (Ex. 1013, ¶¶[0007]-[0008], [0015]), a POSITA would have been motivated to similarly modify Wang's positive electrode, including in a region of the current collector to which the tab of the second (e.g., positive) electrode is to be welded to the current collector. Ex. 1002, ¶158. Indeed, Zhou's rationale for plasma etching the current collector is identical to the rationale the '352 patent provides for its notch: burr removal. *Compare* Ex. 1001, 2:26-40 *with* Ex. 1013, ¶[0007], [0015].

Modifying Wang's positive electrode to include a gas plasma etched current collector would have been well within the skill of a POSITA and would have only required the use of well-known electrode processing and production techniques,

including techniques for plasma etching that were known in the field and disclosed in the prior art to the '352 patent (*see generally, e.g.*, Exs. 1012, 1013). *KSR*, 550 U.S. at 416-417, 421; Ex. 1002, ¶¶159-160. The modification of Wang's positive electrode would have yielded predictable results with a reasonable expectation of success, i.e., a positive electrode including a notch along the side edge of the cathode tab receiving groove where Wang's positive electrode tab is attached to the positive electrode strip. *KSR*, 550 U.S. at 416-417, 421; Ex. 1002, ¶¶159-160.

3. Claim 3:

As discussed in Ground 1, Wang discloses claims 3(pre), 3(a), 3(b), 3(c), 3(d), 3(e), 3(f), 3(h), 3(i), 3(j), 3(k), and 3(l). Ex. 1002, ¶161.

The combination of Wang and Zhou renders obvious claims 3(g) and 3(m), as discussed below, and thus renders obvious claim 3. *Id.*

3(g): the first electrode plate notch is an anode electrode plate notch;

As discussed above in claim 1(g), the combination of Wang and Zhou renders obvious a first electrode plate notch that is an anode (negative) electrode plate notch. Ex. 1002, ¶162.

3(m): the second electrode plate notch is a cathode electrode plate notch.

As discussed above in claim 2(f), the combination of Wang and Zhou renders obvious a second electrode plate notch that is a cathode (positive) electrode plate notch. Ex. 1002, ¶163.

4. Claim 9:

As discussed in Ground 1, Wang discloses claims 9(pre) and 9(a). Ex. 1002, ¶164. The combination of Wang and Zhou renders obvious claim 9(b), as discussed below, and thus renders obvious claim 9. *Id.*

9(b): the first electrode plate notch extends through the first current collector from the first surface of the first current collector.

As discussed above for claim 1(g), the electrode of Wang, modified to include the notch disclosed by Zhou, includes a notch that extends through both the first and second surfaces of the first current collector. Ex. 1002, ¶165. For the same reasons, the modified Wang electrode includes a first electrode plate notch that extends through the first current collector from the first surface of the first current collector. Ex. 1002, ¶165.

5. Claim 10:

As discussed in Ground 1, Wang discloses claims 10(pre) and 10(a). Ex. 1002, ¶166. The combination of Wang and Zhou renders obvious claims 10(b), as discussed below, and thus renders obvious claim 10. Ex. 1002, ¶166.

10(b): the second electrode plate notch extends through the second current collector from the surface of the second current collector.

As discussed above for claim 2(f), the electrode of Wang, modified to include the notch disclosed by Zhou, includes a second electrode plate notch that extends through the surface of the second current collector. Ex. 1002, ¶167. For the same reasons, the modified Wang electrode includes a second electrode plate notch that extends through the second current collector from the surface of the second current collector. Ex. 1002, ¶167.

6. Claim 11: The secondary battery according to claim 1, wherein a whole of the first electrode tab is parallel with the first surface of the first current collector.

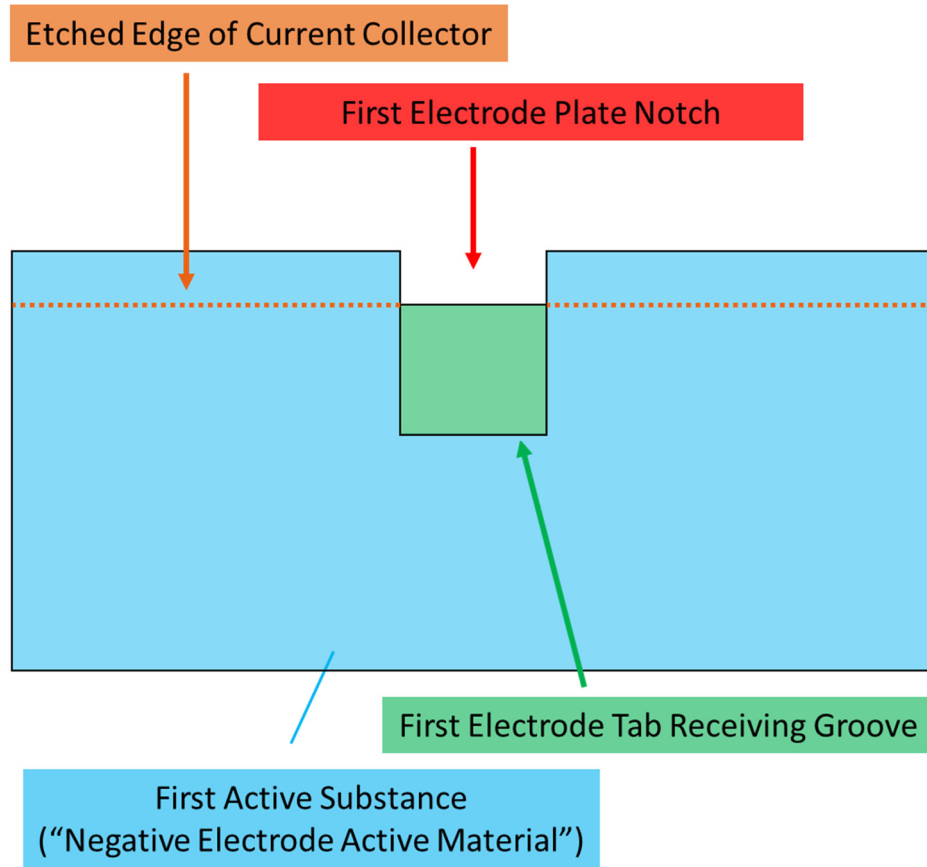
As discussed above in Ground 1, Wang discloses this claim limitation. *See* Section VII.A.8.

The combination of Wang and Zhou renders obvious this claim for substantially the same reasons discussed in Ground 1. Ex. 1002, ¶169.

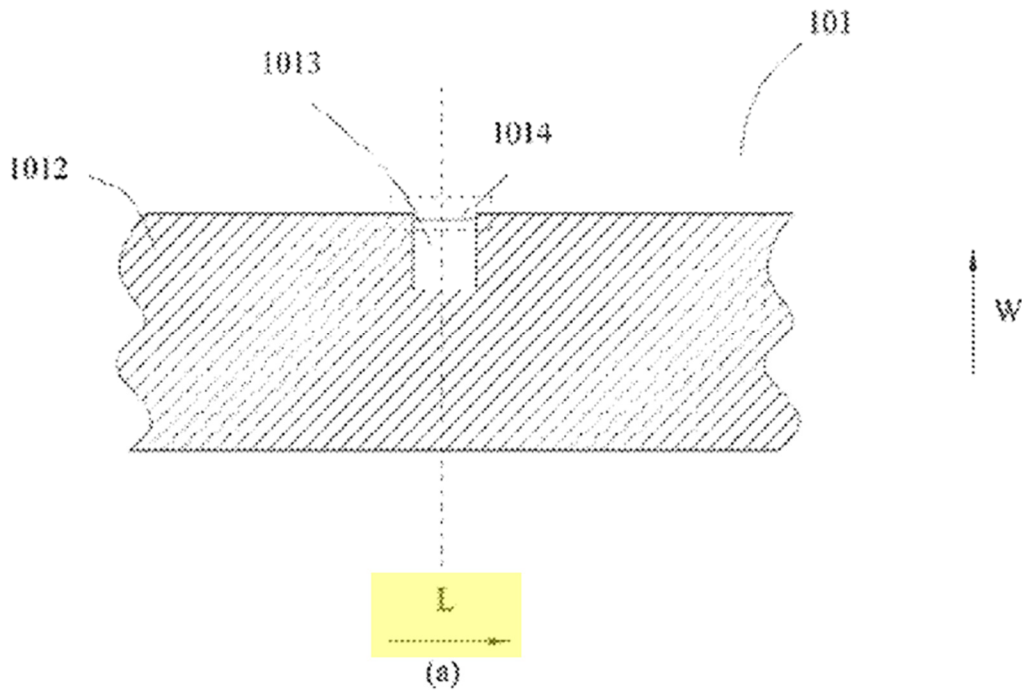
7. Claim 12: The secondary battery according to claim 1, wherein a bottom of the first electrode plate notch is located between the first active substance disposed on two opposite sides of the first electrode tab receiving groove in the length direction of the first electrode plate.

As discussed above for claim 1(g), the combination of Wang and Zhou renders obvious a first electrode including a first electrode plate notch that would

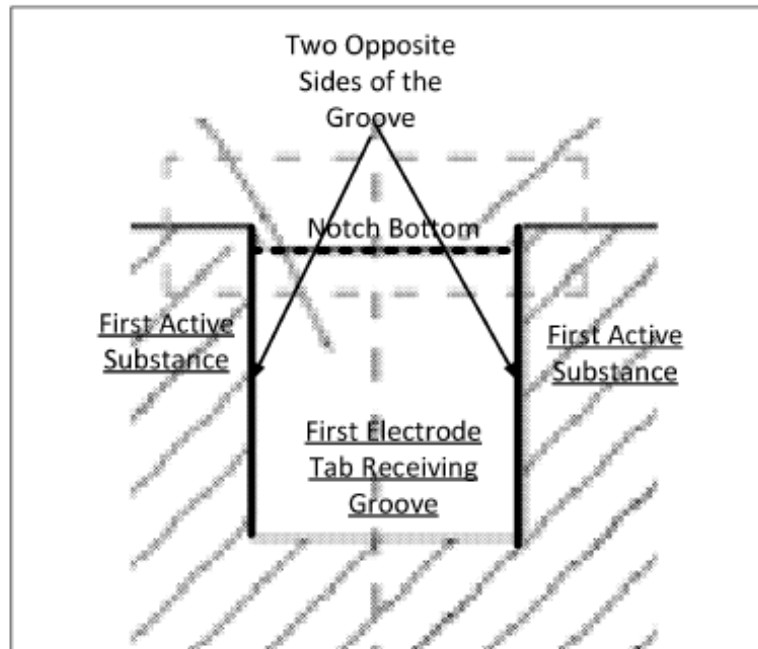
have been positioned on Wang's electrode as shown in the figure below. Ex. 1002, ¶170.



The '352 patent explains that the claimed "length direction of the first electrode plate" is the left-to-right direction in the perspective of the top-down perspective figures of the '352 patent, including Figure 5(a) below. Ex. 1001, 4:1-8 (describing "length direction L"), Fig. 5(a); Ex. 1002, ¶171.

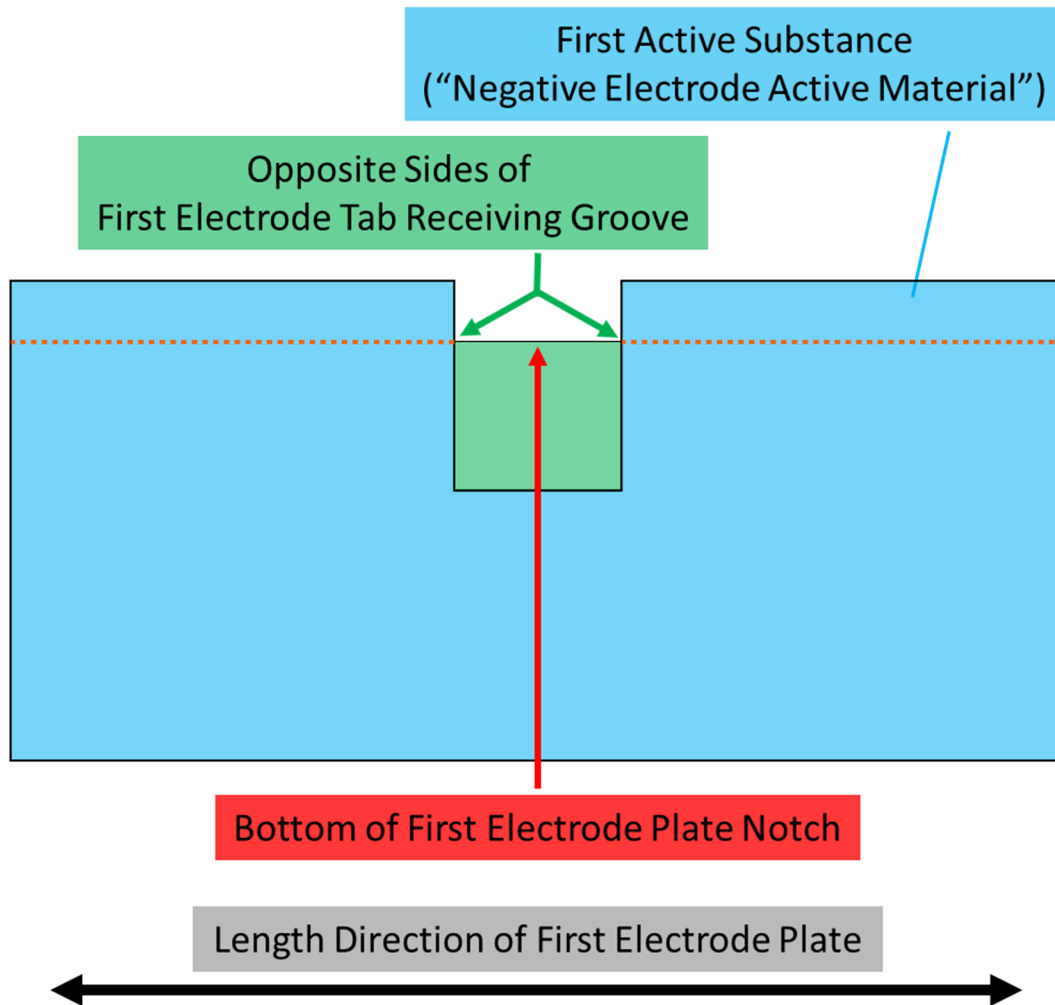


During prosecution of this claim, the Applicant stated that the annotated figure below “depicts” the claimed “bottom of the first electrode plate notch” that “is located between the first active substance disposed on two opposite sides of the first electrode tab receiving groove in the length direction of the first electrode plate.” Ex. 1003, 610-611.



As shown in the annotated figure below, Wang's electrode, modified in view of Zhou, similarly includes a bottom of the first electrode plate notch located between the first active substance disposed on two opposite sides of the first electrode tab receiving groove in the length direction of the first electrode plate.

Ex. 1002, ¶¶172-173.



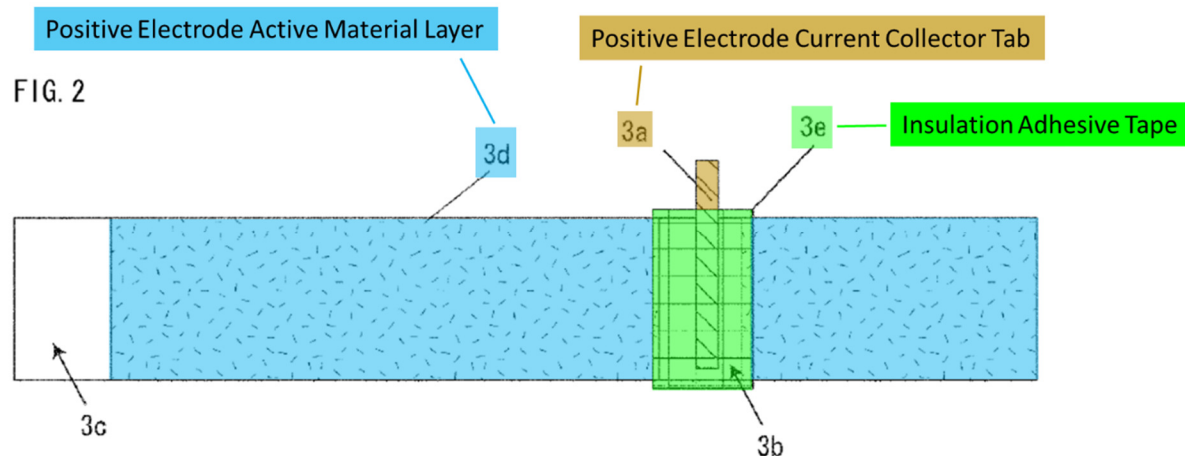
The combination of Wang and Zhou thus renders this claim obvious. Ex. 1002, ¶174.

C. Grounds 3 and 4: Wang, Deng, and Kobayashi (Ground 3) or Wang, Zhou, and Kobayashi (Ground 4) Render Obvious Claims 5-8

1. Disclosure of Kobayashi

Kobayashi states that electrode burrs may create internal short circuits within a lithium-ion battery, and solves this problem by covering the burrs with “insulation adhesive tape.” Ex. 1006, ¶[0007]. The insulation adhesive tape may be

applied, for example, on both a “core exposed portion 3b” (an exposed portion of a current collector) and on the positive electrode active material layer 3d surrounding the positive electrode current collector tab 3a, as shown in annotated Figure 2 below. *Id.*, ¶¶[0050], [0056], Fig. 2; Ex. 1002, ¶175.



2. Claim 5

As discussed below, Wang renders claim 5 obvious in combination with Kobayashi and either Deng (Ground 3) or Zhou (Ground 4). Ex. 1002, ¶¶176-187.

5(pre): The secondary battery according to claim 3, further comprising:

See claim 3 analysis. Ex. 1002, ¶177.

5(a): a first insulating adhesive tape, disposed on the second electrode tab receiving groove; and

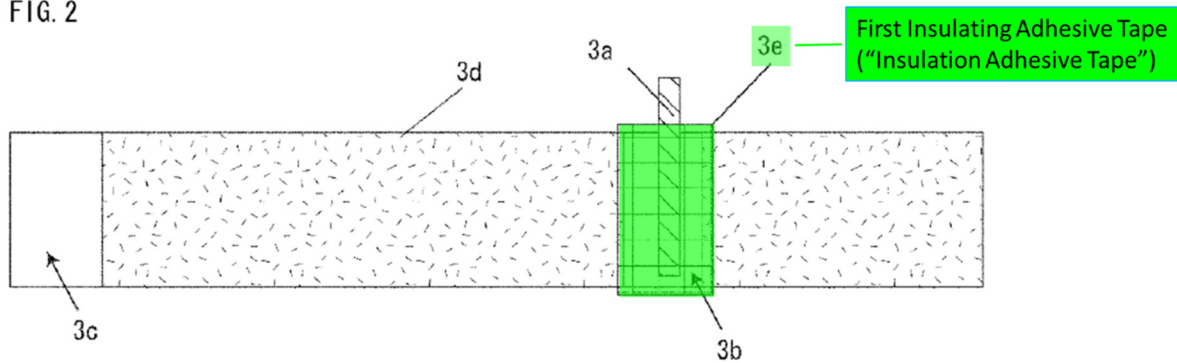
While Wang discloses “welding tabs with tab tapes” in areas including “the area of the positive electrode tab,” Wang does not expressly disclose an insulating adhesive tape disposed on a second electrode (e.g., positive electrode) tab

receiving groove. Ex. 1004, ¶[0032]; Ex. 1002, ¶178. The use of such an insulating adhesive tape on the second electrode tab receiving groove would have been obvious based on Wang in view of Kobayashi. Ex. 1002, ¶178.

Kobayashi discloses a “problem that an internal short circuit occurs because a burr of the positive electrode collector tab sticks out through a separator and thereby the positive electrode is brought in contact with the negative electrode.” Ex. 1006, ¶[0007]. Kobayashi discloses solving this problem by applying an insulation adhesive tape on the positive electrode tab to cover the burr. *Id.*, ¶[0007]. The insulation adhesive tape is applied to cover a “core exposed portion” of the current collector that is not covered in positive electrode active material (and to which the electrode tab is attached), a “part of the positive electrode active material layer,” and “an overlapped area of the positive electrode current collector tab with the core exposed portion.” *Id.*, ¶[0022]. Kobayashi further discloses using such tapes to cover exposed regions of the cathode current collector facing the active material region of the anode to prevent a short circuit. *Id.*, ¶[0007]; Ex. 1002, ¶179.

Kobayashi’s “insulating adhesive tape 3e” is shown in annotated Figure 2 below covering the positive electrode current collector tab 3a, the core exposed portion of the current collector 3b, and part of the positive electrode active material layer 3d. *Id.*, ¶[0056], Fig. 2; Ex. 1002, ¶180.

FIG. 2



A POSITA would have found it obvious, in view of Kobayashi, to use an insulating adhesive tape to cover Wang's positive electrode tab (e.g., positive electrode tab 13), as well as the surrounding active material layer defining the tab receiving groove. Ex. 1002, ¶181. A POSITA would have done so to prevent a short circuit in the battery caused by burrs on the electrode tab, as disclosed by Kobayashi. Ex. 1006, ¶[0007]; Ex. 1002, ¶181. While Wang does not expressly mention placing tape over the second electrode tab receiving groove, a POSITA would understand that burrs at cut tab edges, corners and irregularities from welds can puncture the separator and cause internal shorts. Ex. 1002, ¶181. A POSITA would have known that it is common practice to apply insulating tape on electrodes where tabs are attached, as shown by Kobayashi, in order to minimize the chance of internal shorts. *Id.*

Modifying Wang's positive electrode (in addition to the aforementioned modifications to Wang's battery in view of Deng (Ground 3) or Zhou (Ground 4)) to include the insulation adhesive tape disclosed by Kobayashi would have

required only routine skill, knowledge, and the use of standard production and machining techniques, and would have yielded predictable results with a reasonable expectation of success, i.e., a positive electrode with an insulation adhesive tape positioned over the positive electrode tab. *KSR*, 550 U.S. at 416-417, 421 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”); Ex. 1002, ¶182.

Annotated Figure 1 below depicts where a POSITA would position the first insulating adhesive tape on Wang’s second electrode tab receiving groove. Ex. 1002, ¶183.

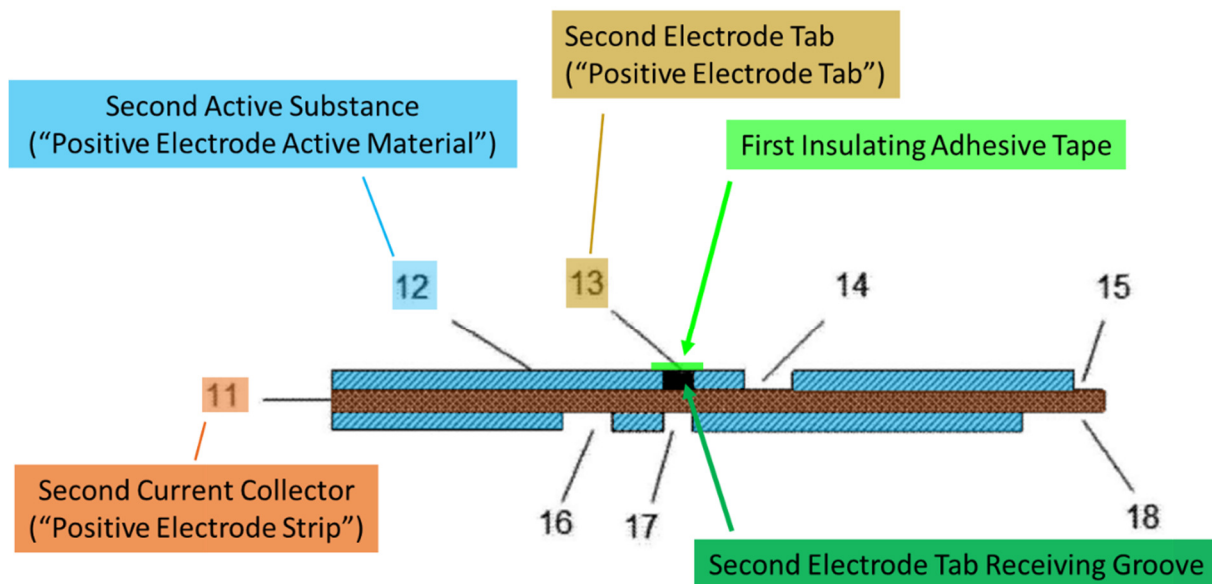


FIG. 1

5(b): a second insulating adhesive tape, disposed on the second active substance and facing the first electrode tab receiving groove.

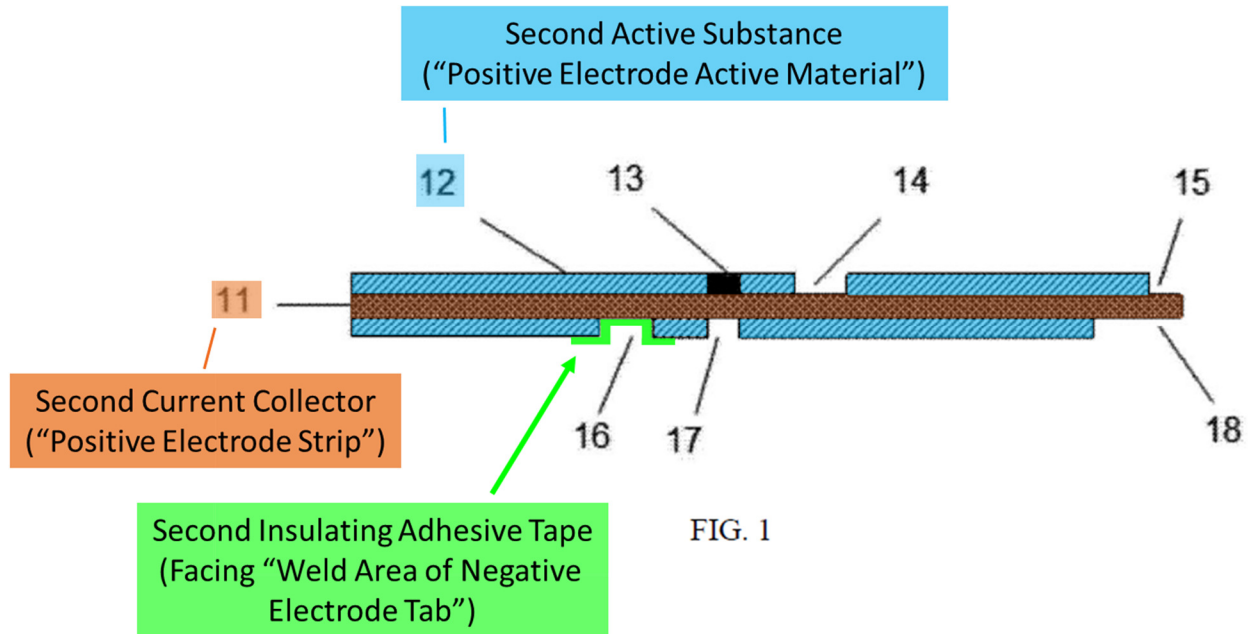
Wang discloses a second insulating adhesive tape (e.g., PET insulation tape covering positive electrode second island area 16) that is disposed on the second active substance (e.g., covering the active material on the periphery of positive electrode second island area 16) and that faces the first electrode tab receiving groove (e.g., the weld area of the negative electrode tab). Ex. 1002, ¶184.

Wang uses the term “island area” to refer to “an uncoated foil area that is not coated with any positive electrode active material on a positive electrode strip facing the front and back surfaces of a weld area of a negative electrode tab once a cell is wound.” Ex. 1004, ¶[0007]. Wang also describes a “positive electrode second island area” on the positive electrode strip that is not coated in active material and which faces the negative electrode tab when the lithium-ion battery is assembled in a wound state. *Id.*, ¶[0049]; Ex. 1002, ¶185. Furthermore, Wang uses the term “coating line” to refer to “an edge area of an island area or uncoated area, i.e., a boundary area between an active material and an electrode strip.” Ex. 1004, ¶[0008]; Ex. 1002, ¶186. Wang describes positioning “polyethylene terephthalate (PET) insulation tape” at, *inter alia*, a coating line area of the positive electrode second island area 16. Ex. 1004, ¶[0102] (“[T]he insulation tapes cover 5 mm on two sides of the coating line areas, and the widths of the insulation tapes are

greater by 1 mm than the widths of . . . positive electrode second island area 16”);
Ex. 1002, ¶186.

A POSITA would have understood that Wang’s disclosure of positioning a PET insulation tape over the “coating line area” of the positive electrode second island area 16 means that the PET tape covers both the “island area,” in which no active material is positioned, as well as the active material surrounding the island area. Ex. 1002, ¶186. The PET tape is thus positioned on the positive electrode active material and faces Wang’s first electrode tab receiving groove when the cell is wound. Ex. 1002, ¶186.

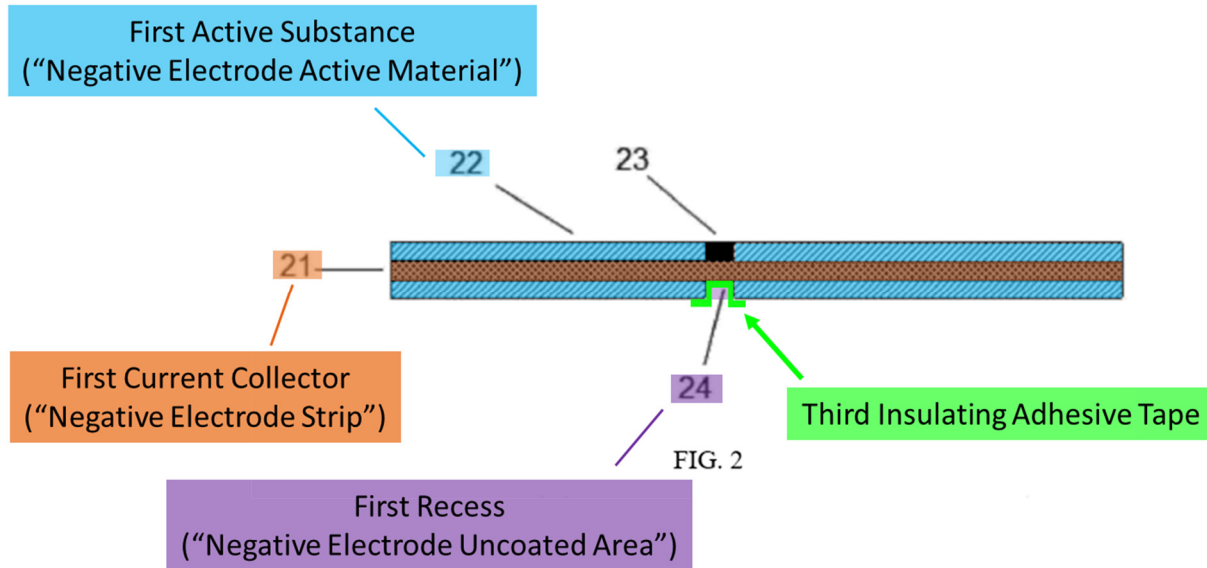
Annotated Figure 1 below depicts where Wang’s PET tape on positive electrode second island area 16, which faces the “weld area of a negative electrode tab,” would be positioned based on Wang’s disclosure. Ex. 1004, ¶[0102]; Ex. 1002, ¶187.



3. **Claim 6: The secondary battery according to claim 5, further comprising: a third insulating adhesive tape, disposed on the anode recess.**

Wang discloses a third insulating adhesive tape (e.g., polyimide acrylic insulation tape) that is disposed on the anode recess (e.g., the negative electrode uncoated area 24). Ex. 1004, ¶[0103]. In particular, Wang discloses a “polyimide acrylic insulation tape [that] is disposed at the negative electrode uncoated area 24; the thickness of the insulation tape is 0.055 mm, the length of the insulation tape is greater by 6 mm than the length of the negative electrode uncoated area 24, and the width of the insulation tape is greater by 1.5 mm than the width of the negative electrode uncoated area 24.” *Id.*; Ex. 1002, ¶188.

Annotated Figure 2 below depicts where the third insulating adhesive tape would be positioned on the anode recess. Ex. 1002, ¶189.



Wang thus renders claim 6 obvious in combination with Kobayashi and either Deng (Ground 3) or Zhou (Ground 4). Ex. 1002, ¶190.

4. Claim 7

As discussed below, Wang renders claim 7 obvious in combination with Kobayashi and either Deng (Ground 3) or Zhou (Ground 4). Ex. 1002, ¶¶191-195.

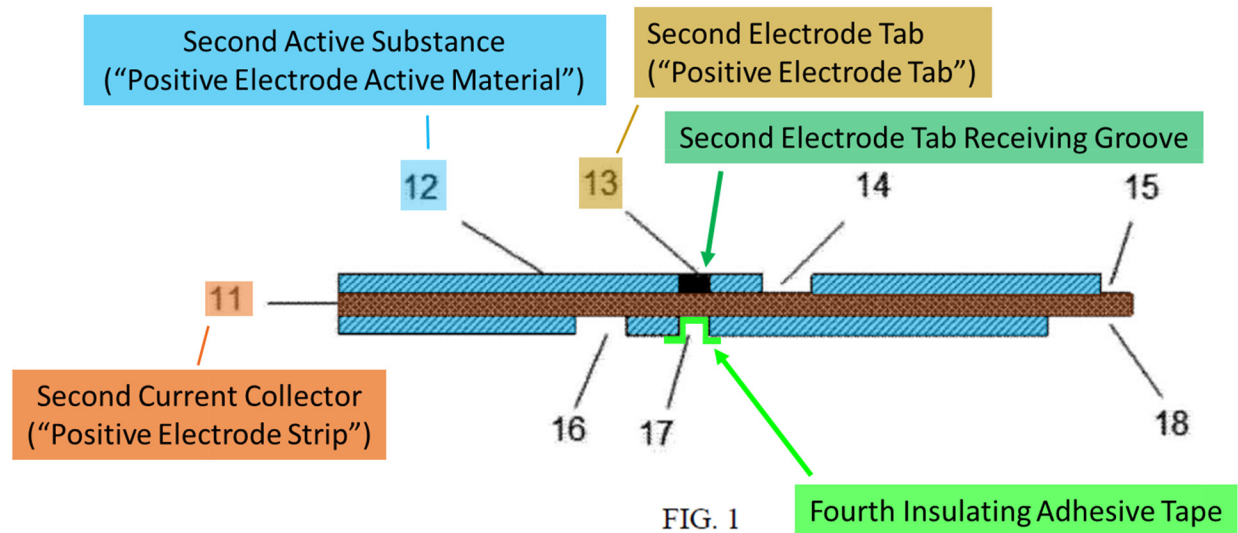
7(pre): The secondary battery according to claim 5, further comprising:

See claim 5 analysis. Ex. 1002, ¶192.

7(a): a fourth insulating adhesive tape;

Wang discloses a fourth insulating adhesive tape (e.g., the PET insulation tape disposed at the positive electrode second uncoated area 17). Ex. 1004, ¶[0102] (“[A] PET insulation tape is disposed at the positive electrode second uncoated area 17.”). Annotated Figure 1 below depicts where the PET insulation tape

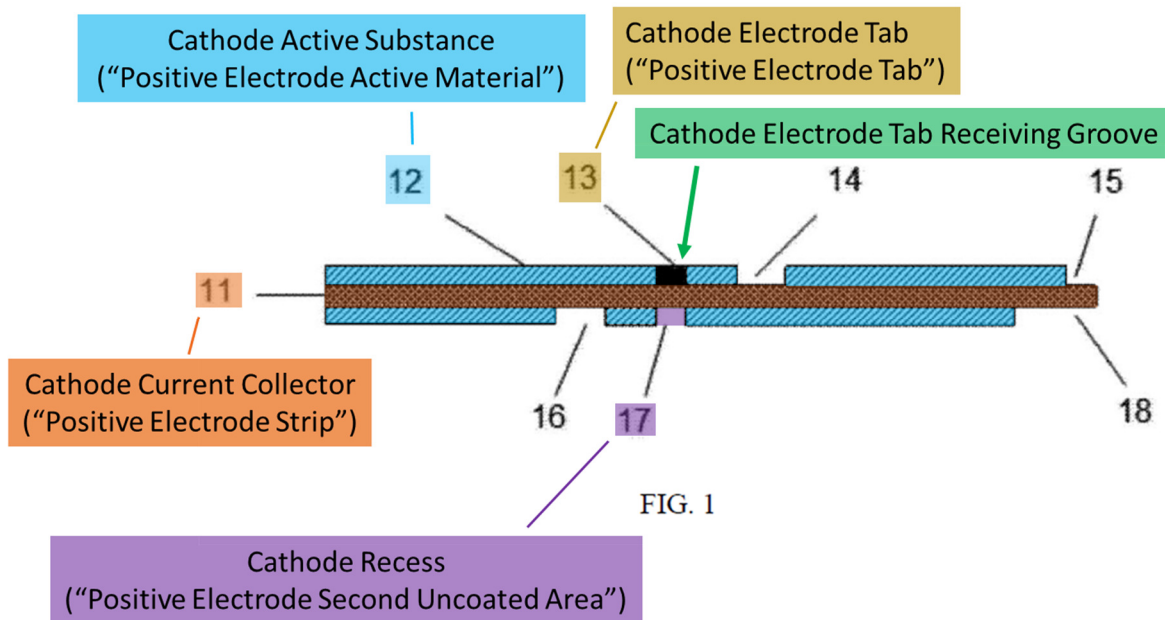
disposed at the positive electrode second uncoated area 17 would be positioned based on Wang's description of that tape. *See, e.g., id.*, ¶[0102] (“[A] PET insulation tape is disposed at the positive electrode second uncoated area 17; the thickness of the insulation tape is 0.02-0.04 mm, the length of the insulation tape is greater by 6 mm than the positive electrode second uncoated area 17, and the width of the insulation tape is greater by 2.5 mm than the width of the positive electrode second uncoated area 17.”), Fig. 1; Ex. 1002, ¶193.



7(b): the cathode electrode plate comprising a cathode recess, wherein the cathode recess and the cathode electrode tab receiving groove are disposed on opposite sides of the cathode current collector; and

As discussed above for claims 2 and 3, Wang discloses a cathode electrode plate comprising a cathode electrode tab receiving groove. Ex. 1002, ¶194. Wang further discloses a cathode recess (e.g., positive electrode second uncoated area 17)

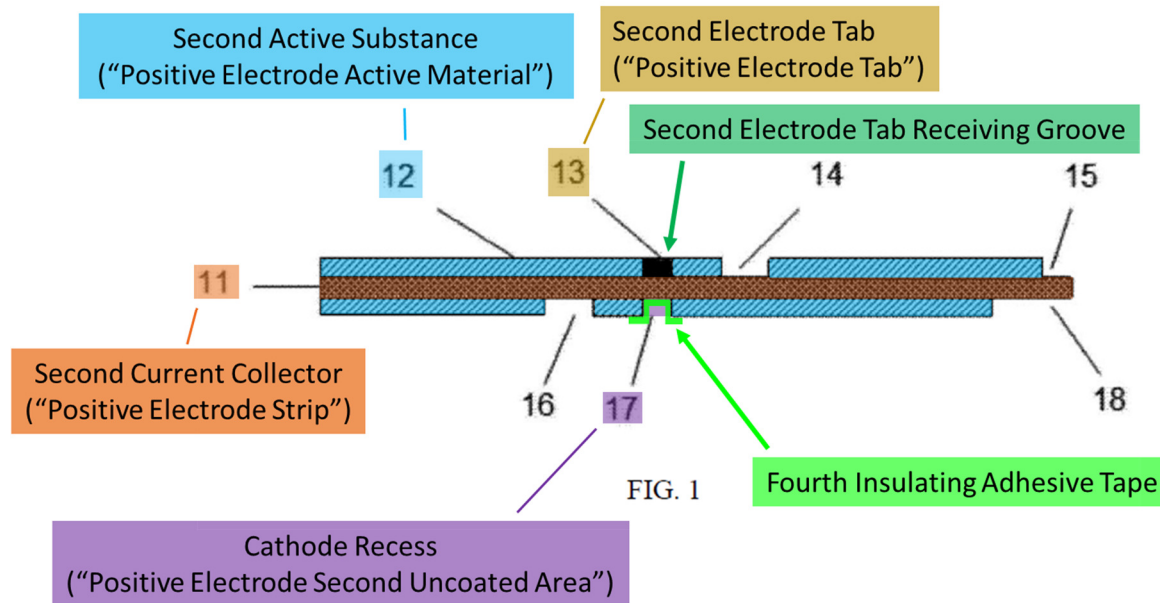
that is disposed on an opposite side of the cathode current collector (e.g., positive electrode strip) from the cathode electrode tab receiving groove. Ex. 1004, ¶¶[0064] (“[T]he positive electrode tab 13 and the positive electrode second uncoated area 17 are located in a middle area of the positive electrode strip 11 and are disposed opposite each other”), [0101] (describing “positive electrode second uncoated area 17” as “not coated with the positive electrode active material 12”), Fig. 1; Ex. 1002, ¶194.



7(c): the fourth insulating adhesive tape is disposed on the cathode recess.

As discussed above in claim 7(a), Wang discloses a fourth insulating adhesive tape. Ex. 1004, ¶[0102] (“[A] PET insulation tape is disposed at the positive electrode second uncoated area 17.”). As discussed above in claim 7(b), Wang also discloses a cathode recess (e.g., positive electrode second uncoated area

17). Ex. 1004, ¶¶[0064], [0101], [0102], Fig. 1. Wang thus discloses a fourth insulating adhesive tape that is disposed on the cathode recess, as shown in annotated Figure 1 below. Ex. 1004, ¶[0102], Fig. 1; Ex. 1002, ¶195.



5. **Claim 8: The secondary battery according to claim 7, wherein: each of the first insulating adhesive tape, the second insulating adhesive tape, the third insulating adhesive tape, and the fourth insulating adhesive tape is a single-sided insulating adhesive tape.**

As discussed above for Claims 5-7, Wang discloses first through fourth insulating adhesive tapes. Ex. 1004, ¶¶[0102] (describing the use of several “polyethylene terephthalate (PET) insulation tapes”), [0103] (describing the use of a “polyimide acrylic insulation tape”); Ex. 1002, ¶196. While Wang does not expressly disclose that these tapes are single-sided insulating adhesive tapes (as opposed to, e.g., double-sided insulating adhesive tapes), a POSITA would have

understood that Wang's PET insulation tapes are single-sided because the reference describes adhering the respective tapes to only one structural feature of the battery without describing them being as double-sided adhesives that adhere to two structural elements of the battery. Ex. 1002, ¶196.

Single-sided insulating adhesive tapes are well known in the art, have been used in the battery industry for decades, and would have been obvious to a POSITA in view of Wang's disclosure of the purpose and structure of its insulation tapes. Ex. 1002, ¶197; *see* Section II.B, *supra*. At the very least, a POSITA would have found it obvious to implement single-sided tapes for each of Wang's first through fourth insulating tapes. Doing so would have been a simple and routine design choice between two well-known alternatives, single- and double-sided insulation tapes. Ex. 1002, ¶197; *see KSR*, 550 U.S. at 417, 421 (explaining that where "there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp"); *Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1338-41 (Fed. Cir. 2020); *ACCO Brands Corp. v. Fellowes, Inc.*, 813 F.3d 1361, 1367 (Fed. Cir. 2016). A POSITA would have understood (and found it obvious) that single-sided insulation tapes are suitable for applications where the tape only needs to be adhered to a battery structure on one side of the tape, while a double-sided

insulation tape would be suitable where two battery components are connected together. Ex. 1002, ¶197.

Wang thus renders claim 8 obvious in combination with Kobayashi and either Deng (Ground 3) or Zhou (Ground 4). Ex. 1002, ¶198.

D. Grounds 5 and 6: Wang, Deng, and Hasegawa (Ground 5) or Wang, Zhou, and Hasegawa (Ground 6) Render Obvious Claim 11

1. Disclosure of Hasegawa

Hasegawa discloses a lithium-ion battery including a negative electrode with a “substantially flat negative electrode lead 21” that is electrically connected to current collector 20a. Ex. 1007, ¶[0022], [0030], Figs. 1, 3; Ex. 1002, ¶199. Both the positive and negative electrode leads are connected to a respective current collector near its center, thereby reducing the internal electrical resistance of the electrodes. Ex. 1007, ¶[0010]; Ex. 1002, ¶199.

Fig.1

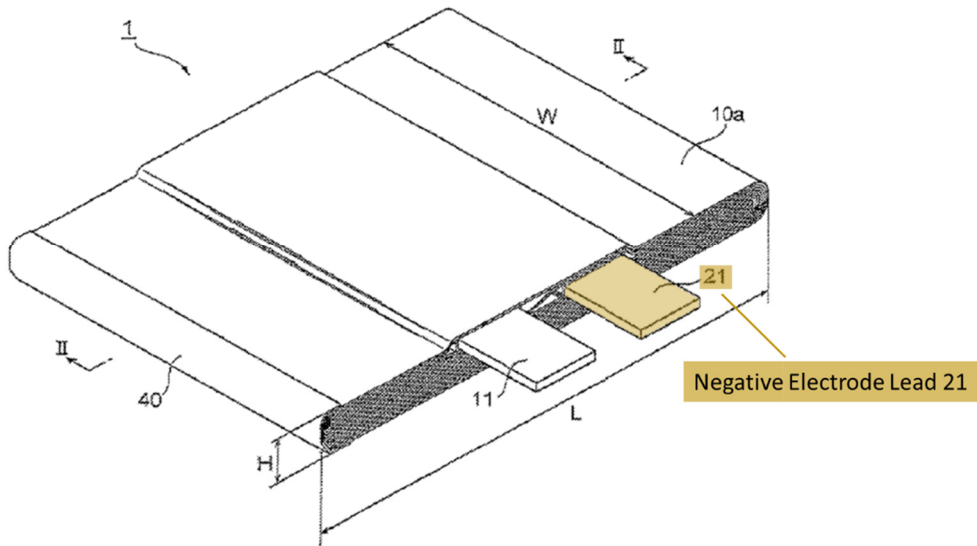
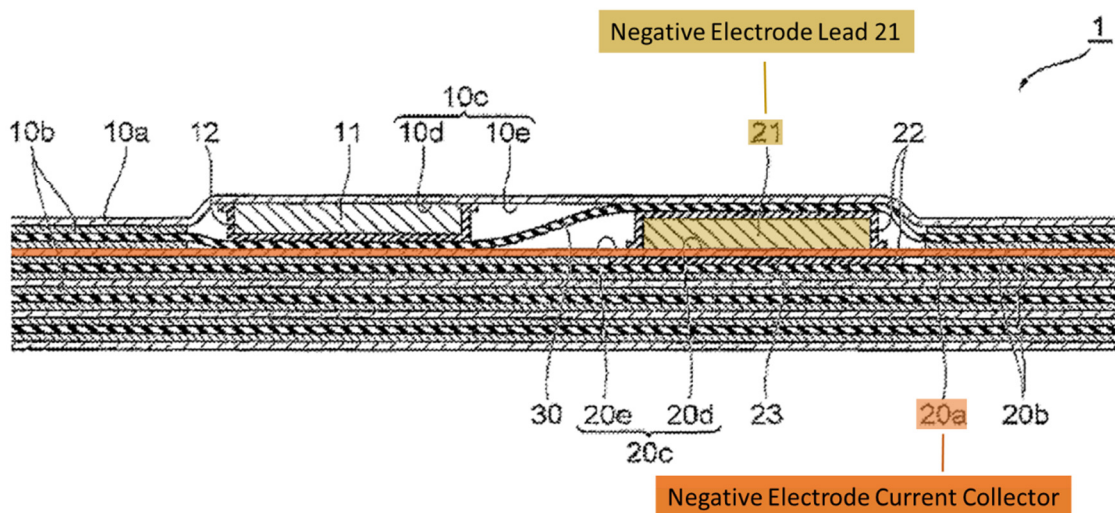


Fig.3



2. **Claim 11: The secondary battery according to claim 1, wherein a whole of the first electrode tab is parallel with the first surface of the first current collector.**

As shown in annotated Figures 1 and 3 below, Hasegawa discloses a “substantially flat” negative electrode tab (e.g., negative electrode lead) wherein

the whole of the electrode tab is parallel with the first surface of the current collector, including the portions of the electrode tab that extend beyond the current collector. Ex. 1007, ¶¶[0022], [0030]; Ex. 1002, ¶200.

Fig.1

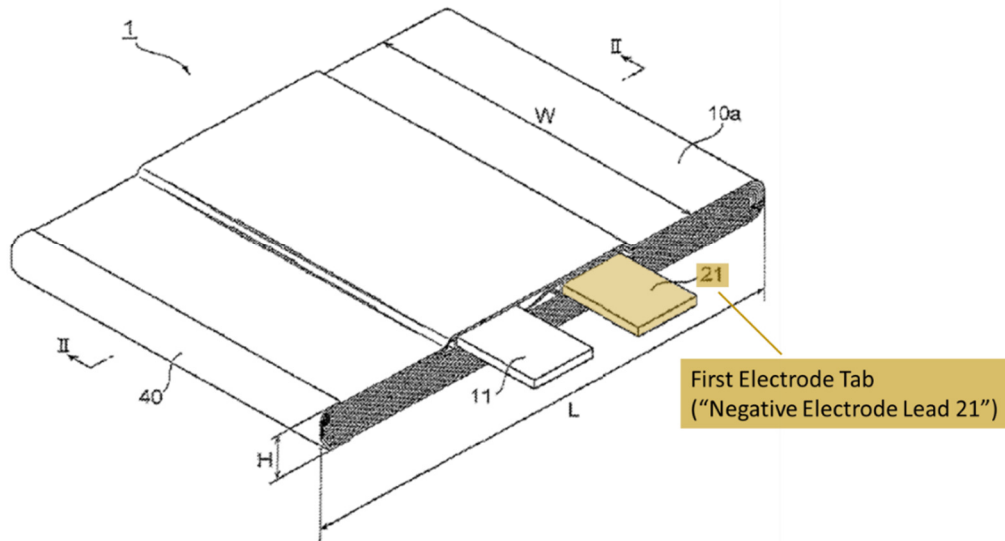
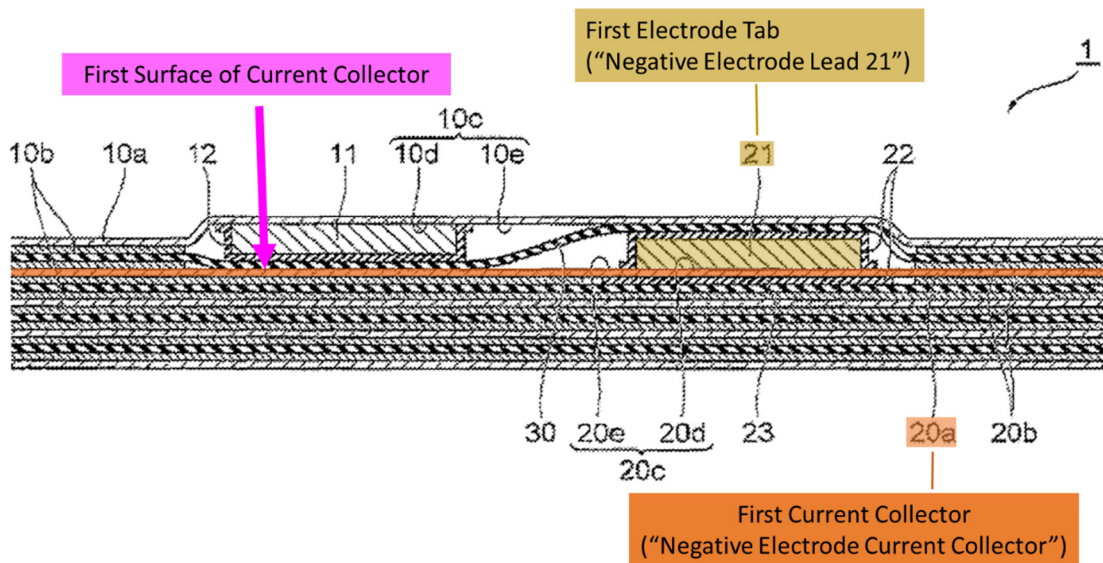


Fig.3



If Patent Owner asserts (or it is otherwise found) that the combinations of Wang and Deng (Ground 1) or Wang and Zhou (Ground 2) do not render this claim obvious, a POSITA would have found it obvious to implement a “substantially flat” electrode tab (such as Hasegawa’s) in Wang’s negative electrode. Ex. 1002, ¶201. The flat tab shape disclosed by Hasegawa is a conventional and routine electrode tab shape commonly used in the art, and as discussed above in Ground 1, a POSITA would have known of several benefits of implementing a flat electrode tab that is entirely parallel to the current collector, including better electrical performance and a stronger weld. Ex. 1002, ¶¶201-202.

A POSITA would have found it obvious, in view of the common and well-known flat electrode structure depicted in Hasegawa, to implement a similar electrode tab in Wang (as modified in view of Deng (Ground 5) or Zhou (Ground 6)) and would have had a reasonable expectation of success in doing so given the well-known tab structure and benefits provided by this tab structure. Ex. 1002, ¶203; *KSR*, 550 U.S. at 416-417, 421 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”).

Wang thus renders claim 11 obvious in combination with Hasegawa and either Deng (Ground 5) or Zhou (Ground 6). Ex. 1002, ¶204.

VIII. DISCRETIONARY DENIAL IS NOT WARRANTED

A. The Board Should Not Deny Institution Under § 325(d)

The Board should not exercise its discretion to deny institution. The relevant considerations are: (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of the first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8-9 (P.T.A.B. Feb. 13, 2020).

Neither factor supports denial of institution. During prosecution, the Examiner found that, “while the prior art teaches the presence of notches or grooves on various portions of the current collectors, the combination and orientation of the notch and groove together required by the instant claims would not have been obvious to one of ordinary skill in the art as applicant argues.” Ex. 1003, 658-659. But the Examiner did not consider several prior art references material to patentability of the claims, including Wang, Deng, Kobayashi, and Hasegawa, relied upon herein. Zhou was submitted in an IDS and noted as considered by the Examiner (Ex. 1003, 416, 599) but was not otherwise addressed by the Examiner during prosecution. As a result, the Examiner did not consider the

same (or substantially the same) combinations of prior art and arguments during prosecution that are presented in this Petition.

B. The Board Should Not Deny Institution Under § 314(a)

The Board should not exercise its discretion to deny institution under § 314(a). This Petition has been filed well before the one-year bar date imposed by 35 U.S.C. § 315(b) in view of Patent Owner's assertion of the '352 patent against Petitioner in *Ningde Ampere Tech. Ltd. v. Zhuhai CosMX Battery Co., Ltd.*, Civ. No. 2:22-cv-00232-JRG (E.D. Tex.). Moreover, *Fintiv* and the Office's interim guidelines dated June 21, 2022 ("Interim Procedures") require institution. IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential). As detailed below, Factor 6 requires institution; Factor 3 favors institution; and Factors 1, 2, 4, and 5 do not warrant denial.

Factor 6 requires institution because Petitioner presents a compelling unpatentability challenge. "[W]here the PTAB determines that the information presented at the institution stage presents a compelling unpatentability challenge, that determination alone demonstrates that the PTAB should not discretionarily deny institution under *Fintiv*." Interim Procedures, 4-5 (emphasis added). The Interim Procedures define a compelling challenge as one in which "the evidence, if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence." Interim Procedures, 4. As

explained in this Petition, the evidence plainly demonstrates that claims 1-3 and 5-12 are obvious by at least a preponderance of the evidence.

Factor 3 further favors institution because almost no parallel investment has occurred. *See Nearmap US, Inc. v. Eagle View Techs., Inc.*, IPR2022-01009, Paper 7 at 9 (PTAB Dec. 14, 2022) (“The litigation also is in a relatively early stage because the parties appear to have recently completed exchanging infringement and invalidity contentions and no claim construction hearing has occurred.”). The parties only finished exchanging infringement and invalidity contentions in mid-January, and the claim construction hearing is not scheduled until August 2023. Ex. 1015, 4-5.

Regarding Factors 1, 2, 4, and 5, Patent Owner filed its initial Complaint (asserting the presently challenged ’352 patent for the first time) against Petitioner on June 24, 2022. Ex. 1014. No stay has been requested, trial is currently scheduled for February 5, 2024, and the median time-to-trial in the Eastern District of Texas (per government statistics published on uscourts.gov dated March 31, 2022) is 24.2 months, so trial is projected to occur, at the earliest, in June or July 2024. Ex. 1014, 12; Ex. 1015, 1; Ex. 1016, 35. A FWD is anticipated in October or November 2024, about three months after trial if the median time-to-trial holds true. In these circumstances, Factors 1, 2, 4, and 5 do not warrant denial. *See NetNut v. Bright Data*, IPR2021-01492, Paper 12 at 9-16 (PTAB Mar. 21, 2022)

(instituting IPR without stipulation and co-pending trial date six months before FWD).

Denial of institution is accordingly not warranted under *Fintiv*.

IX. GROUNDS FOR STANDING

Petitioner certifies that the '352 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting *inter partes* review challenging the patent claims on the grounds identified herein.

X. MANDATORY NOTICES

A. Real Party-in-Interest

The real party-in-interest is Zhuhai CosMX Battery Co., Ltd.

B. Related Matters

Patent Owner has asserted the '352 patent against Petitioner in *Ningde Amperex Tech. Ltd. v. Zhuhai CosMX Battery Co., Ltd.*, Civ. No. 2:22-cv-00232-JRG (E.D. Tex.).

The application that issued into the '352 patent claims priority to PCT Pat. App. No. PCT/CN2015/088638. Chinese Patent Application No. CN 201580082766 also claims priority to the PCT '638 application. A continuation of the '352 patent, U.S. Patent App. No. 17/710,936, is currently pending before the Patent Office.

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Lead Counsel	Back-Up Counsel
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D. Service Information Under 37 C.F.R. § 42.8(b)(4)

Please address all correspondence to counsel at the addresses above.

Petitioner consents to service by email at the above addresses.

XI. CONCLUSION

In view of the foregoing, the Board should institute an IPR proceeding, find claims 1-3 and 5-12 of the '352 patent obvious, and cancel the claims. The Office may charge any required fees to Deposit Account No. 06-0916.

Respectfully submitted,

Dated: March 31, 2023

/Michele C. Bosch/
Michele C. Bosch (Reg. No. 40,524)
Lead Counsel for Petitioner

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(a)(1)(i), the undersigned hereby certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW contains 13,957 words, excluding parts of this Petition exempted under § 42.24(a), as measured by the word-processing system used to prepare this paper.

Dated: March 31, 2023

/Michele C. Bosch/
Michele C. Bosch (Reg. No. 40,524)
Lead Counsel for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), the undersigned certifies that on March 31, 2023, a copy of the foregoing **Petition for *Inter Partes* Review**, the associated **Power of Attorney**, and **Exhibits 1001 through 1016** were served by FedEx Priority Overnight at the correspondence address of record indicated in the Patent Office's Patent Center system for U.S. Patent No. 11,329,352:

Yalei Sun
Morgan, Lewis & Bockius LLP
1400 Page Mill Rd.
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/William Esper/
William Esper
Case Manager and PTAB Coordinator
FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP