

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 IPR2026-00398
U.S. Patent No. 10,916,769

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,916,769**

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Statutes

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PETITIONER’S EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 10,916,769
1002	File History of U.S. Patent No. 10,916,769
1003	Declaration of Yu Zhu, Ph.D.
1004	<i>Curriculum Vitae</i> of Yu Zhu, Ph.D.
1005	U.S. Patent Publication No. 2016/0294015 (“Tanaka”)
1006	U.S. Patent Publication No. 2015/0147624 (“Yamafuku”)
1007	U.S. Patent No. 8,846,237 B2 (“Kim”)
1008	U.S. Patent Publication No. 2016/0013480 (“Sikha”)
1009	Chinese Publication No. 202905885 with Certified English Language Translation (“Li”)
1010	U.S. Patent Publication No. 2009/0068548 (“Kaplan”)
1011	U.S. Patent Publication No. 2011/0168550 (“Wang”)
1012	U.S. Patent Publication No. 2006/0073380 (“Kim-380”)
1013	U.S. Patent Publication No. 2006/0088759 (“Roh”)
1014	U.S. Patent Publication No. 2013/0017340 (“Brown”)

I. STATEMENT OF PRECISE RELIEF REQUESTED AND REASONS THEREFOR (37 C.F.R. §42.22(A))

Zhuhai CosMX Battery Co., Ltd. (“Petitioner”) petitions for *inter partes* review, seeking cancellation of claims 1-19 of U.S. Patent No. 10,916,769 (“the ’769 patent”; EX1001), assigned to Ningde Ampere Technology Limited (“Patent Owner” or “PO”). The ’769 patent relates to secondary battery electrode constructions and their properties. EX1003, ¶34. The challenged claims are unpatentable under 35 U.S.C. §§ 102(a)(1) and 103(a). This Petition is supported by the Declaration of Dr. Yu Zhu (Exhibit 1003), an expert in polymer science and engineering with a focus in polymer materials, composite and porous materials, and electrochemical energy-storage systems. EX1003, ¶4.

II. BACKGROUND

Before the filing of the ’769 patent, high-capacity electrochemical devices such as lithium-ion (“Li-ion”) batteries were widely used. EX1003, ¶39. Li-ion batteries typically include an “anode” serving as the negative electrode, a “cathode” serving as the positive electrode, a separator between the anode and the cathode, and an electrolyte. *Id.* Consumer demands for more power packed into slimmer and smaller form factors have driven a need for higher capacity batteries capable of faster charging. *Id.* One well-known approach to satisfy this demand has been to increase the amount of active material incorporated into the electrodes, particularly the cathode. *Id.*

Increasing the amount of active material in an electrode (e.g., “electrode loading” by forming thicker electrodes or increasing the packing density of electrode materials) is well-known to increase the amount of active material per unit electrode area. EX1003, ¶40. Accordingly, more lithium-intercalation material can be incorporated into a single cell, directly increasing capacity without increasing the battery’s external dimensions. *Id.*

Multi-layer electrodes—particularly cathodes—including layers having different power and voltage properties have been well-known to increase electrode thickness, active-material content, and resulting energy density. EX1003, ¶41. Such multi-layer cathodes are routinely formed by depositing a first cathodically-active slurry onto a current collector, allowing the slurry to dry, and subsequently depositing a second slurry—containing the same or a different active material—on top of the first layer. *Id.* Each of these layers may be compacted or calendared to achieve a desired density or porosity. *Id.* This sequential process achieves greater active material utilization than single-layer cathodes. *Id.*

The individual layers of a multi-layer cathode can be independently tailored, through various properties, to achieve desired performance characteristics. EX1003, ¶42. By selecting and combining layers with different properties, a Person of Ordinary Skill in the Art (“POSA”) can optimize a cell for a given application. *Id.*

In addition, a wide variety of cathode active materials (e.g., olivines, spinels, and lithium-transition-metal oxides) were commonly used in such multi-layer structures. EX1003, ¶43. A broad range of particle sizes, layer thicknesses, and material densities were known and are routinely selected by skilled artisans. *Id.* Thus, a POSA would have been able to choose appropriate materials and layer configurations by balancing known tradeoffs among capacity, energy density, safety, manufacturability, and cost. *Id.*

Batteries can be manufactured using stacked (laminated) electrode assemblies or wound (jelly-roll) electrode assemblies. EX1003, ¶44; *see also, e.g.*, EX1012; EX1013. For example, lithium secondary batteries may be formed using jelly-roll type electrode assemblies in which electrode sheets are wound into a roll configuration. *See generally* EX1012. Alternatively, stacked assemblies may be formed by laminating alternating electrodes. *See generally* EX1013. Thus, well before the '769 patent, these structures were well-known alternatives that could be employed depending on the required form factor for a given application. *See* EX1005, [0003]-[0004]; EX1006, [0202]. EX1003, ¶44.

III. THE CHALLENGED PATENT

A. Claims

Independent claim 1 recites a cathode, and independent claims 9 and 15 recite an electrochemical device and an electronic device, respectively, that

incorporate that cathode into a wound electrode assembly including an anode and a separator. EX1001, 20:28-43 (claim 1), 21:38-57 (claim 9), 22:32-53 (claim 15).

Although the purportedly novel feature of the '769 patent is a “gap between the active material layer and the insulating layer,” the independent claims do not recite any “gap.” EX1003, ¶¶45-46; EX1001, 1:49-53, 5:16-25. Instead, the independent claims recite first and second cathode active material layers and an insulating layer having a thickness that is greater than that of the first cathode active material layer. EX1003, ¶47; EX1001, 20:42-43, 21:51-52, 22:47-48. All of these elements were well known, and the prior art contains examples of lithium-ion battery cathodes having the recited structure. EX1003, ¶48. The dependent claims recite the touted gap feature, but include a range of distances for that gap, which range includes zero. A gap of zero distance is structurally no different than the absence of a gap. The claims are thus disconnected from the alleged invention.

B. Prosecution History

The '769 patent issued from U.S. Patent Application No. 16/298,738 (“the '738 application”). EX1001, (21). The '738 application was filed on March 11, 2019, and claims priority to Chinese Patent Application No. 201811308841, filed on November 5, 2018. EX1001, (22), (30).

During prosecution, only a single Office Action was issued, rejecting most of the claims over Tanaka or Tanaka in view of Yamafuku. *See* EX1002, 119-31.

Prosecution claims 6, 14, and 20 were determined to be allowable. *See* EX1002, 131-34. Applicant incorporated prosecution claim 6 into the independent claims, and the application was allowed. *See* EX1002, 200, 208-09. None of these claims should have been allowed over Tanaka and Yamafuku. EX1003, ¶50.

Prosecution claim 6 recited the feature that “a thickness of the insulating layer is greater than a thickness of the first cathode active material layer” that is recited by patented claims 1, 9, and 15. However, Tanaka at least *inherently* discloses this relationship and, separately, *explicitly* discloses a range of thicknesses for insulating member 40 that anticipate this claim element. EX1003, ¶51. Thus, the Examiner materially erred in failing to appreciate these disclosures by Tanaka. EX1003, ¶51.

The Examiner also incorrectly interpreted prosecution claim 9 (patented claim 8) as requiring *both* a polymer *and* inorganic particles. *See* EX1002, 123-24; EX1003, ¶52. However, patented claim 8 only requires “*at least one of* inorganic particles *and* a polymer.”¹ *See infra* § VII. Thus, the Examiner again erred by misunderstanding the scope of the claim and failing to reject this feature over Tanaka alone. EX1003, ¶52.

¹ Emphasis added unless otherwise noted.

The Examiner also erroneously allowed prosecution claims 14 and 20 (patented claims 12 and 19). EX1003, ¶53. The limitation that “ $0 \leq$ the first distance $\leq \frac{\pi}{4} * D + 4 \text{ mm}$ ” means that, *at a minimum*, the first distance falls within the range of 0 mm to 4 mm, inclusive. *Id.*, ¶53. Tanaka *explicitly discloses* this feature that the Examiner had determined to be allowable. *Id.*; *see infra* § IX.D.

The Examiner’s failure to reject the claims of the ’769 patent over Tanaka and/or Tanaka in view of Yamafuku reflects multiple material errors by the Office. EX1003, ¶54. In addition, the Examiner’s failure to understand that all of the limitations recited by claims of the ’769 patent were well known in the prior art, as evidenced below by Kim and Sikha, constitutes yet another material error in prosecution. *Id.* The Board should correct these errors by instituting review.

IV. OVERVIEW OF PRIOR ART

A. Tanaka

Tanaka was filed on November 12, 2014, and published on October 6, 2016. EX1005, (22), (43). Thus, Tanaka is prior art under 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Tanaka describes a secondary battery that “includes an electrode laminate body” having positive and negative electrodes “alternately laminated with [a] separator 20 interposed therebetween.” EX1005, [0031]. The positive electrode (or

cathode) includes a “positive electrode active material layer 2 having a multi-layer structure” of a “first active material layer 2a” formed on positive electrode current collector 3 and “second active material layer 2b” laminated on first active material layer 2a. *Id.*, [0035]. “[I]nsulating member 40 [is] formed so as to cover border part 4 between the applied part and non-applied part of positive electrode active material layer 2.” *Id.*, [0048]. The thickness of insulating member 40 is “90% or less of the average thickness of multi-layer part M” “and more preferably [] 60% or less of the average thickness of” of part M. *Id.*, [0051]. EX1003, ¶¶56-57.

B. Yamafuku

Yamafuku was filed on November 6, 2014, and published on May 28, 2015. EX1006, (22), (43). Thus, Yamafuku is prior art to the ’769 patent under 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Yamafuku describes an energy storage device (e.g., a lithium-ion secondary battery) that uses an electrode assembly made from sheet-like, belt-shaped electrodes and a separator, which are assembled and then wound. EX1006, Abstract, [0074]-[0075]. Yamafuku’s assembly “includes a sheet-like positive electrode 3, a sheet-like negative electrode 5 and a sheet-like separator 4 arranged between the positive electrode 3 and the negative electrode 5.” *Id.*, [0075]. The electrode assembly demonstrates improved short-circuit robustness due to laminated layers having different binder chemistries. *Id.*, [0042], [0044]-[0047].

Yamafuku describes that this lamination technique can be used in either a wound-type electrode assembly or “a stacked type assembly.” *Id.*, [0202]. EX1003, ¶58.

C. Kim

Kim was filed on July 2, 2008, and issued on September 30, 2014. EX1007, (22), (45). Thus, Kim is prior art under 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Kim discloses an electrode assembly and secondary battery designed to improve safety and durability by addressing damage to separators caused by non-uniform electrode coating regions. EX1007, Abstract. Kim discloses that “an insulating member [is] disposed on one side of the positive or negative electrode non-coating portion, and formed adjacent to at least one of the ends of the” respective electrode coating portion. *Id.*, 2:29-41. To effectively prevent separator damage and internal short circuits, the insulating member is preferably spaced “3.5 mm or less” from the end of the electrode coating portion. *Id.*, 2:42-45, 6:39-52. EX1003, ¶¶59-60.

D. Sikha

Sikha was filed on March 5, 2014, and published on January 14, 2016. EX1008, (22), (43). Thus, Sikha is prior art under 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Sikha discloses forming a cathode by sequentially depositing “a first slurry mixture comprising a cathodically active material” on a current collector “to form

a first cathode material layer,” and then depositing “a second slurry mixture comprising a cathodically active material ... on the first cathode material layer 210.” EX1008, [0034], [0035], [0038], [0053]. The individual layers may be engineered to have different properties, stating that “the multilayer electrodes have different properties (e.g., porosity, surface area, electrode composition) in each layer,” or “different active material chemistries in each layer.” *Id.*, [0023]. The first cathode layer may function as a dense “energy layer” by “having a high packing density” while the second, overlying cathode layer, which is more porous, may function as a “power layer.” *Id.*, [0068]. EX1003, ¶¶61-62.

E. Li

Li was filed on April 16, 2012, and published on April 24, 2013. EX1009, (22), (45). Thus, Li is prior art under 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Li discloses a prismatic lithium-ion battery having a winding structure in which the corner regions of the electrode assembly are specially configured to reduce deformation while maintaining safety, including the use of insulating or protective layers at the corners. EX1009, Title, Abstract, FIG. 3. The corner regions of Li’s positive and negative electrodes are intentionally left uncoated, such that “no active material layer is coated.” *Id.*, [0035]. Applying a protective or insulating layer to these corner regions “prevent[s] the blank current collectors from puncturing the separator.” *Id.*

Li further specifies that this protective layer may take multiple forms, including “an adhesive tape, a protective coating, or a conductive coating,” and that “the thickness of the protective layer is 1-3 times that of the corresponding current collector,” thereby ensuring mechanical protection and insulation of the separator in the corner portions of the wound electrode assembly. EX1009, [0035]. Li explains this configuration reduces stress concentration and deformation in wound prismatic cells while maintaining electrical safety, and the protective layer avoids short circuits caused by exposed current collectors at the electrode corners. *Id.*, [0017]. EX1003, ¶¶63-64.

F. Kaplan

Kaplan was filed on September 6, 2007, and published on March 12, 2009. EX1010, (22), (43). Thus, Kaplan is prior art under 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Kaplan discloses prismatic cells that have “desirable properties for use in digital cameras and other applications,” such as “cell phones, MP3 players, and personal digital assistants (PDA’s) such as Blackberries®.” EX1010, Title, Abstract, [0005], [0007]. The defining structural dimension of Kaplan’s prismatic cell is its thickness: prismatic cells “generally have a thickness that is much less than their width and length.” *Id.*, [0005]. Kaplan explains that “[m]any prismatic cells have dimensions in the ranges of 40-60 mm long by 30-40 mm wide by 4-

10 mm thick.” *Id.* Kaplan also defines prismatic cells as having “a thickness of between about 2 mm and about 15 mm.” *Id.*, [0015].

V. IDENTIFICATION OF THE CHALLENGE (37 C.F.R. §42.104(B))

Petitioner requests IPR based on the Grounds summarized below.

Ground	35 U.S.C. §	Claims	References
1A	102(a)(1)	1-8	Tanaka
1B	103	9-13, 15-18	Tanaka
1C	103	8-13, 15-18	Tanaka and Yamafuku
1D	103	11, 17	Tanaka, Yamafuku, and Li
1E	103	14, 19	Tanaka, Yamafuku, and Kaplan
2A	103	1-10, 12, 13, 15, 16, 18	Kim and Sikha
2B	103	8	Kim, Sikha, and Yamafuku
2C	103	11, 17	Kim, Sikha, and Li
2D	103	14, 19	Kim, Sikha, and Kaplan

VI. PERSON OF ORDINARY SKILL IN ART

A POSA at the earliest priority date of the ’769 patent would have had at least an undergraduate degree in chemistry, chemical engineering, polymer science and engineering, or materials science and engineering and two years of experience in the field of lithium-ion secondary batteries. A higher level of education, such as

a master's degree in one of these same fields, could substitute for work experience.

EX1003, ¶37.

VII. CLAIM CONSTRUCTION

Claims must be given their ordinary and customary meaning in light of the specification—"the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (*en banc*). Petitioner has given all terms herein their plain meanings in view of the specification.

Regarding claim 8, the plain meaning of the term "at least one of ... and" is not conjunctive "when the patent's claims, specification, or prosecution history necessitate a broader meaning." *Ex parte Jung*, Appeal No. 2016-008290 at 5-6 (PTAB 2017). That is the case here because "at least one of" modifies the phrase "inorganic particles and a polymer." This "list" fails to form a "series" because (1) it only includes two elements, and (2) it violates the principles of parallel wording that would convey that these items should be understood as having similar function. Instead, claim 8 lists a plural ("inorganic particles") followed by a singular ("a polymer"). The specification of the '769 patent does nothing to resolve this ambiguity, merely repeating the same phrase. *See* EX1001, 2:54-56, 8:41-45.

In view of the above, claim 8 does not convey that the insulating layer should contain *both* inorganic particles *and* a polymer, but rather that the insulating

layer should contain inorganic particles, a polymer, or both. A POSA would thus understand that the insulating layer could be formed from only inorganic particles, from only a polymer, or from a combination of inorganic particles and a polymer.

With the above understanding, the Examiner erred in failing to reject patented claim 8 over Tanaka. EX1003, ¶52. However, even in the case that claim 8 does require *both* inorganic particles *and* a polymer (it does not), Yamafuku renders obvious these claim limitations, as explained by the Examiner during prosecution. EX1002, 123-24.

VIII. GROUND 1A: CLAIMS 1-8 ARE ANTICIPATED BY TANAKA.

As explained in detail throughout the sections that follow, Tanaka expressly or inherently discloses all the limitations of claims 1-8. EX1003, ¶69.

At a high level, Tanaka at least inherently discloses the limitation that “a thickness of the insulating layer is greater than a thickness of the first cathode active material layer,” which the Examiner erroneously allowed over Tanaka. *See infra* § VIII.9. Specifically, Tanaka’s first active material layer 2a “slopes” from its average thickness towards a thickness of zero. EX1005, [0053], FIGs. 2, 3A, 10; EX1003, ¶¶88-89. As a result, first active material layer 2a *necessarily* has a portion along that slope where the thickness is less than the thickness of Tanaka’s insulating member 40 (because zero is necessarily less than nonzero). *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987);

Continental Can Co. v. Monsanto Co., 948 F.2d 1264, 1268 (Fed. Cir. 1991); *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999).

Tanaka also *explicitly* discloses the above limitation. *See infra* § VIII.9. Contrary to the apparent understanding of the Examiner, Tanaka is not limited to an insulating member 40 having a thickness of 0.03 mm. Rather, Tanaka expressly describes a much broader *range of thicknesses* for insulating member 40. EX1003, ¶¶90-92; EX1005, [0051]. The disclosed range encompasses thicknesses greater than the disclosed thickness of first active material layer 2a and therefore anticipates the claimed range. EX1003, ¶¶92-93.

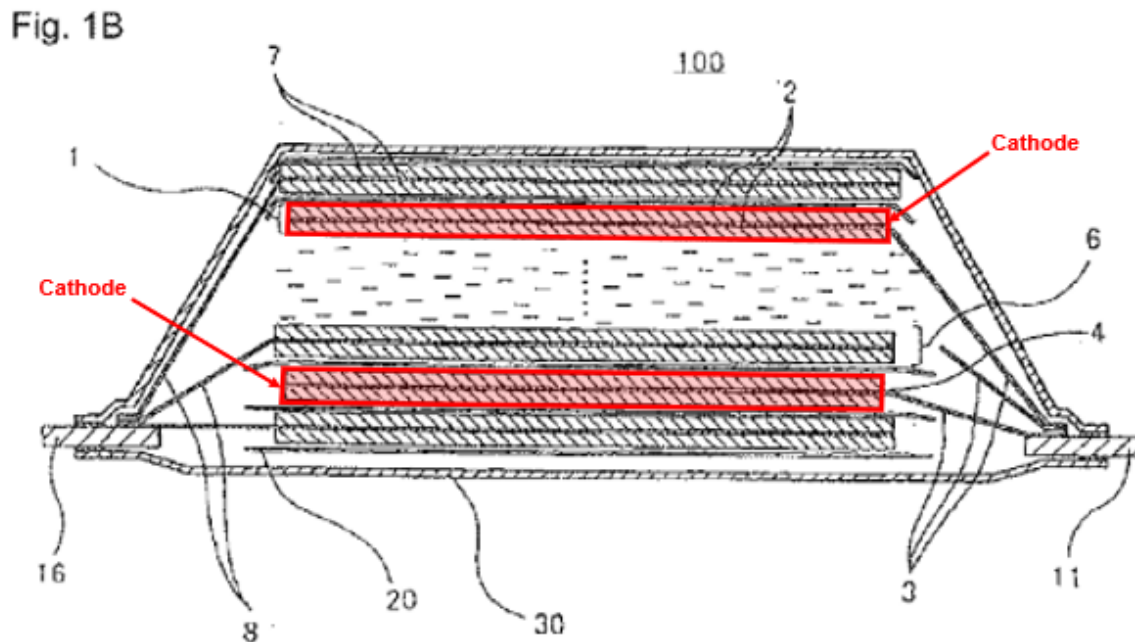
In addition, regarding claims 2, 3, and 5, Tanaka discloses ranges that overlap the claimed ranges for the first distance, the second distance, and the thickness of the first cathode active material layer. EX1003, ¶¶94-101, 103. Those overlapping ranges are disclosed with sufficient specificity to establish anticipation because there is no reasonable difference in how the claimed invention operates. *See Ineos USA LLC v. Berry Plastics Corp.*, 783 F.3d 865, 869 (Fed. Cir. 2015); *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, 999 (Fed. Cir. 2006); *ClearValue, Inc. v. Pearl River Polymers, Inc.*, 668 F.3d 1340, 1345 (Fed. Cir. 2012). To the extent Patent Owner attempts to rebut this *prima facie* case of anticipation by arguing criticality, Tanaka defeats any such argument. *Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333, 1338 (Fed. Cir. 2020).

Finally, dependent claims 6-8 recite Markush groups. Tanaka discloses at least one member of each recited Markush group and therefore anticipates each of those claims. *In re Slayter*, 276 F.2d 408, 411 (CCPA 1960); *In re Gosteli*, 872 F.2d 1008, 1010 (Fed. Cir. 1989).

A. Independent Claim 1

1. 1.P

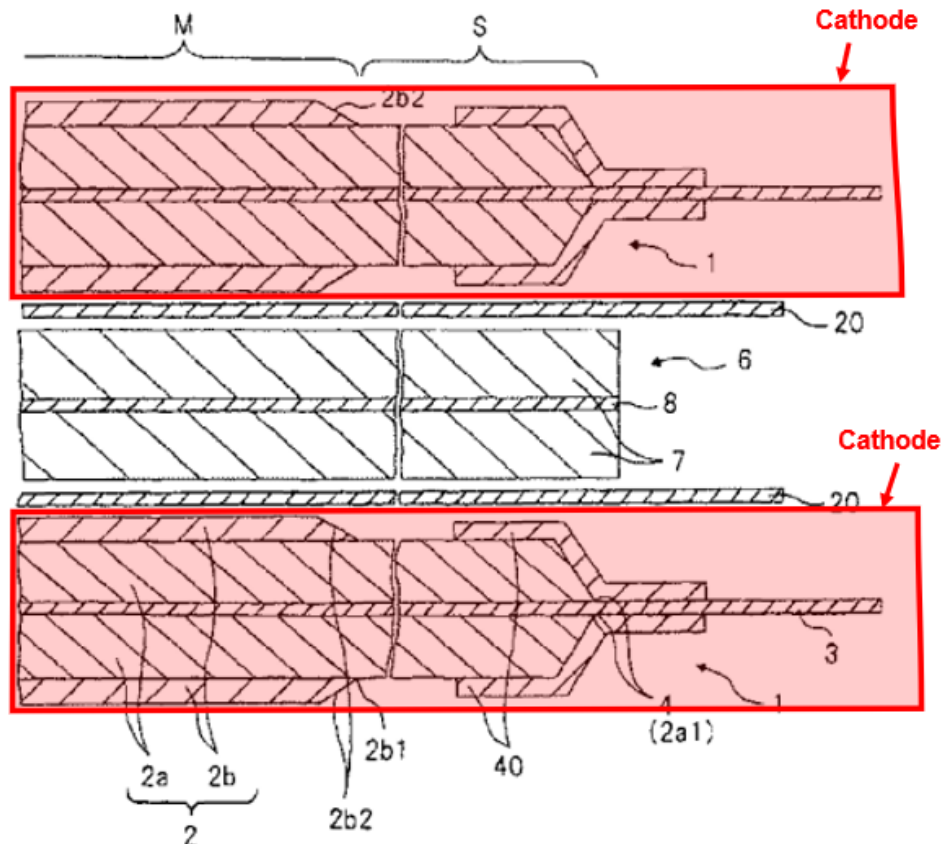
Tanaka discloses a battery including “positive electrodes (positive electrode sheets) 1 and negative electrodes (negative electrode sheets) 6.” EX1005, [0031], FIG. 1B; EX1003, ¶70.



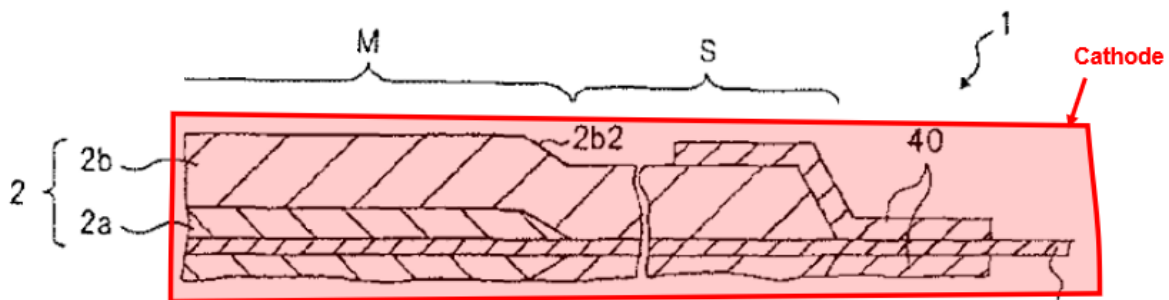
EX1005, FIG. 1B (annotated); EX1003, ¶70.

Tanaka’s positive electrode “includes [a] current collector (positive electrode current collector) 3 for the positive electrode, and active material layer

(positive electrode active material layer) 2 for the positive electrode applied on positive electrode current collector 3.” EX1005, [0032], FIGs. 2, 3A, 10; EX1003, ¶71. Tanaka’s positive electrode is the same as the recited cathode. EX1003, ¶72.



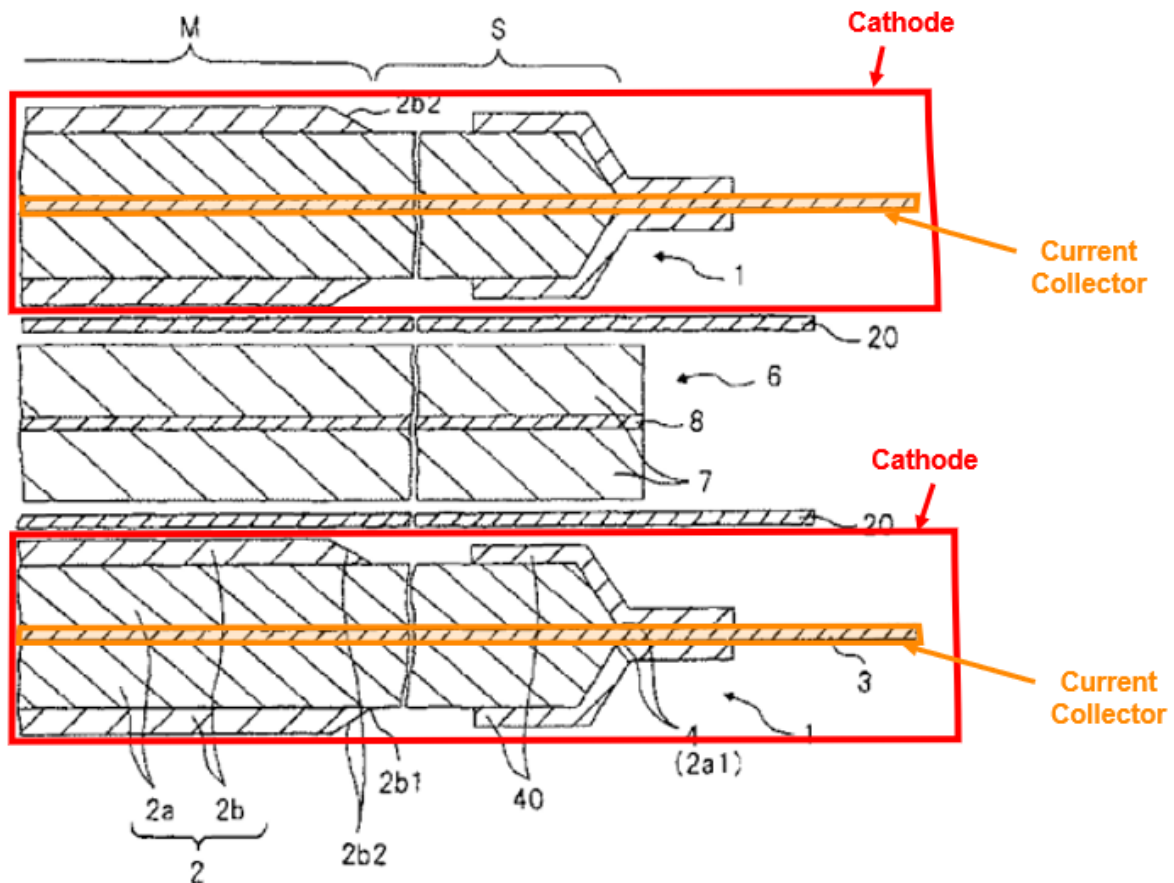
EX1005, FIG. 2 (annotated); EX1003, ¶71.



EX1005, FIG. 10 (annotated); EX1003, ¶71.

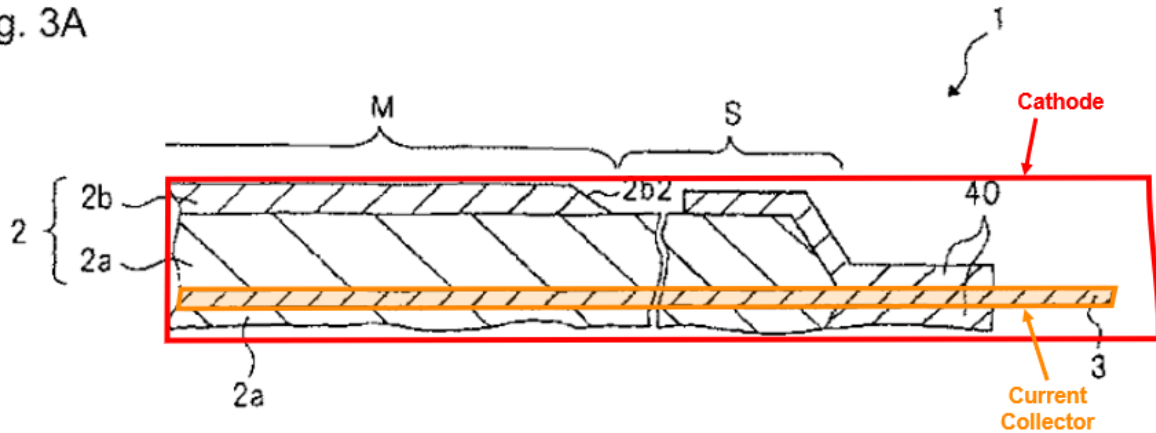
2. 1.A

Tanaka's positive electrode comprises a "current collector (positive electrode current collector) 3" made of "aluminum, stainless steel, nickel, titanium, and the like" that is the same as the recited cathode current collector. EX1005, [0032], [0043], FIGs. 2, 3A, 10; EX1003, ¶¶73-74.

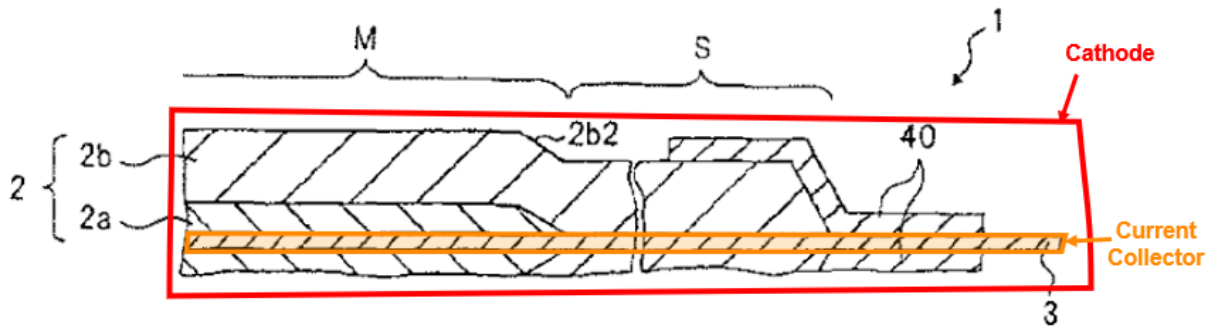


EX1005, FIG. 2 (annotated); EX1003, ¶73.

Fig. 3A



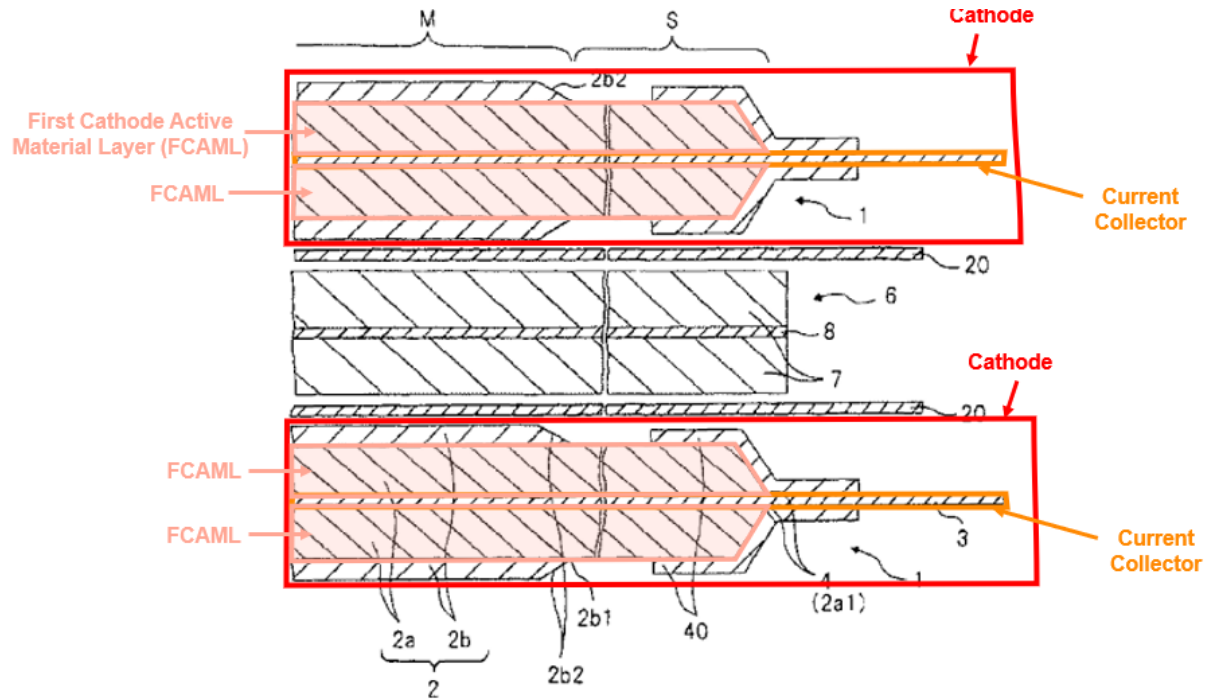
EX1005, FIG. 3A (annotated); EX1003, ¶73.



EX1005, FIG. 10 (annotated); EX1003, ¶73.

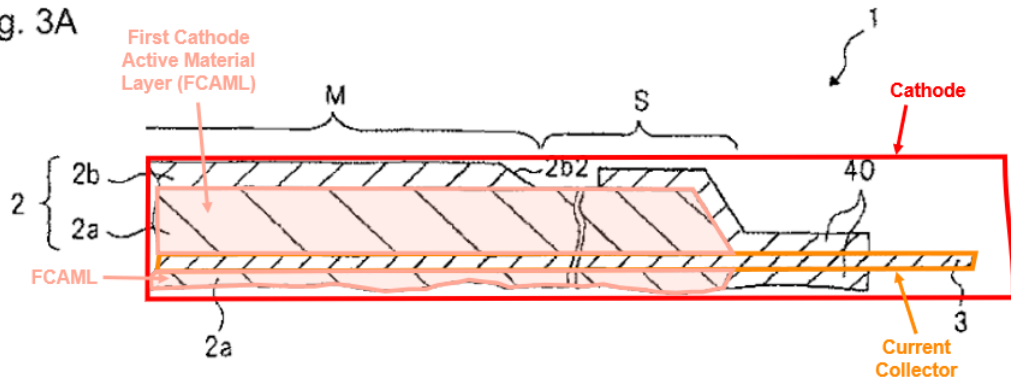
3. 1.B

Tanaka's first active material layer 2a includes an "active material," comprising, for example, "layered, oxide-based materials," "spinel materials," "olivine materials," and "olivine fluoride materials." EX1005, [0012], [0035], [0040], FIGs. 2, 3A, 10; EX1003, ¶75. Tanaka's first active material layer 2a is the same as the recited first cathode active material layer. *Id.*, ¶76.

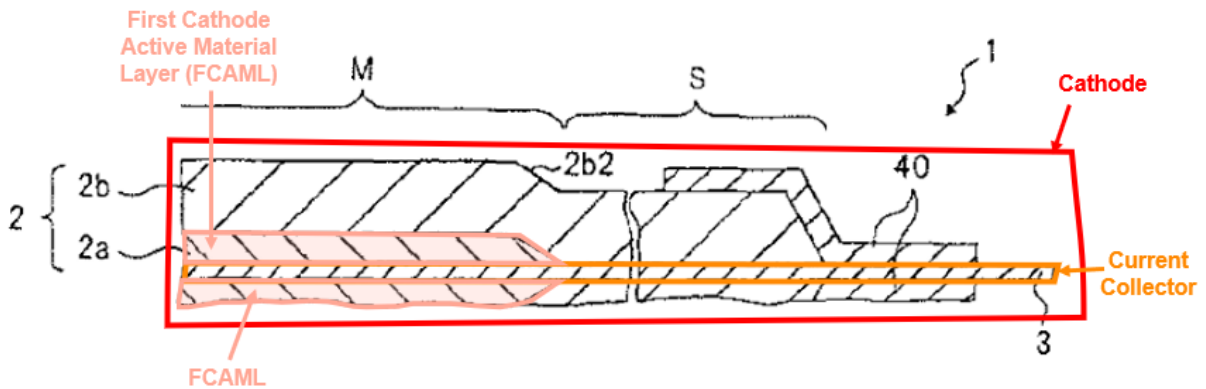


EX1005, FIG. 2 (annotated); EX1003, ¶75.

Fig. 3A



EX1005, FIG. 3A (annotated); EX1003, ¶75.



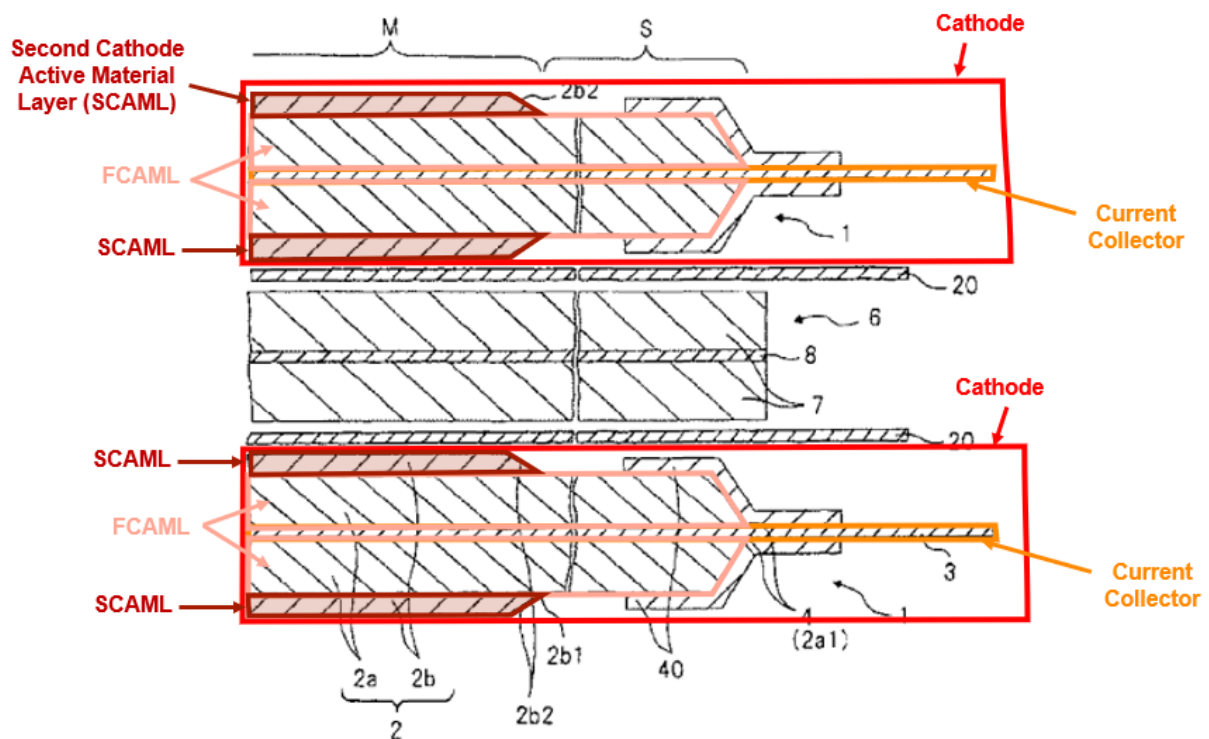
EX1005, FIG. 10 (annotated); EX1003, ¶75.

4. 1.C

Tanaka's positive electrode "has a multi-layer structure that includes a first active material layer and a second active material layer." EX1005, [0012].

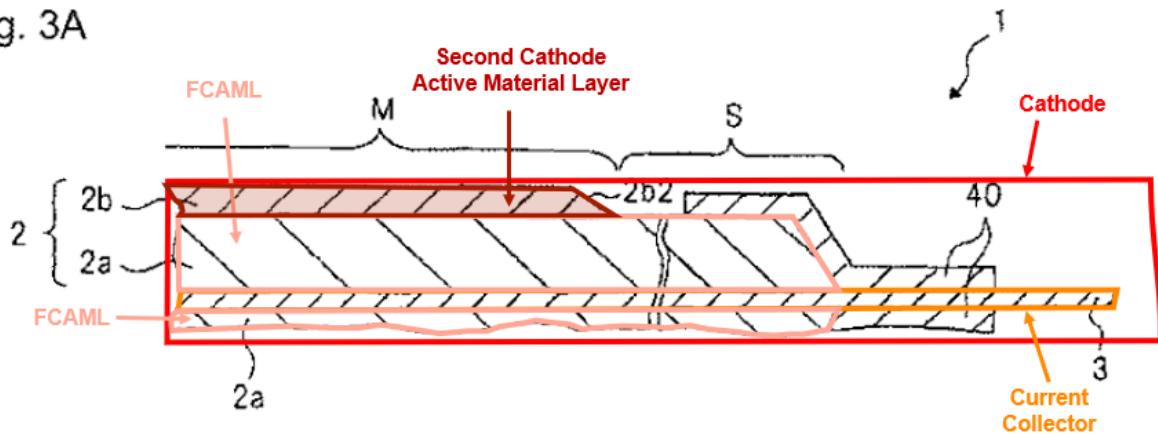
Tanaka's "second active material layer 2b is laminated" on top of first active material layer 2a by applying "an active material mixture agent" on top of the first. *Id.*, [0035], [0040], [0050], FIGs. 2, 3A, 10; EX1003, ¶¶77. Tanaka's second active material layer is the same as the recited second cathode active material layer.

EX1003, ¶78.



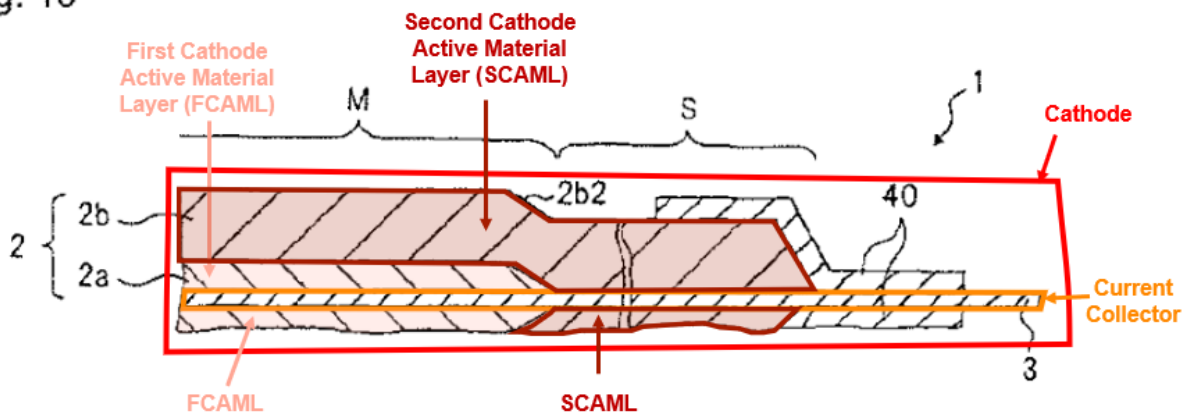
EX1005, FIG. 2 (annotated); EX1003, ¶77.

Fig. 3A



EX1005, FIG. 3A (annotated); EX1003, ¶77.

Fig. 10

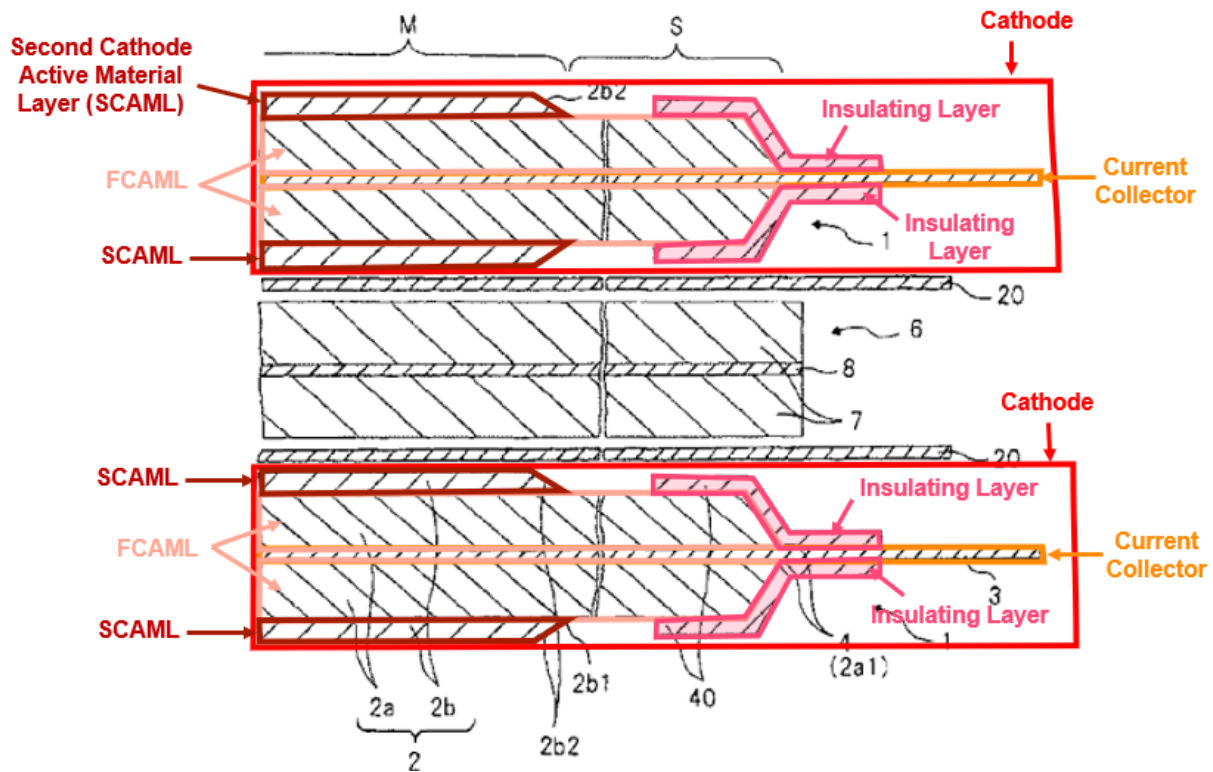


EX1005, FIG. 10 (annotated); EX1003, ¶77.

5. 1.D

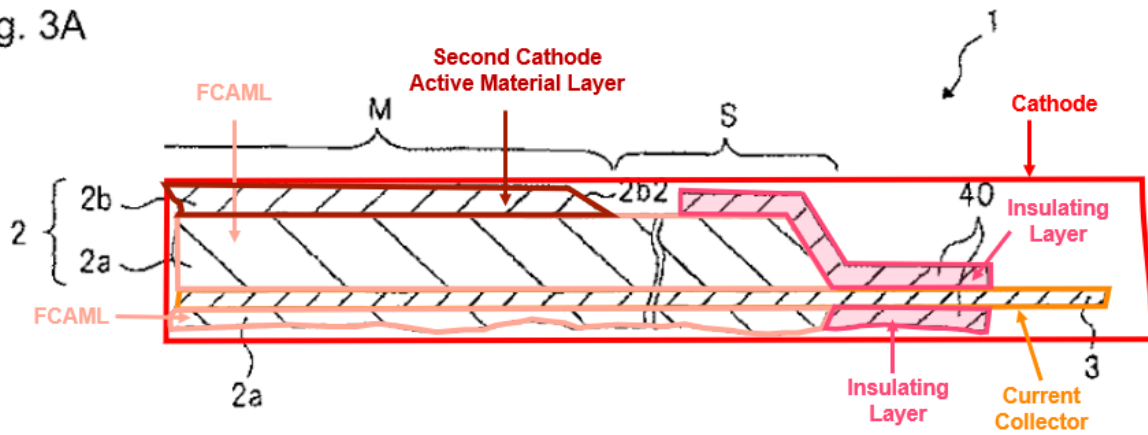
Tanaka discloses an “insulating member 40” made of “polyimide, glass fiber, polyester, polypropylene, or materials containing them” that is formed “by bonding a tape-like resin member to border part 4 by heat, or by applying a gel-like resin on border part 4 and then drying the resin.” EX1005, [0048]; EX1003, ¶79.

Tanaka’s insulating member 40 is the same as the recited insulating layer. EX1003, ¶80.



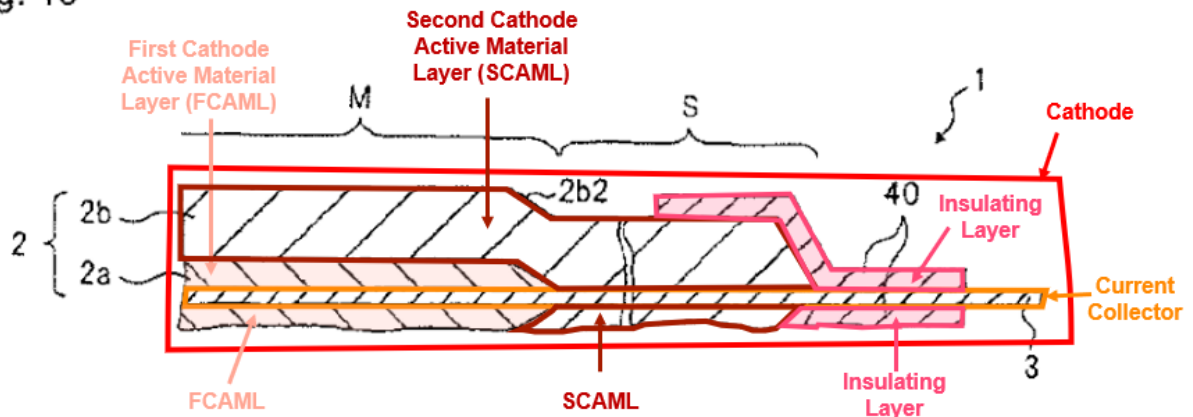
EX1005, FIG. 2 (annotated); EX1003, ¶79.

Fig. 3A



EX1005, FIG. 3A (annotated); EX1003, ¶79.

Fig. 10



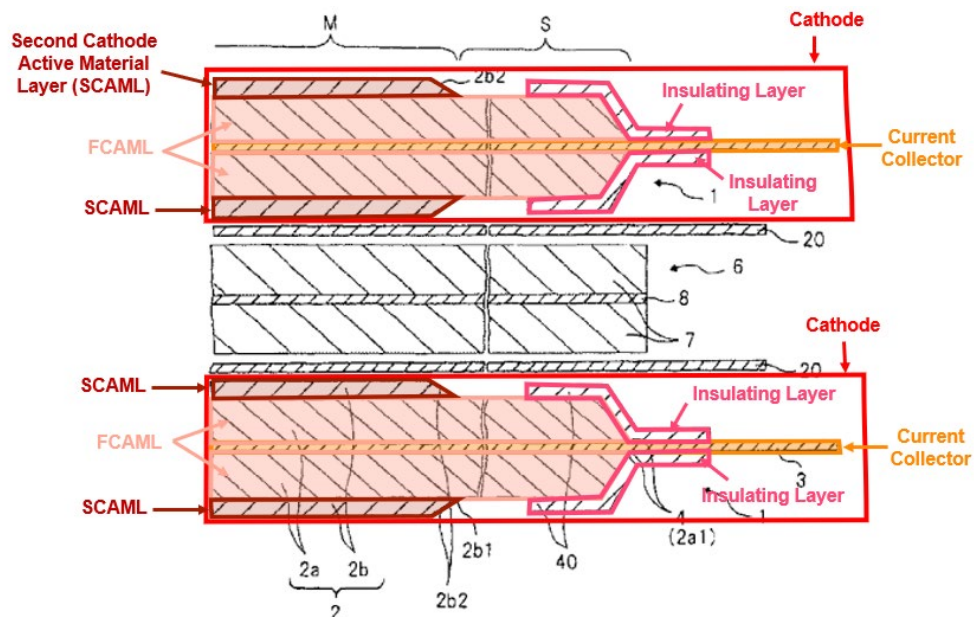
EX1005, FIG. 10 (annotated); EX1003, ¶79.

6. 1.E.1

Tanaka's first active material layer 2a is disposed on top of current collector 3 and beneath second active material layer 2b. EX1005, [0012], [0035], [0050].

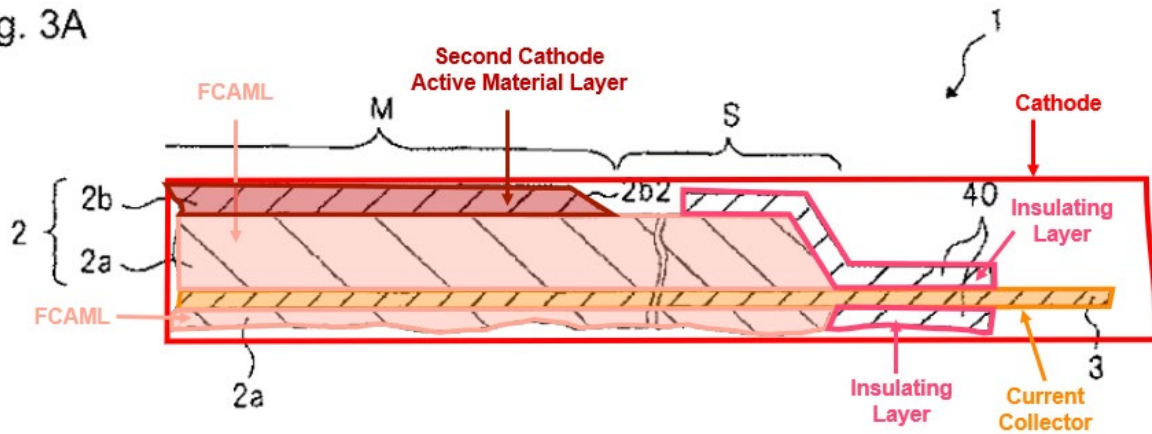
Thus, Tanaka's first active material layer 2a is between cathode current collector 3 and second active material layer 2b, as claimed. *Id.*, FIGs. 2, 3A, 10; EX1003,

¶¶81-82.



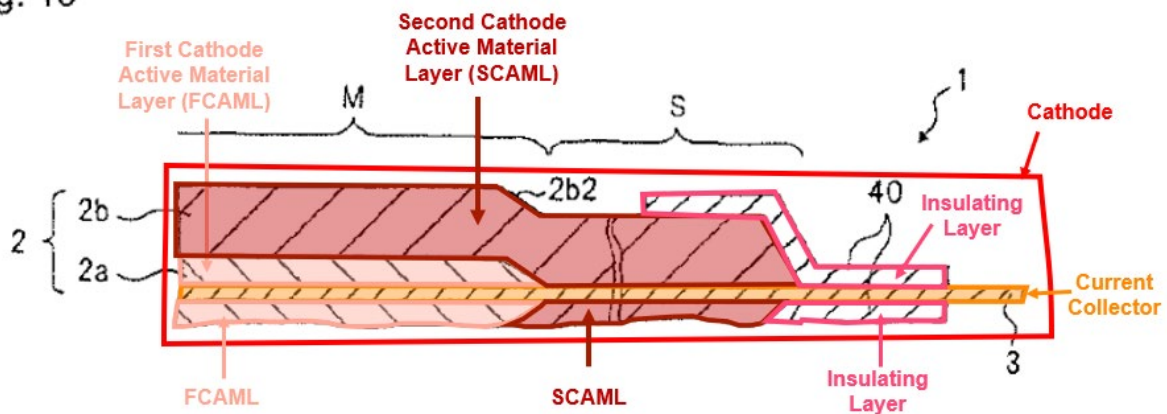
EX1005, FIG. 2 (annotated); EX1003, ¶81.

Fig. 3A



EX1005, FIG. 3A (annotated); EX1003, ¶81.

Fig. 10



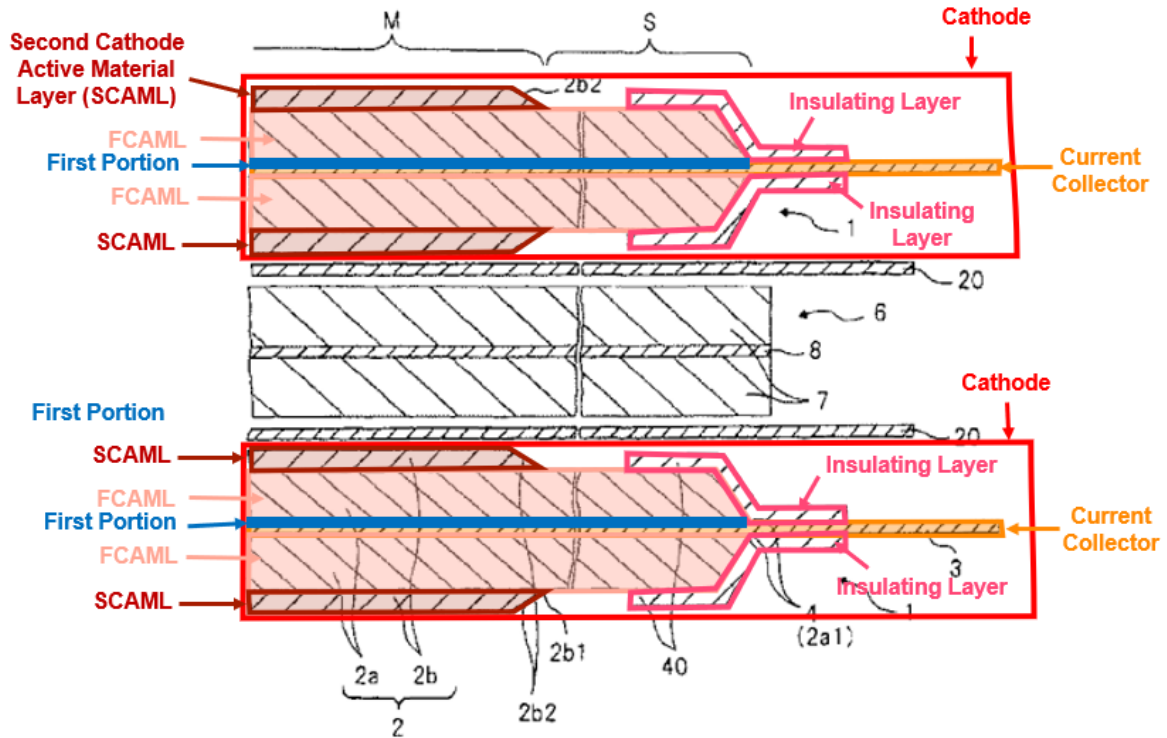
EX1005, FIG. 10 (annotated); EX1003, ¶81.

7. 1.E.2

Tanaka's first active material layer 2a is disposed on current collector 3.

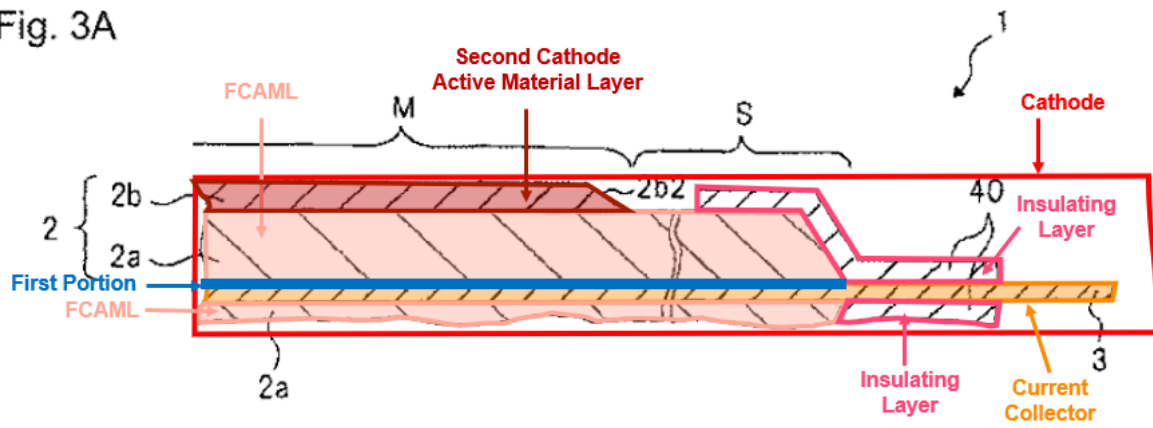
EX1005, [0012], [0035], [0050]. Thus, Tanaka's first active material layer 2a covers a portion of the surface of positive electrode current collector 3, as claimed.

Id., FIGs. 2, 3A, 10; EX1003, ¶¶83-84.



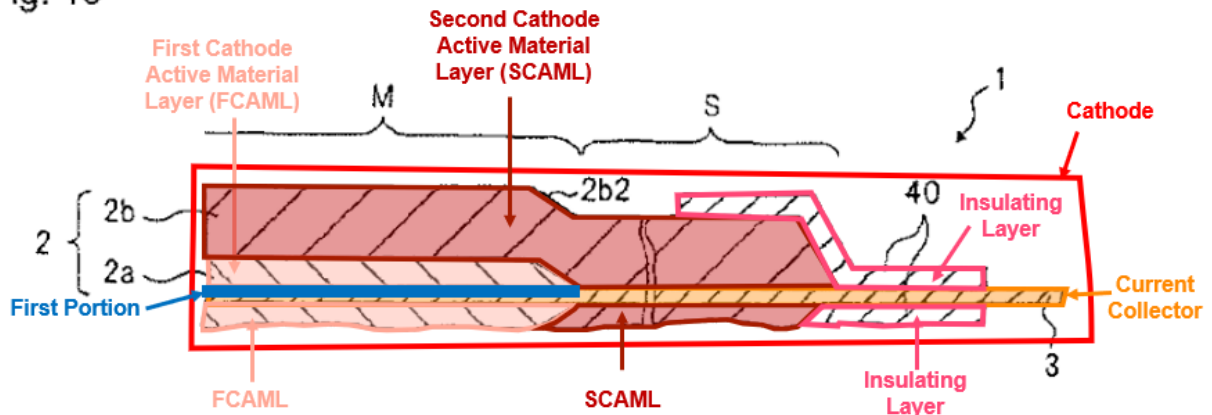
EX1005, FIG. 2 (annotated); EX1003, ¶83.

Fig. 3A



EX1005, FIG. 3A (annotated); EX1003, ¶83.

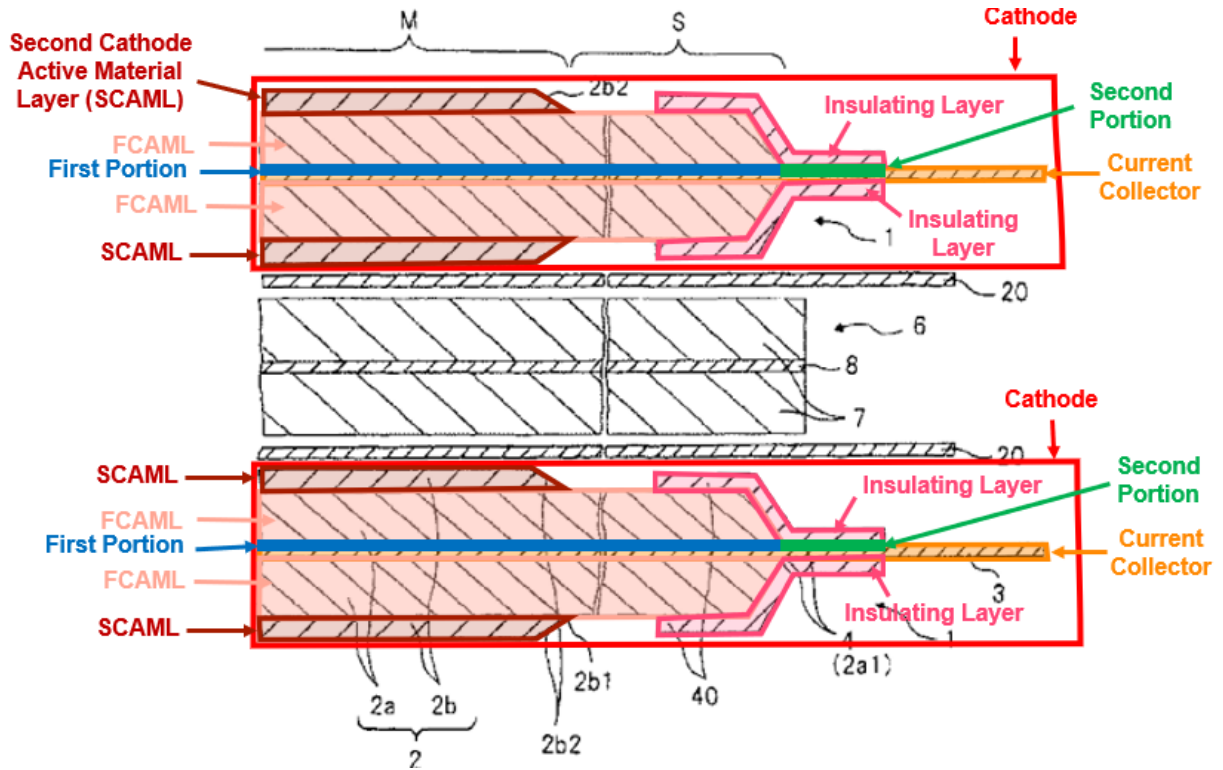
Fig. 10



EX1005, FIG. 10 (annotated); EX1003, ¶83.

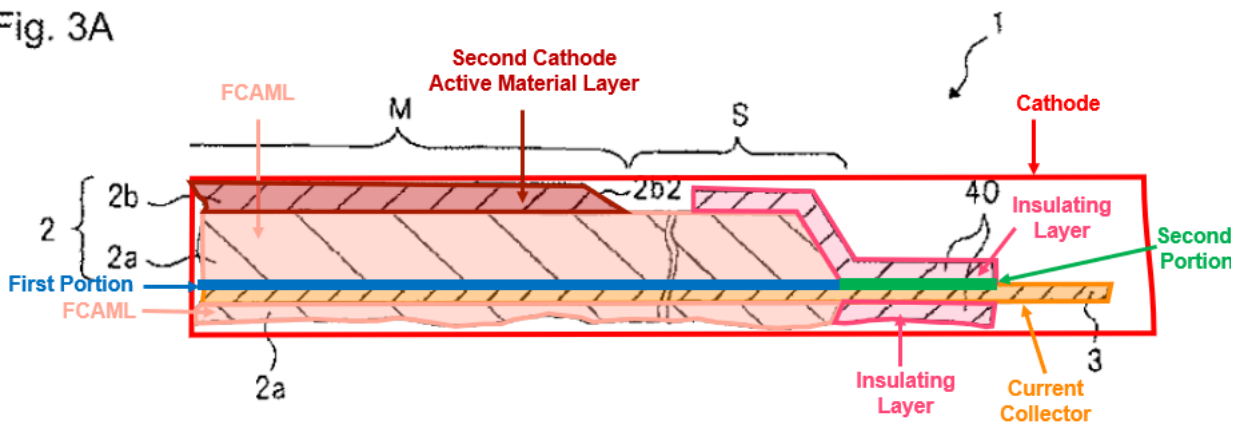
8. 1.F

Tanaka's insulating member 40 "is formed across both the non-applied part (positive electrode tab) and positive electrode active material 2 ... so as to cover border part 4." EX1005, [0036]. Thus, Tanaka's insulating member 40 extends onto the non-applied part (the claimed "second portion") that is not covered by the first cathode active material layer. *Id.*, [0051], FIGs. 2, 3A, 10; EX1003, ¶85.



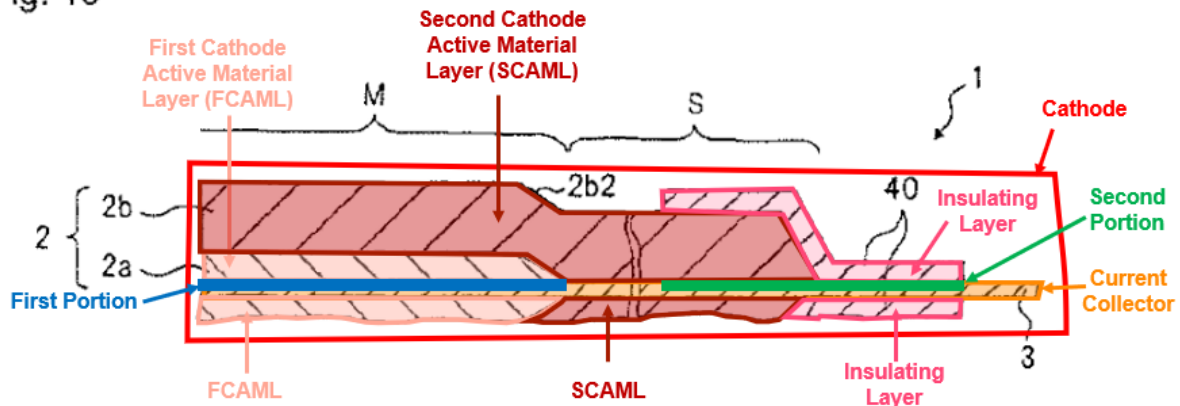
EX1005, FIG. 2 (annotated); EX1003, ¶85.

Fig. 3A



EX1005, FIG. 3A (annotated); EX1003, ¶85.

Fig. 10



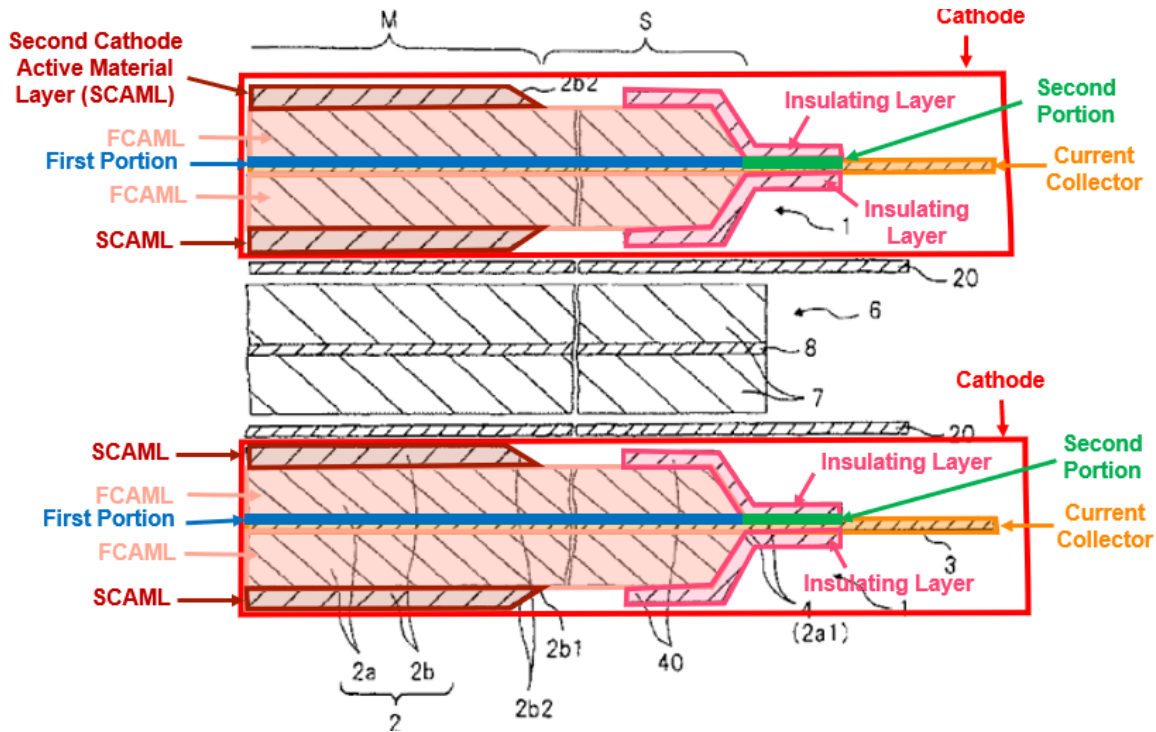
EX1005, FIG. 10 (annotated); EX1003, ¶85.

The portion of the surface of Tanaka’s positive electrode current collector 3 that is covered by the first active material layer 2a (the “first portion”) *is separated from* the portion of the positive electrode current collector 3 that is covered by insulating member 40. *See supra* EX1005, FIG. 10. EX1003, ¶86.

9. 1.G

Tanaka discloses this limitation in at least two different ways. EX1003, ¶87.

First, Tanaka at least inherently discloses this claim limitation by describing that first active material layer 2a “may slope” from its average thickness towards a thickness of zero at positive current collector 3. EX1005, [0051], FIG. 2; EX1003, ¶88.

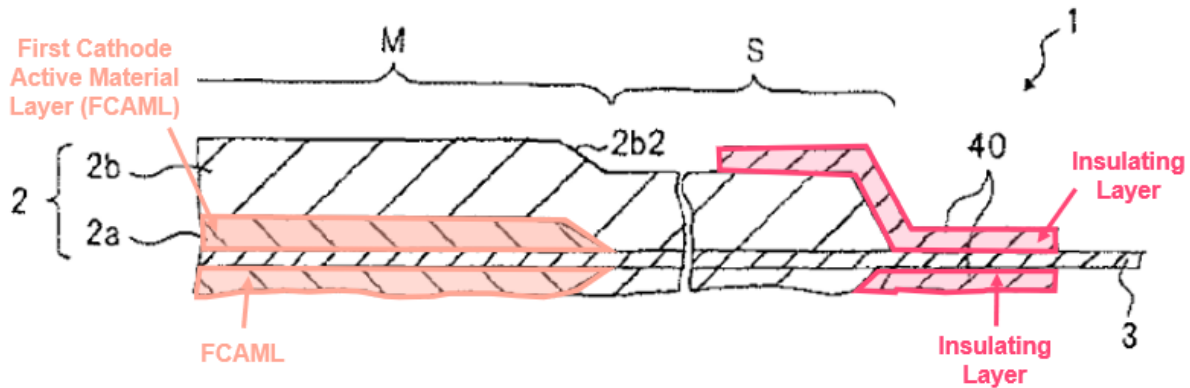


EX1005, FIG. 2 (annotated); EX1003, ¶88.

A POSA would understand that, because Tanaka's first active material layer 2a slopes towards zero thickness, there **must necessarily** be locations along that slope where the thickness of first active material layer 2a is less than the thickness of insulating member 40. EX1003, ¶89. Thus, Tanaka inherently discloses this limitation.

Second, Tanaka expressly discloses thickness ranges for insulating member 40 that encompass thicknesses greater than the thickness of first active material layer 2a. EX1003, ¶90. Tanaka describes that insulating member 40 may have a thickness of preferably “90% or less of the average thickness of multi-layer part M.” EX1005, [0051]. As one exemplary embodiment, Tanaka describes that “the

average thickness of first active material layer 2a is 0.04 mm” and “the average thickness of second active material layer 2b is 0.1 mm,” and insulating member 40 may have a thickness of 0.03 mm. *Id.*, [0071], [0073]-[0074], FIG. 10; EX1003, ¶¶90-91.



EX1005, FIG. 10 (annotated); EX1003, ¶91.

However, Tanaka’s insulating member 40 is not limited to the specific thickness of 0.03 mm disclosed in that embodiment. EX1003, ¶92. Instead, Tanaka describes that insulating member 40 may have a thickness falling within a broader range, namely less than or equal to 90% of the thickness of the multi-layer part M. EX1005, [0051]. Tanaka further discloses exemplary insulating member thicknesses of 20 μm and 40 μm confirming that insulating member 40 may be selected from a range of thicknesses rather than a single value. EX1005, [0065]; EX1003, ¶90.

Applying Tanaka’s express disclosure to the exemplary embodiment above, a POSA would understand that multi-layer part M has a thickness of 0.14 mm and

that insulating member 40 may therefore have a thickness up to 0.126 mm, or more preferably up to 0.084 mm. EX1003, ¶92. The expressly disclosed range of thicknesses for insulating member 40 therefore encompasses numerous thicknesses that are greater than the disclosed thickness of first active material layer 2a (0.04 mm). EX1003, ¶92; EX1005, [0071], [0073]-[0074]. Thus, Tanaka expressly discloses insulating member thicknesses that satisfy the claimed relationship while achieving the same benefits described by Tanaka. *See, e.g.*, EX1005, [0051]; EX1003, ¶92.

Accordingly, Tanaka expressly discloses an insulating member thickness that is greater than the thickness of first active material layer 2a and therefore also discloses this limitation. EX1003, ¶93.

B. Claim 2

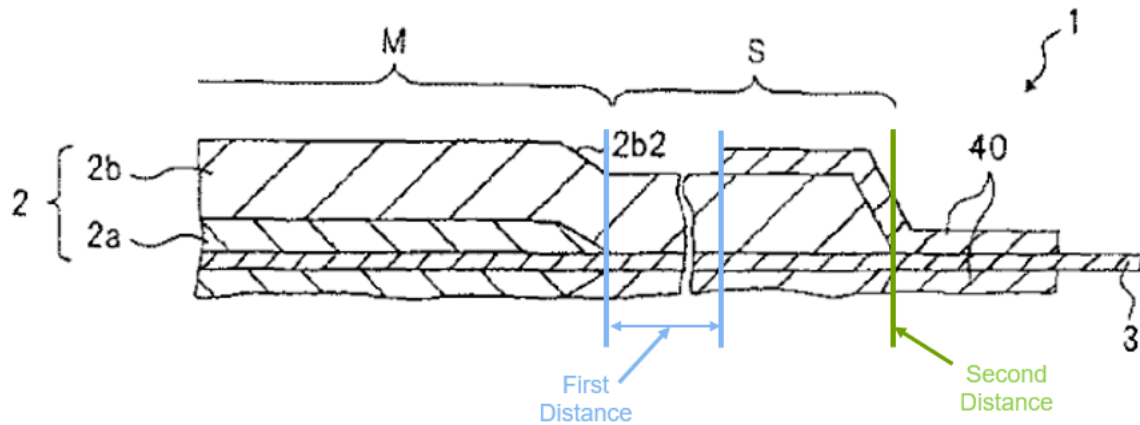
The claims and specification of the '769 patent allow for either, or both, of the first distance and the second distance to be zero. EX1001, 6:64-7:6 (“**the first distance and the second distance are respectively** greater than or **equal to 0** and the second distance is less than or equal to the first distance”). EX1003, ¶95.

Tanaka’s first and second active material layers 2a and 2b have termination positions that are “deviated in a planar direction” so that a part of second active material layer 2b extends beyond the end of first active material layer 2a. EX1005,

[0012], [0066], [0071], FIG. 10. By this description, the claimed first distance is therefore greater than zero. EX1003, ¶97.

Tanaka's single-layer part S, which is partially covered by insulating member 40, "may be configured by second active material layer 2b." EX1005, [0071]. As such, the distance between second active material layer 2b and insulating member 40 (the claimed "second distance") is zero, which overlaps the recited range. EX1003, ¶98. The first distance, which is greater than zero, is thus greater than the second distance, which is zero. *Id.*, ¶97.

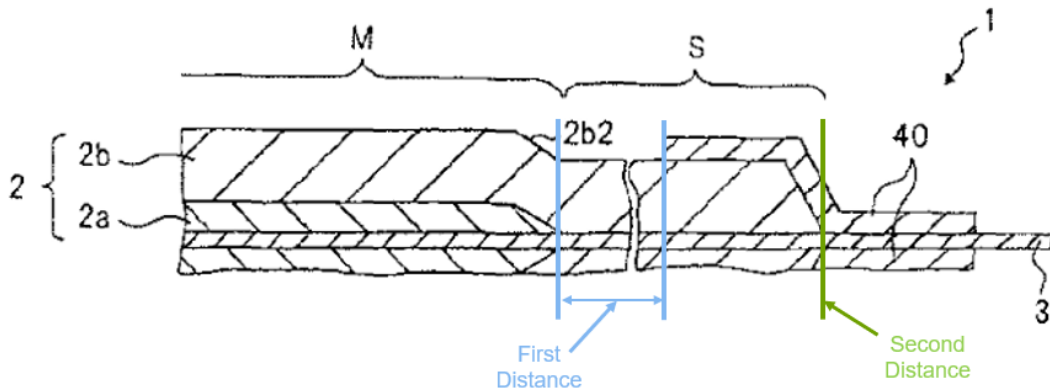
Tanaka also at least inherently discloses that the second distance is approximately zero and that the first distance is necessarily greater. EX1005, FIG. 10; EX1003, ¶99. As shown, the second distance (e.g., zero) is less than or equal to the first distance (e.g., greater than zero). EX1003, ¶100. It is a well-established principle of patent law that drawings that clearly show a claimed feature anticipate that feature. *See In re Bager*, 47 F.2d 951, 953 (CCPA 1931); *In re Mraz*, 455 F.2d 1069, 1072 (CCPA 1972); *In re Aslanian*, 590 F.2d 911, 914 (CCPA 1979). That is the case here, where Figure 10 of Tanaka clearly shows that the second distance (which is zero) **must necessarily** be smaller than the first distance (which is non-zero).



EX1005, FIG. 10 (annotated); EX1003, ¶99.

C. Claim 3

The distance between the termination of Tanaka’s first active material layer 2a and the termination of second active material layer 2b may be “0.5 to 5 mm, and more preferably, is 0.5 to 3 mm.” EX1005, [0066]. Tanaka’s insulating member 40 partially overlaps second active material layer 2b. EX1003, ¶101. Thus, the distance between the termination of first active material layer 2a and the end of insulating member 40 (the claimed “first distance”) will be greater than zero but less than the distance of “0.5 to 5 mm” disclosed by Tanaka. EX1005, [0066]; EX1003, ¶101. This range of distances is narrower than and overlaps, and therefore anticipates, the claimed range. *Id.*



EX1005, FIG. 10 (annotated); EX1003, ¶101.

D. Claim 4

Tanaka's second active material layer 2b is "positioned on the first active material layer" so that "the end part of the applied part of the second active material layer is positioned on the current collector beyond the end part of the applied part of the first active material layer." EX1005, [0012], [0066], [0071]; EX1003, ¶102. By being so disposed, Tanaka's second active material layer 2b completely covers the top surface of, and in fact extends beyond, first active material layer 2a. EX1003, ¶102.

E. Claim 5

Tanaka's active material layer 2 (including both layers 2a and 2b) may have a thickness of "about 5 to 200 μm ." EX1005, [0064]. Tanaka also describes that "the difference in thickness between multi-layer part M" (including both first and second active material layers) "and single-layer part S" (including only one of the first and second active material layers) may be "10 μm to 70 μm ." *Id.*, [0064]-

[0065]. Thus, the thickness of Tanaka's first active material layer 2a may be from less than 5 μm up to 70 μm . EX1003, ¶103. This range substantially overlaps, and therefore anticipates, the claimed range. *Id.*

F. Claim 6

Tanaka discloses that “as the active material composing positive electrode active material layer 2, for example ... **LiCoO₂**, **LiNiO₂**, **LiNi_(1-x)CoO₂**, **LiNi_x(CoAl)_(1-x)O₂**, **Li₂MO₃—LiMO₂** and **LiNi_{1/3}Co_{1/3}Mn_{1/3}O₂**, ... **LiMn₂O₄**, **LiMn_{1.5}Ni_{0.5}O₄** and **LiMn_(2-x)M_xO₄**, ... **LiMPO₄**, ... **Li₂MPO₄F** and **Li₂MSiO₄F**, and vanadium oxide materials such as **V₂O₅** can be used.” EX1005, [0040]. Tanaka also describes that “[t]he positive electrode active material mixture agent of first active material layer 2a and the positive electrode active material mixture agent of second active material layer 2b ... may be different.” *Id.*, [0035]. Thus, Tanaka's first and second cathode active materials are each independently selected from the recited Markush group of materials. EX1003, ¶104.

G. Claim 7

Tanaka's “positive electrode active material layer 2” may be formed from an agent including “**a binding agent, a conductive assistant** and the like.” EX1005, [0042]. The binding agent may comprise “**polyvinylidene fluoride, polytetrafluoroethylene, carboxymethyl cellulose**, denatured acrylonitrile rubber particles.” *Id.*, [0042]. The conductive assistant may include “**carbon black**,

carbon fiber, graphite and the like.” *Id.* Thus, Tanaka discloses a binder and a conductive agent each selected from the respective Markush groups recited by claim 7. EX1003, ¶¶106-108.

H. Claim 8

Tanaka discloses that “[f]or insulating member 40 ... polyimide, glass fiber, polyester, **polypropylene**, or materials containing them can be used.” EX1005, [0048]. Thus, Tanaka discloses an insulating layer comprising a polymer selected from the Markush group recited by claim 8. EX1003, ¶109.

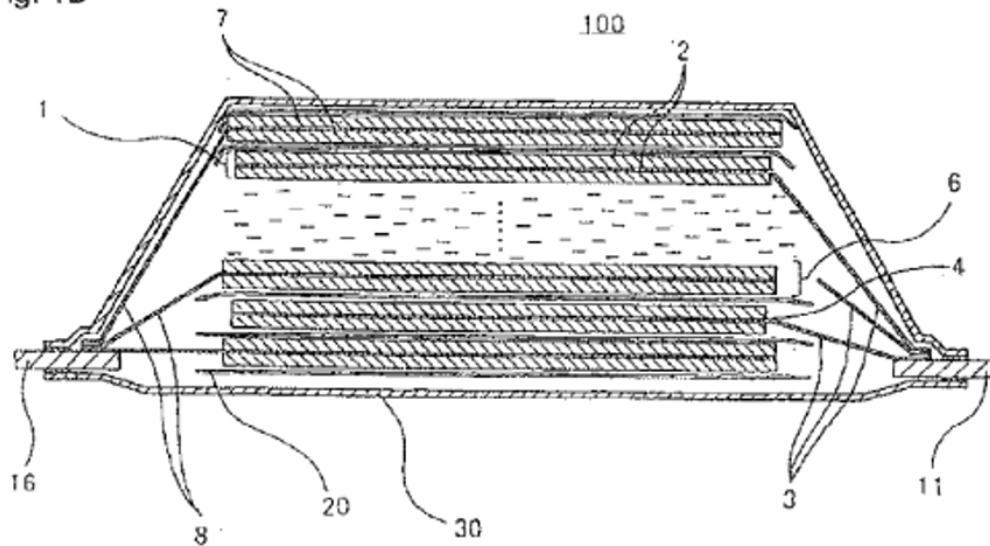
IX. GROUND 1B: CLAIMS 9-13 AND 15-18 ARE OBVIOUS OVER TANAKA.

A. Independent Claim 9

1. 9.P

Tanaka discloses a battery “in which positive electrodes ... and negative electrodes ... are alternately laminated with separator 20 interposed therebetween.” EX1005, [0030]-[0031], FIG. 1B; EX1003, ¶110. This is the same kind of electrochemical device used in the same context for the same purpose as that of the ’769 patent. EX1003, ¶111.

Fig. 1B

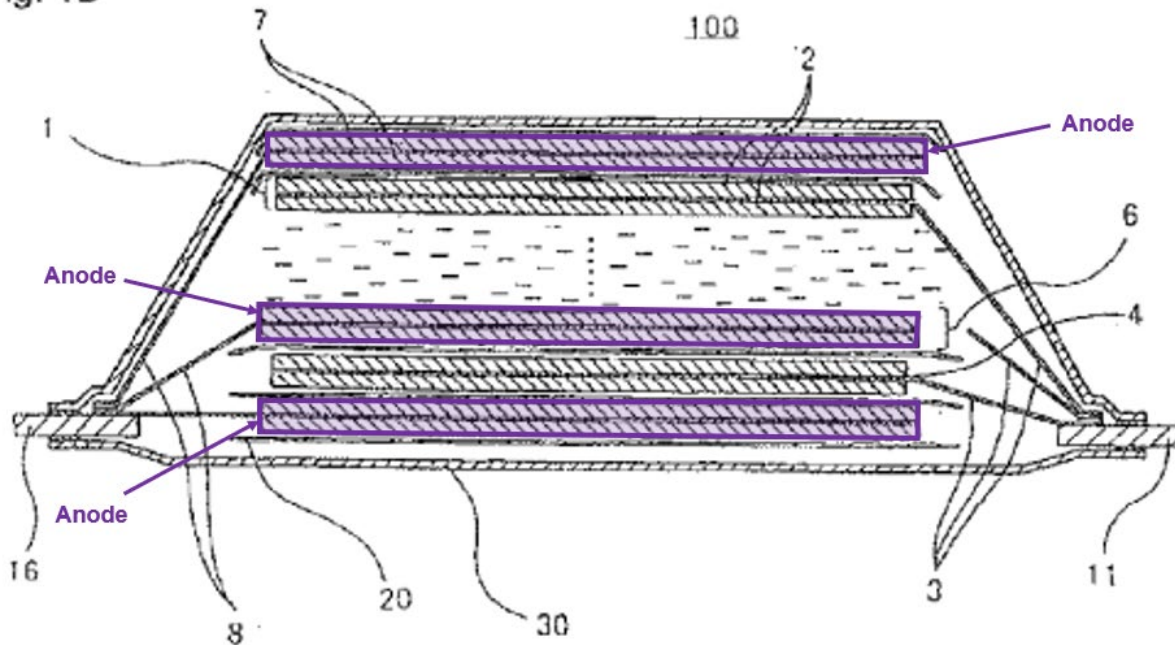


EX1005, FIG. 1B.

2. 9.A

Tanaka's battery includes "negative electrodes" that comprise a "negative electrode active material" (the claimed "anode"). EX1005, [0031], [0039], [0041], [0047], FIG. 1B; EX1003, ¶112. Tanaka's negative electrode 6 is the same as the recited anode. EX1003, ¶¶113-114.

Fig. 1B

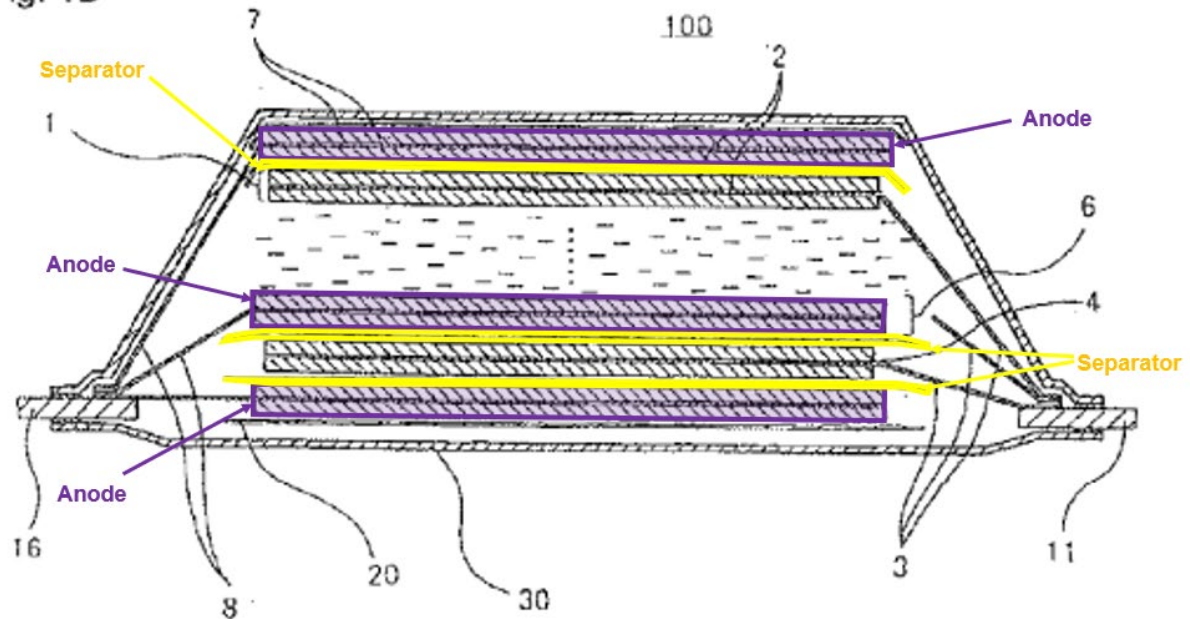


EX1005, FIG. 1B (annotated); EX1003, ¶112.

3. 9.B

Tanaka's battery includes "a separator" that is "mainly formed of a plastic porous membrane, woven fabric or non-woven fabric, or the like," for example "a polyolefin-based microporous member" to "provide[] excellent separation between the positive and negative electrodes" while also having "excellent ion permeability." EX1005, Abstract, [0045], FIG. 1B. Tanaka's separator 20 is the same as the recited separator. EX1003, ¶¶115-116.

Fig. 1B



EX1005, FIG. 1B (annotated); EX1003, ¶115.

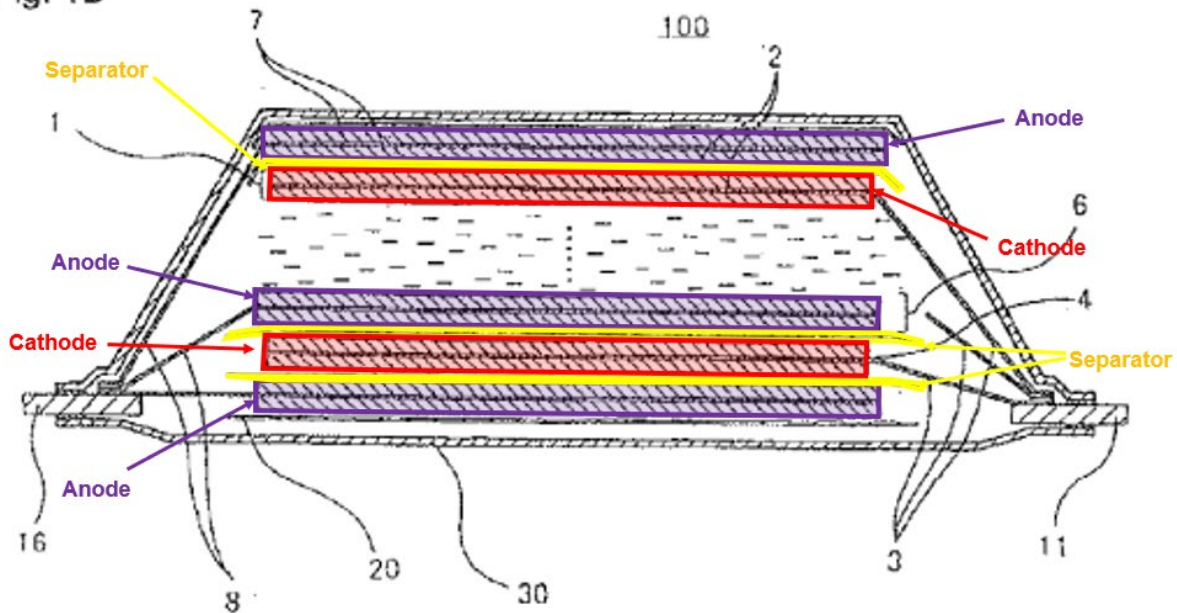
4. 9.C-9.J

Limitations 9.C-9.J recite a cathode having the same limitations as those of claim 1. Tanaka discloses all the limitations of claim 1. *Supra* § VIII.A. Tanaka discloses these limitations for the same reasons. EX1003, ¶¶117-125.

5. 9.K

Tanaka's separator 20 is disposed between the anode and the cathode as claimed. *Supra* § IX.A.B; EX1005, Abstract, [0054], FIG. 1B; EX1003, ¶¶126-127.

Fig. 1B



EX1005, FIG. 1B (annotated); EX1003, ¶126.

6. 9.L

a. Tanaka

Tanaka describes a “wound”-type electrode assembly structure as one of two well-known possibilities in the art. EX1005, [0003]-[0004]. Tanaka explains “[t]he secondary battery can be roughly classified into a wound type and a laminated type,” where the difference is whether the electrode sheets “are wound multiple times” or “laminated alternately and repeatedly.” *Id.*, [0003]. In either case, “the battery electrode assembly is contained in a sealed outer container” with terminals that lead out of the outer container. *Id.*, [0004].

b. Obviousness Rationale

It would have been obvious to a POSA to modify Tanaka to have a wound-type structure. EX1003, ¶129. Tanaka's teachings are not limited to the case of a laminated-type structure. *Id.* And a wound-type structure is obvious to try as one of two classes of batteries discussed by Tanaka. *Id.*

A POSA would have known that such a wound-type structure is an alternative arrangement to the laminated-type structure explicitly taught by Tanaka. EX1003, ¶130. Thus, a POSA would have been capable of and motivated to rearrange Tanaka's electrode assembly as a wound electrode assembly because it was a well-known alternative to a laminated electrode assembly. *Id.* And a POSA would have had a reasonable expectation of success in modifying Tanaka to arrange Tanaka's electrodes and separator into a wound electrode assembly because a wound electrode assembly was a well-known alternative to the stacked electrode assembly that is explicitly described by Tanaka. *Id.*, ¶¶44, 130.

B. Claim 10

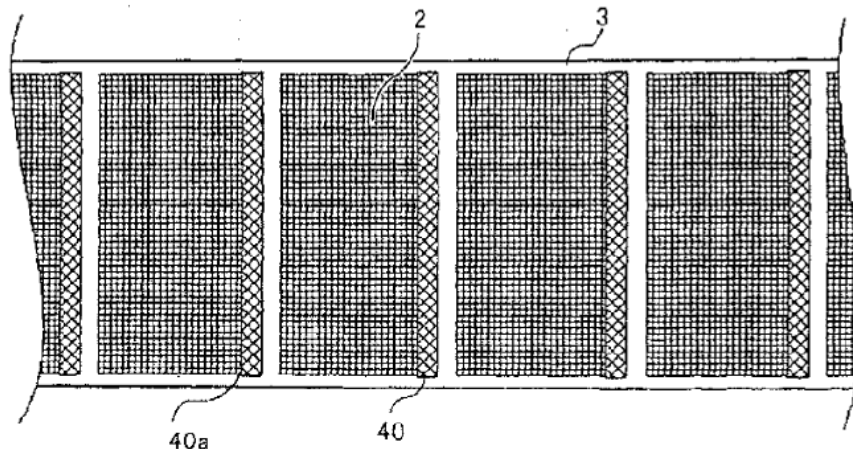
Claim 10 recites the same limitations as claim 2. Tanaka discloses all the limitations of claim 2. *Supra* § VIII.B. Tanaka discloses these limitations for the same reasons. EX1003, ¶131.

C. Claim 11

Figures 5 and 6 of Tanaka show that the positive electrode current collector is "divided along cutting lines 90 shown by broken lines in FIG. 6A." EX1005,

[0051]. Therefore, insulating member 40, and thus the first distance and the second distance, are all disposed at a corner of the resulting electrode assembly. EX1003, ¶132.

Fig. 5



EX1005, FIG. 5; EX1003, ¶132.

Fig. 6A

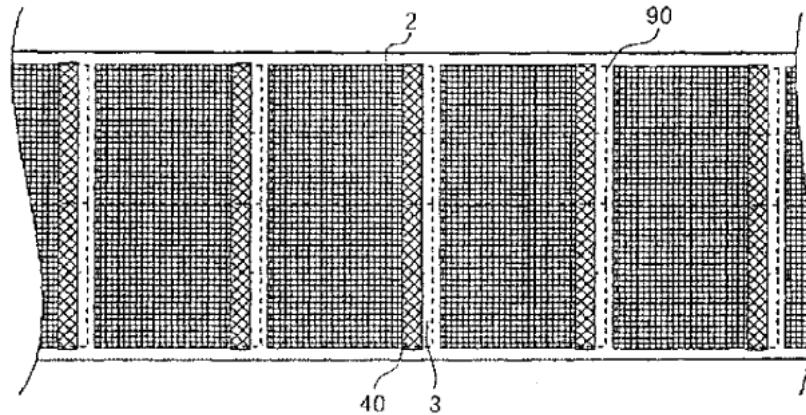
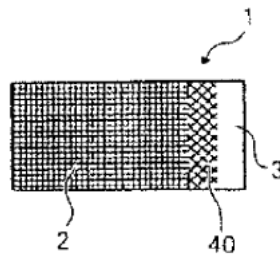


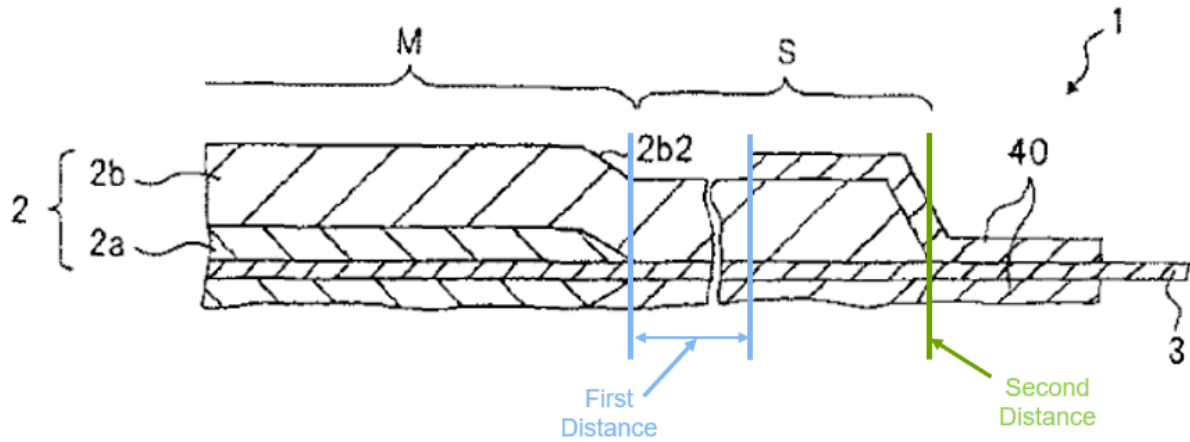
Fig. 6B



EX1005, FIGs. 6A, 6B; EX1003, ¶132.

D. Claim 12

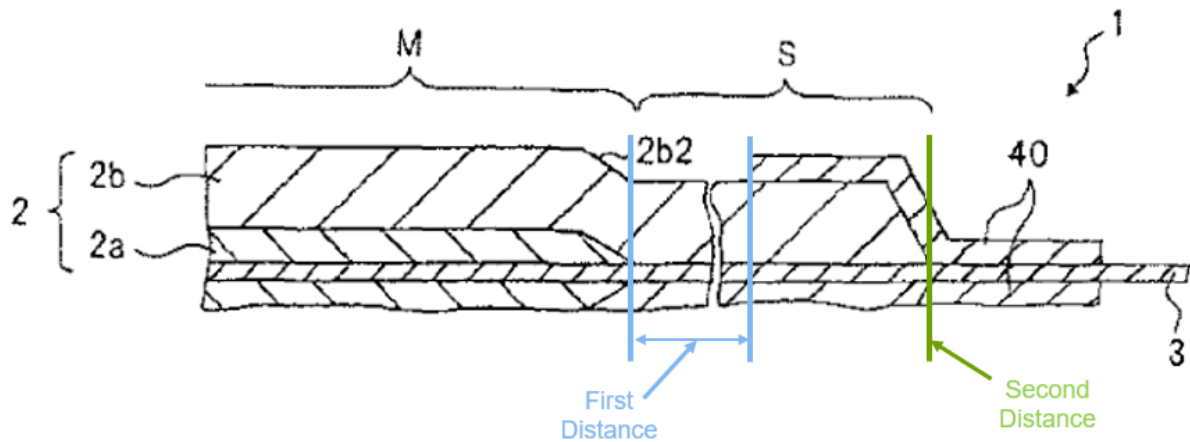
Tanaka discloses a first distance between the termination end of first cathode active layer 2a and insulating member 40. *Supra* § VIII.B. The separation between the termination part of first active material layer 2a and the end of insulating member 40 (see below) is less than the length of the single-layer region S that Tanaka describes as being 0.5-5 mm, and preferably less than 0.5-3 mm. *Id.* Logically, this distance must be less than any distance $\pi/4 D + 4$ mm, which must be greater than at least 4 mm. EX1003, ¶133.



EX1005, FIG. 10 (annotated); EX1003, ¶133.

E. Claim 13

Tanaka discloses a second distance between the termination end of second cathode active layer 2b and insulating member 40 that may be 0 mm. *Supra* § VIII.B; EX1003, ¶134.



EX1005, FIG. 10 (annotated); EX1003, ¶134.

F. Independent Claim 15

1. 15.P

Tanaka discloses that the electrochemical device may be used to power various electronic devices, such as “a portable electronic device, an electric bicycle, an electric assist bicycle, a stationary charger, an electric vehicle, a hybrid vehicle or the like.” EX1005, [0064]; EX1003, ¶135.

2. 15.A-15.M

Limitations 15.A-15.M recite an electrochemical device having the same limitations as those of claim 9. Tanaka discloses all the limitations of claim 9. *Supra* § IX.A. Tanaka discloses these limitations for the same reasons. EX1003, ¶¶136-149.

G. Claim 16

Claim 16 recites the same limitations as those of claim 2. Tanaka discloses all the limitations of claim 2. *Supra* § VIII.B. Tanaka discloses these limitations for the same reasons. EX1003, ¶150.

H. Claim 17

Claim 17 recites the same limitation as that of claim 11. Tanaka discloses the limitation of claim 11. *Supra* § IX.C. Tanaka discloses this limitation for the same reasons. EX1003, ¶151.

I. Claim 18

Claim 18 recites the same limitations as those of claims 12 and 13. Tanaka discloses all the limitations of claims 12 and 13. *Supra* §§ IX.D, IX.E. Tanaka discloses these limitations for the same reasons. EX1003, ¶152.

X. GROUND 1C: CLAIMS 8-13 AND 15-18 ARE OBVIOUS IN VIEW OF TANAKA AND YAMAFUKU.

A. Obviousness Rationale

A POSA would have been motivated to modify Tanaka to adopt a wound electrode assembly as explicitly taught by Yamafuku. EX1003, ¶¶153-160. This is because doing so would have yielded predictable and well-known advantages in manufacturability, energy density, and mechanical robustness. *Id.*

Like Tanaka and the '769 patent, Yamafuku describes the structure of a cathode used in a wound-type electrode assembly of a lithium-ion battery. EX1006, [0002], [0004], [0043], [0059]; EX1003, ¶154. Like Tanaka, Yamafuku acknowledges that a wound-type assembly is one of two well-known form factors, the other being a stacked assembly. *See* EX1006, [0202]; EX1003, ¶158. Yamafuku's wound-type assembly is therefore compatible with Tanaka's assembly that includes an anode, a cathode, and a separator. EX1003, ¶158.

Tanaka expressly or inherently discloses or suggests all the limitations of claims 1-13 and 15-18. *Supra* §§ VIII, IX. Yamafuku makes more explicit the wound-type assembly recited by independent claims 9 and 15. EX1003, ¶158.

Yamafuku teaches a wound-type electrode formed of overlapping sheet-like positive and negative electrodes with a separator between. EX1006, [0058]-[0059]. Unlike in Tanaka's stacked structure, where the cathode and anode are cut to form sheets for laminating, Yamafuku winds the sheet-like electrodes without cutting them. EX1006, [0074], [0202]; EX1003, ¶158. A POSA would have known that a wound assembly may be more practical for use in powering larger devices, such as "for a vehicle such as an automobile and a motorcycle, a variety of equipment such as a portable terminal and a notebook personal computer." EX1006, [0003]; EX1003, ¶158.

Tanaka and Yamafuku each apply similar cathode active materials onto a cathode current collector by mixing the active material into a solvent, which is subsequently evaporated. EX1003, ¶159. Thus, Tanaka's production methods (except for cutting the electrodes into sheets) could readily be implemented in Yamafuku's wound-type electrode. EX1003, ¶159.

In Tanaka-Yamafuku, the electrode assembly would comprise positive and negative electrodes stacked together with a separator therebetween and wound into a prismatic or cylindrical form factor. EX1003, ¶160. A POSA would have known that such a wound-type electrode assembly would be desirable for certain applications, such as for a vehicle or a larger electronic device. *Id.* Thus, a POSA

would have found it obvious to modify Tanaka in view of Yamafuku to arrive at a wound-type electrode assembly. *Id.*

And a POSA would have had a reasonable expectation of success in modifying Tanaka in view of Yamafuku by arranging Tanaka's electrodes and separator to create a wound electrode assembly, EX1003, ¶160, because a wound electrode assembly was a well-known alternative to the stacked electrode assembly that is explicitly described by Tanaka. *Id.*, ¶¶44, 160.

B. Claim 8

1. Tanaka

Tanaka discloses claim 8 for the same reasons as those discussed above. *Supra* § VIII.H. To the extent Tanaka does not explicitly describe an insulating layer comprising inorganic particles, Yamafuku does. EX1003, ¶¶162-165.

2. Yamafuku

Like Tanaka, Yamafuku teaches an electrode assembly having “an insulating layer arranged on the current collecting substrate.” EX1006, Abstract; EX1003, ¶162. Yamafuku's insulating layer “contains an insulating material and a third binder.” EX1006, Abstract. The insulating material “include[s] inorganic particles and a resin,” where the inorganic particles may constitute “particles made from iron oxide, SiO₂, Al₂O₃, TiO₂, BaTiO₂, ZrO, an alumina-silica composite oxide, and the like.” *Id.*, [0127]-[0129]. The third binder may be an aqueous binder of “polyethylene oxide (polyethylene glycol), polypropylene oxide (polypropylene

glycol), polyvinyl alcohol, polyacrylic acid, polymethacrylic acid, polytetrafluoroethylene (PTFE), a styrene butadiene rubber (SBR), polyolefin, a nitrile-butadiene rubber and cellulose, and more.” *Id.*, [0067]. Thus, Yamafuku teaches using an insulating layer comprising *both* inorganic particles (e.g., “inorganic particles” of silicon oxide) *and* a polymer (e.g., polyethylene, polypropylene, etc.). EX1003, ¶162.

3. *KSR*

Yamafuku and Tanaka describe the use of similar materials for an insulating member. EX1003, ¶163. Yamafuku teaches a polyolefin binder material and inorganic particles. EX1006, [0011], [0210]. Similarly, Tanaka describes using a polyolefin (e.g., polypropylene) to form insulating member 40. EX1005, [0048]; EX1003, ¶163.

However, Tanaka also broadly describes that “polyimide, glass fiber, polyester, polypropylene, **or materials containing them** can be used.” EX1005, [0048]. Tanaka thus explicitly invites a POSA to use other materials that comprise a polymer like polyethylene *as well as other components*, and a POSA would have looked to a reference such as Yamafuku to learn what kinds of other polymers and other components would be useful in this application. EX1003, ¶164.

In these devices, Yamafuku teaches enhancing “the insulation properties” of “an insulating layer on one electrode” of the electrode assembly to avoid a short

circuit due to shrinkage of the separator. EX1006, [0008]-[0009]; EX1003, ¶165.

To this end, Yamafuku incorporates inorganic particles into the insulating layer.

See, e.g., EX1006, [0049]; EX1003, ¶165. Thus, a POSA would have been motivated to modify Tanaka's insulating member 40 to include the binder and inorganic particles taught by Yamafuku. EX1003, ¶165.

C. Independent Claim 9

1. [9.P]-[9.K]

Tanaka discloses elements 9.P-9.K. *Supra* § IX.A. EX1003, ¶166.

2. [9.L]

Tanaka discloses or at least suggests this claim limitation. *Supra* § IX.A.6.

To the extent Tanaka does not specify whether this embodiment can be arranged in a wound-type structure rather than a laminated structure, and Tanaka does not provide any details for wound embodiments, a POSA would look to a reference like Yamafuku to learn whether and how Tanaka's laminated embodiment can be provided according to Tanaka's disclosure of a wound-type structure. EX1003, ¶167.

Yamafuku describes forming sheet-like positive and negative electrodes, with a separator disposed between, "in a belt-like shape" and then winding them into an electrode assembly. EX1006, Abstract, [0074]-[0075]. EX1003, ¶168.

Yamafuku explains that wound and stacked configurations are alternative implementations, and that a wound configuration may be desirable for certain

applications. EX1006, [0003], [0202]; EX1003, ¶169. For these reasons, and for the reasons in § IX.A *supra*, a POSA would have found it obvious to modify Tanaka in view of Yamafuku to arrive at a wound-type assembly. EX1003, ¶169.

D. Claims 10-13

Tanaka discloses these claims for the same reasons as discussed above.

Supra §§ IX.B-IX.E; EX1003, ¶¶170-173.

E. Independent Claim 15

1. [15.P]-[15.L]

Tanaka discloses elements 15.P-15.K. *Supra* § IX.F. EX1003, ¶174.

2. [15.M]

Tanaka discloses or at least suggests this claim limitation. *Supra* §§ IX.F.2, IX.A.6. Tanaka-Yamafuku renders obvious this limitation for the same reasons as above. *Supra* § X.C.2. EX1003, ¶175.

F. Claims 16-18

Tanaka discloses these claims for the same reasons as above. *Supra* §§ IX.G-IX.I. EX1003, ¶¶176-178.

XI. GROUND 1D: CLAIMS 11 AND 17 ARE OBVIOUS IN VIEW OF TANAKA, YAMAFUKU, AND LI.

A. Obviousness Rationale

A POSA would have been motivated to modify the electrode assembly of Tanaka-Yamafuku further in view of Li. EX1003, ¶179. This is because Li

identifies a particular problem with the wound electrode structure of Tanaka-Yamafuku and describes a specific solution to that problem. *Id.*

Similar to Tanaka, Yamafuku, and the '769 patent, Li is directed towards a “lithium-ion battery” formed by winding “a positive electrode, a negative electrode, and a separator.” EX1009, [0008], [0051]; EX1003, ¶180.

Tanaka-Yamafuku teaches a wound-type assembly of positive and negative electrodes with a separator. EX1003, ¶181. To the extent Tanaka-Yamafuku does not explicitly describe forming the first distance and the second distance at a corner of the electrode assembly, Li does.

Li recognizes a specific problem with deformation of and the formation of dendritic fragments in wound-type, lithium-ion battery electrode assemblies. EX1003, ¶182. For this reason, Li describes forming an insulating “protective layer” on the uncoated region of the positive current collector. EX1009, [0017], FIG. 3; EX1003, ¶182.

Li’s “protective layer” is analogous to Tanaka’s insulating member 40. EX1003, ¶183. For example, both may be formed in the same uncoated area on a current collector. *Id.* Both may comprise a polyimide insulating resin. *Id.* And both may be formed in similar ways. *Id.* Thus, the teachings of Li’s protective layer 14 would be directly applicable to Tanaka’s insulating member 40. *Id.*

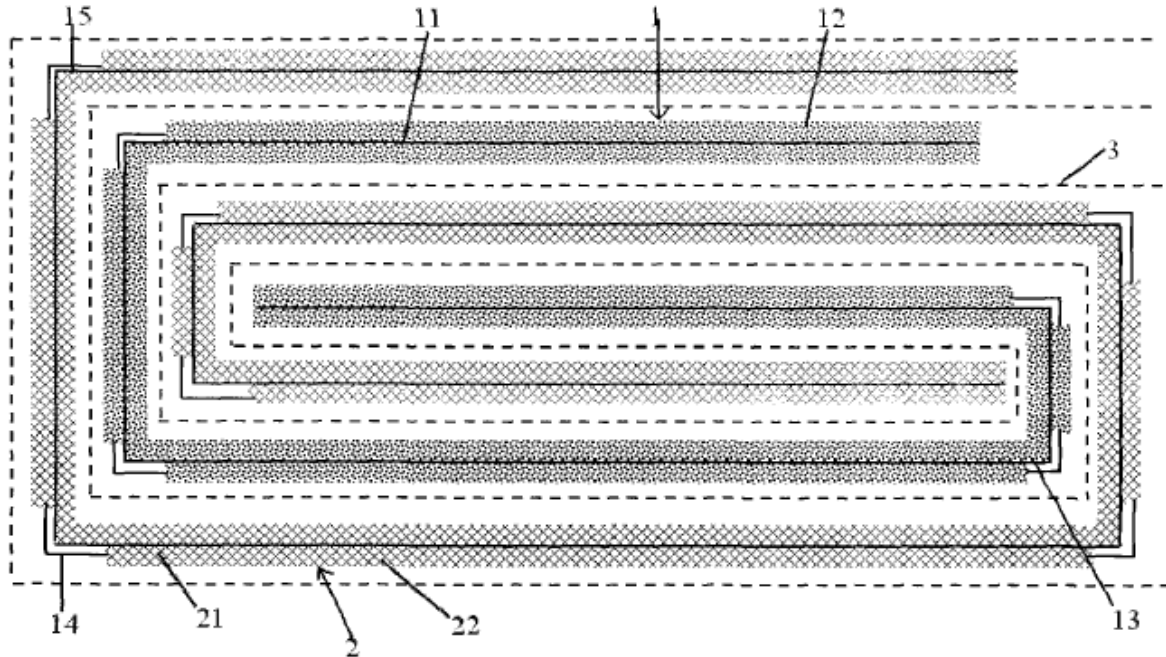
In the resulting combination of Tanaka-Yamafuku-Li, Tanaka's insulating member 40 would be disposed on non-applied regions of the cathode collector that form the "corner" regions of the resulting electrode assembly. EX1003, ¶184. This could be accomplished by adjusting the widths of Tanaka's applied regions and, instead of cutting the electrode into individual layers at cutting lines 90, simply winding the electrode to form corners at the cutting lines. *Id.* A POSA, having the knowledge of Li, which published years prior to Tanaka and Yamafuku, would have been motivated to modify Tanaka-Yamafuku to having an insulating layer (and thus the first distance and the second distance) at the corner of the electrode assembly, as explicitly taught by Li. *Id.*

A POSA would have had a reasonable expectation of success in modifying Tanaka-Yamafuku further in view of Li to adjust the spacing of the cathode active material and insulating layers to have the insulating layer disposed at the corners of the assembly, EX1003, ¶184, because such a configuration would avoid the deformation and dendritic fragment problems that Li had identified years earlier. *Id.*

B. Claim 11

Li describes "a positive electrode, a negative electrode, a separator, and an electrolyte solution" that are wound into a prismatic cell. EX1009, Abstract,

[0008]. An insulating protective layer 14 is formed in “the corner region[s] 13 of the positive electrode.” *Id.*, [0017]-[0019], [0031], [0035], FIG. 3; EX1003, ¶186.



EX1009, FIG. 3.

The positioning of such an insulating protective layer avoids deformation caused by “non-uniform stress distribution” throughout the battery while also avoiding the formation of “dendritic metal fragments” in the cathode collector.

EX1009, [0008]-[0009], [0016]-[0017]. Thus, a POSA would have been motivated to adjust the positioning of the insulating member in Tanaka-Yamafuku to be formed in the corners of the electrode assembly, as explicitly taught by Li, to avoid deformation of the electrode assembly and formation of dendritic particles.

EX1003, ¶187.

C. Claim 17

Tanaka-Yamafuku-Li teaches this claim element for the same reasons as for claim 11. *Supra* § XI.B. EX1003, ¶188.

XII. GROUND 1E: CLAIMS 14 AND 19 ARE OBVIOUS IN VIEW OF TANAKA, YAMAFUKU, AND KAPLAN.

A. Obviousness Rationale

A POSA would have been motivated to modify the electrode assembly of Tanaka-Yamafuku further in view of Kaplan. EX1003, ¶189. This is because Kaplan describes a wound electrode assembly formatted as a prismatic cell that may be useful in many electronic devices. *Id.*

Kaplan, like Tanaka, Yamafuku, and the '769 patent, is directed towards “secondary lithium batteries, and in particular to lithium prismatic cells” that comprise “a prismatic-shaped housing that houses an anode, a cathode ... and a separator between the anode and the cathode” that are “wound” “to increase the surface area.” EX1010, [0001], [0007], [0038]; EX1003, ¶190.

Tanaka-Yamafuku teaches a wound-type electrode assembly. *Supra* § X.A. To the extent that Tanaka and Yamafuku do not explicitly describe an electrode assembly having a thickness D that is from about 1.5 mm to about 50 mm, Kaplan does. EX1003, ¶191.

Kaplan describes “prismatic cell type Li-ion secondary batteries” that “have desirable properties for use in digital cameras and other applications.” EX1010,

[0007]. Kaplan specifically defines such a “prismatic cell” as having “at least four generally flat sides, and [having] one dimension (e.g., thickness) that is substantially smaller than two other dimensions (e.g., length and width).” *Id.*, [0015]. A “prismatic cell” that is “desirable” “for use in digital cameras” and other electronic devices may “have a thickness of between about 2 mm and about 15 mm (e.g., between about 4 mm and about 10 mm).” *Id.*

Kaplan’s “prismatic cell” is analogous to Tanaka-Yamafuku. EX1003, ¶194. Each is a wound-type electrode assembly used to power portable electronic devices and includes a similar cathode, anode, and separator. *Id.* Thus, a POSA would have understood that the electrode assembly of Tanaka-Yamafuku could be configured into the “prismatic cell” form factor described in Kaplan. *Id.*

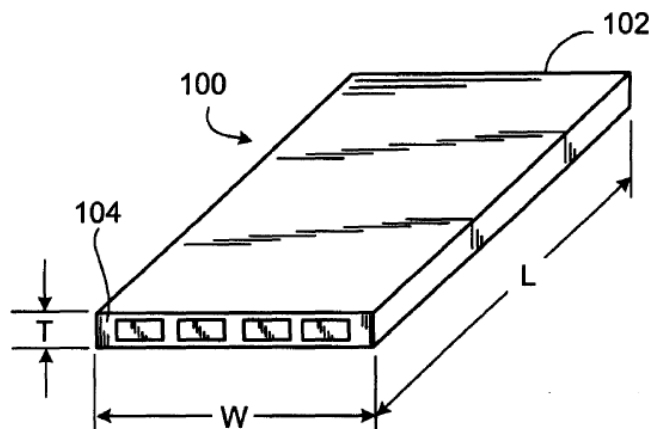
In Tanaka-Yamafuku-Kaplan, the wound assembly would be configured into a prismatic cell having “at least four generally flat sides” with a thickness that “is substantially smaller than two other dimensions.” EX1010, [0015]; EX1003, ¶195. As taught by Kaplan, the resulting assembly would be configured to “have a thickness of between about 2 mm and about 15 mm (e.g., between about 4 mm and about 10 mm).” EX1010, [0015]. This configuration would enable the electrode assembly to be used in, for example, “digital cameras” as well as “cell phones, MP3 players, and personal digital assistants (PDA’s).” EX1010, [0005], [0007]; EX1003, ¶195. And to the extent that Kaplan may not have foreseen the impending

ubiquity of cell phones, a POSA at the time of Tanaka and Yamafuku, which published in 2016 and 2015, respectively, certainly would have. EX1003, ¶195.

And a POSA would have had a reasonable expectation of success in modifying Tanaka-Yamafuku further in view of Kaplan to configure the wound electrode assembly of Tanaka-Yamafuku into the dimensions of a prismatic cell, EX1003, ¶195, because such a configuration would allow the resulting battery to be used to power a wide range of electronic devices including cell phones. *Id.*

B. Claim 14

Kaplan describes “a prismatic lithium ion” having “at least four generally flat sides, and [have] one dimension (e.g., thickness) that is substantially smaller than two other dimensions (e.g., length and width).” EX1010, [0015]. Kaplan’s “prismatic cell” has “a thickness of between about 2 mm and about 15 mm (e.g., between about 4 mm and about 10 mm).” *Id.* EX1003, ¶197.



EX1010, FIG. 1B.

Kaplan's "prismatic cell" is analogous to Tanaka-Yamafuku. EX1003, ¶198.

A POSA would have been motivated to modify Tanaka-Yamafuku further in view of Kaplan to provide an electrode assembly with a form factor that could be used in various portable electronic devices, such as a digital camera, cell phone, MP3 player, or PDA. *Id.*

C. Claim 19

Tanaka-Yamafuku-Kaplan teaches this limitation for the same reasons as claim 14. *Supra* § XII.B. EX1003, ¶199.

XIII. GROUND 2A: CLAIMS 1-10, 12, 13, 15, 16, AND 18 ARE OBVIOUS IN VIEW OF KIM AND SIKHA.

A. Obviousness Rationale

Kim and Sikha are in the same field of endeavor as each other and the problem addressed by the '769 patent. The '769 patent is broadly directed towards "the field of electrochemical devices, and more particularly, to a cathode and a lithium-ion battery." EX1001, 1:17-19. Kim discloses "an electrode assembly and a secondary battery." EX1007, 1:14-19, 2:37-39. Likewise, Sikha describes "high-capacity energy storage devices" (e.g., "lithium-ion batteries"). EX1008, [0002], [0009], [0010]. EX1003, ¶200.

1. Kim

Kim describes an "electrode assembly 10 [that] includes the positive electrode plate 20, the negative electrode plate 30, and the separator 40, which are

stacked and wound in a jelly-roll type electrode assembly.” EX1007, 3:50-53.

Kim’s positive electrode plate 20 includes “a positive electrode coating portion 22” formed as a slurry on the surface of “positive electrode collector 21,” thereby defining a coating portion and “a positive electrode non-coating portion 23.” *Id.*, 3:58-65. An “insulating member 26” having a thickness of “about 24 μm or more” “is adhered to the positive electrode noncoating portion 23” to be “spaced 3.5 mm or less apart from the end part of the positive electrode coating portion 22.” *Id.*, 6:50-52, 6:58-59. EX1003, ¶201.

Although Kim does not explicitly disclose that positive electrode coating portion 22 is formed to have a multi-layer structure, such a structure was well-known in the art well before even the earliest priority date of the ’769 patent. EX1003, ¶202. Such a multi-layer cathode structure was well-known to achieve “faster charging, higher capacity energy storage device[s].” EX1008, [0009]; EX1003, ¶202. Thus, a POSA would have sought references that explained how to provide such a multi-layer cathode structure in Kim’s electrode assembly. EX1003, ¶202. Sikha is such a reference. *Id.*

2. Sikha

Like Kim, Sikha describes a “cathode structure 103” for a lithium-ion battery that includes a first cathode material layer 210 formed over a current collector 113. EX1008, [0034], [0038]. Like Kim, Sikha’s cathode material layer

may be formed by applying a “slurry mixture comprising a cathodically active material” onto “current collector 113.” *Compare* EX1008, [0038], *with* EX1007, 6:11-20. However, Sikha then “form[s] a second cathode material layer 220” on first cathode material layer 210 by depositing “a second slurry mixture.” EX1008, [0053]. This second cathode material layer 220, like the first cathode material layer 210 below it, may “comprise cathodically active materials and at least one of a binder, electro-conductive material and a solvent.” *Id.*, [0053]. Sikha’s first and second cathode material layers may have various properties that vary from one another. *Id.*, [0059], [0061], [0063], [0064], [0067], [0068]. The two active material layers may also be “compressed to achieve a desired porosity.” *Id.*, [0060]. EX1003, ¶203.

Sikha describes specific advantages of using a multi-layer cathode structure, including thicker/denser electrodes, increased energy density, and reduced production costs; faster charging, higher capacity batteries; and improved performance. EX1003, ¶204. A POSA would have realized that these benefits could be realized in Kim’s electrode assembly simply by modifying Kim’s cathode structure to incorporate two cathode active material layers, as taught by Sikha. *Id.*

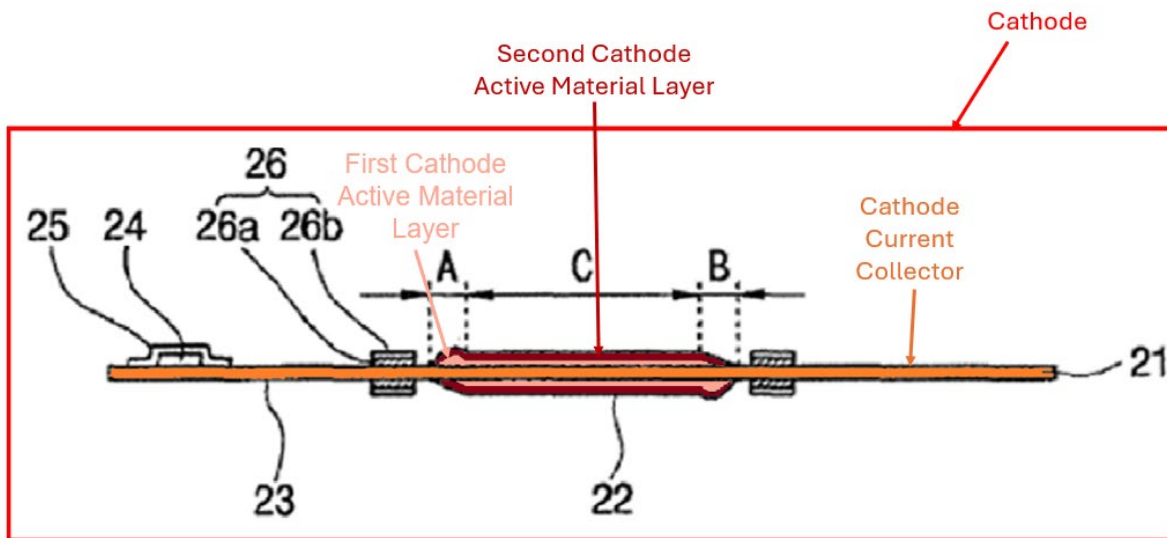
3. KSR

A POSA would have known that modifying Kim in view of Sikha would have involved only the routine application of known slurry deposition methods to

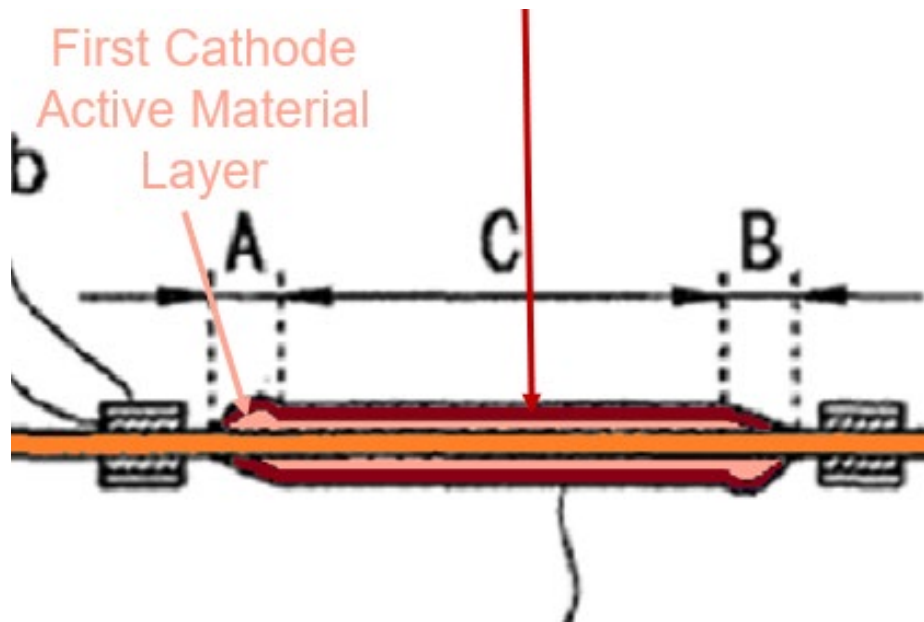
form Sikha's first and second cathode active layers on Kim's current collector.

EX1003, ¶205. This is because Sikha describes using a slurry-based deposition technique similar to that of Kim to form each of the cathode active material layers.

Id. The results of this combination are depicted in the below figures:



EX1007, FIG. 2B (annotated); EX1003, ¶205.



EX1007, FIG. 2B (annotated as above, abridged, and enlarged); EX1003, ¶205.

Given the similarity of the techniques described by Kim and Sikha, a POSA would not have encountered any unreasonable technical challenges in modifying Kim to include the multi-layer cathode structure taught by Sikha. EX1003, ¶206.

Modifying Kim in view of Sikha would have yielded the predictable result of a cathode structure for a lithium-ion battery having a second cathode active material layer disposed on a first cathode active material layer. EX1003, ¶207. A POSA would have known that such a multi-layer cathode structure would result in “faster charging,” “higher capacity,” “higher power,” and “longer cycle” lithium-ion batteries “that are smaller, lighter, and can be more cost effectively manufactured at a high production rate” than cathode single-layer lithium-ion batteries. *Id.*; EX1008, [0009], [0024]. Thus, a POSA would have found it obvious

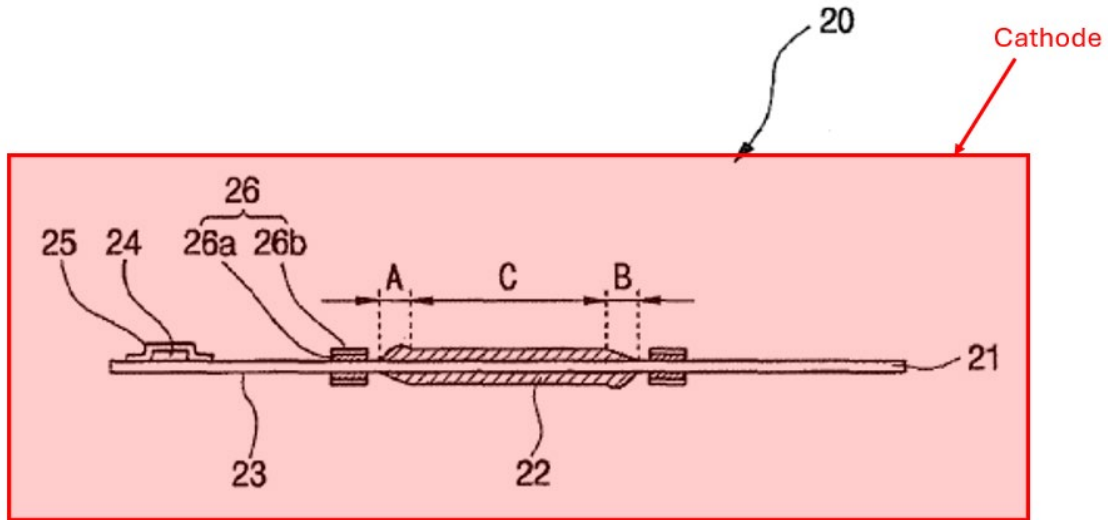
to modify Kim in view of Sikha to arrive at the claimed multi-layer cathode structure. EX1003, ¶207.

And a POSA would have had a reasonable expectation of success in modifying Kim in view of Sikha to provide Kim's cathode with the multi-layer cathode structure taught by Sikha by using the slurry deposition taught by each of Kim and Sikha. EX1003, ¶¶41, 205. This is because such a multi-layer cathode would have resulted in a battery with increased energy density. *Id.*, ¶¶40, 204.

B. Independent Claim 1

1. 1.P

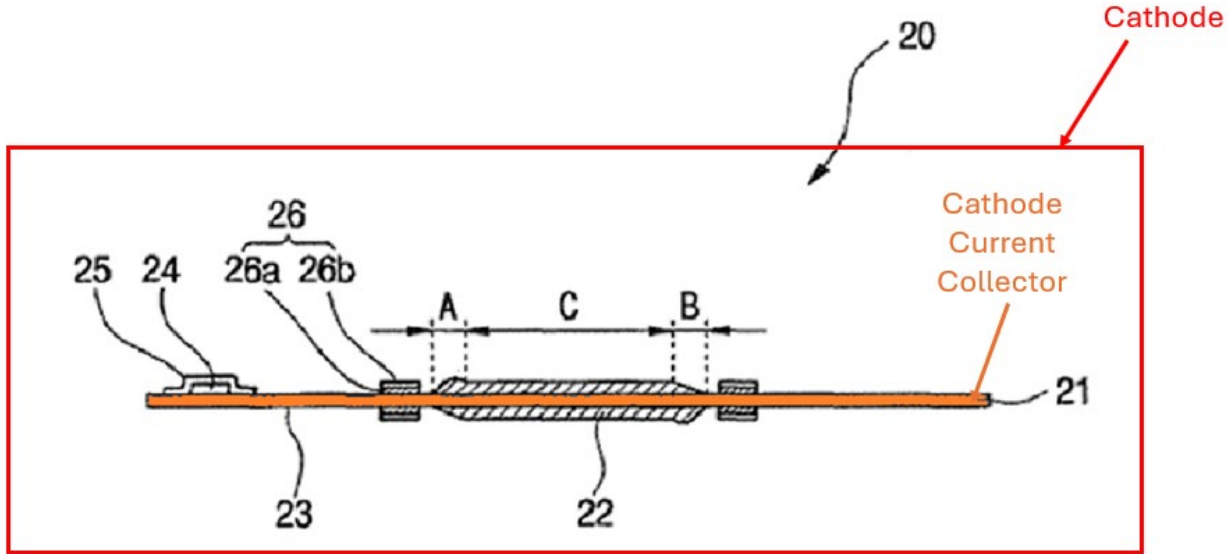
Kim discloses “an electrode assembly 10” including “a first electrode plate (hereinafter, referred to as a positive electrode plate) 20.” EX1007, 3:42-57, Abstract, 2:29-45, 5:65-6:6, 6:7-11, FIGs. 1, 2B. Kim's positive electrode is the recited “cathode.” EX1003, ¶208.



EX1007, FIG. 2B (annotated); EX1003, ¶208.

2. 1.A

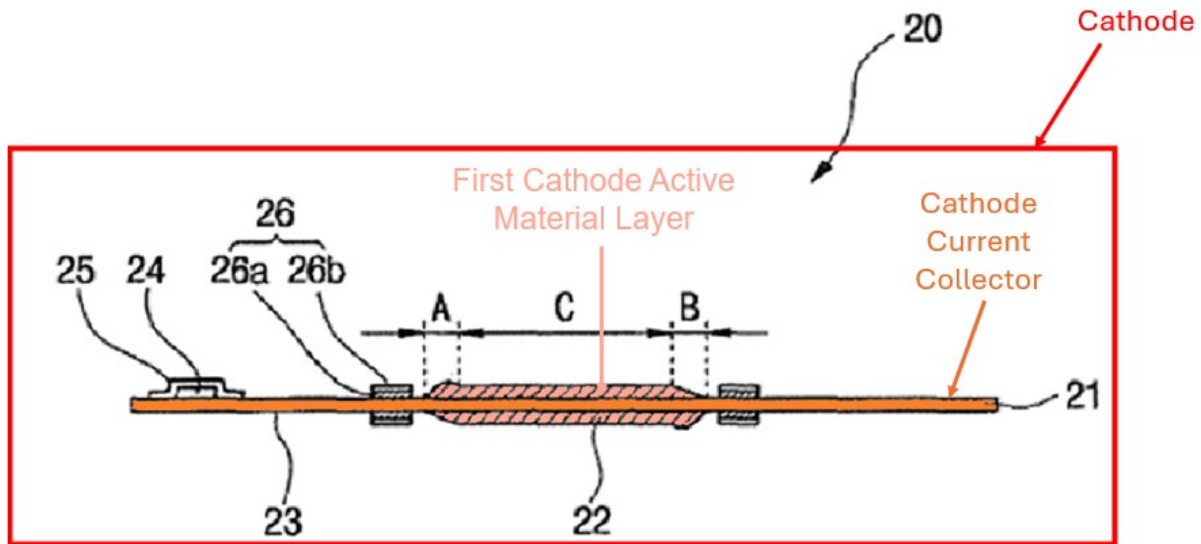
Kim's positive electrode plate 20 includes "a positive electrode collector 21" "formed of stainless steel, nickel, aluminum, titanium or an alloy thereof" and "formed to a thickness of 1 to 50 μm ." EX1007, 2:29-45, 4:3-14, FIG. 2B. Kim's positive electrode collector 21 is the same as the recited cathode current collector. EX1003, ¶209.



EX1007, FIG. 2B (annotated); EX1003, ¶209.

3. 1.B

A portion of Kim's positive electrode collector 21 is coated to form a positive electrode coating portion 22. EX1007, 2:29-45, 3:50-57, 5:65-6:6, 6:7-11, FIG. 2B. The coating material may include a "positive electrode active material" such as "at least one of a complex oxide and lithium." *Id.*, 4:15-28; EX1003, ¶210. Kim's active material in positive electrode coating portion 22 is the same as the claimed first cathode material layer. EX1007, 4:15-28; EX1003, ¶210.



EX1007, FIG. 2B (annotated); EX1003, ¶210.

4. 1.C

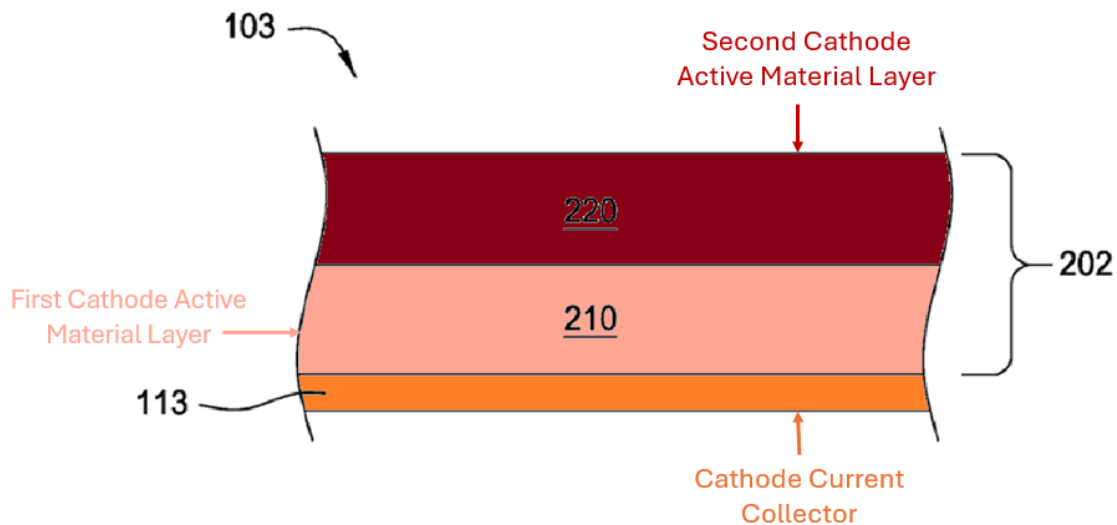
a. Kim

To the extent Kim is alleged to lack this feature, Sikha teaches it. EX1003, ¶211.

b. Sikha

Sikha teaches “a method for forming a multi-layer cathode structure” comprising “depositing a first slurry mixture comprising a cathodically active material to form a first cathode material layer over [a] conductive substrate.” EX1008, Abstract, [0010], [0038]. Then, a “second slurry mixture comprising a cathodically active material” is deposited “over the first cathode material layer” “to form a second cathode material layer.” *Id.*; *see also id.*, [0053].

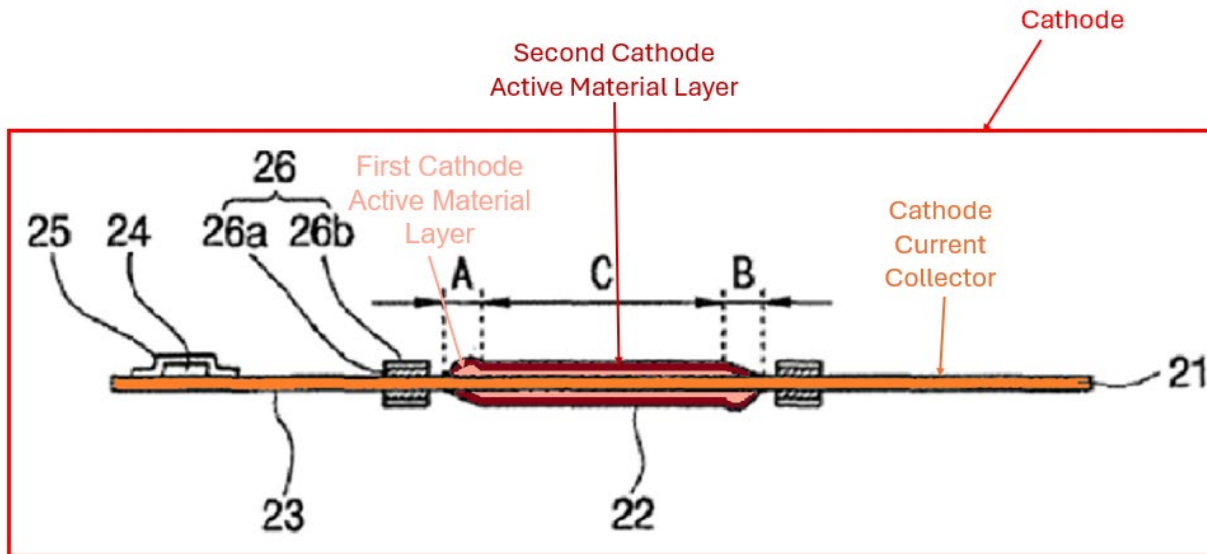
To form the “active electrode material of a Li-ion battery,” “a wide range of lithium transition metal oxides” may be used, such as, for example, “ LiMn_2O_4 (LMO),” “layered structures (LiCoO_2 , lithium nickel-manganese-cobalt oxides (NMC))” and “ LiFePO_4 .” *Id.*, [0006]. The result is the formation of a multi-layer cathode structure having a second cathode active layer formed on top of a first cathode active layer. *See id.*, [0010], [0034], FIG. 2C. EX1003, ¶211.



EX1008, FIG. 2C (annotated); EX1003, ¶211.

c. KSR

Kim-Sikha teaches this claim element. EX1003, ¶212. It would have been obvious to a POSA to modify Kim in view of Sikha to provide the multi-layer cathode structure shown below. *See supra* § XIII.A; EX1003, ¶213.



EX1007, FIG. 2B (annotated); EX1003, ¶213.

Kim and Sikha are each directed towards cathode electrode structures for lithium-ion secondary batteries. *Supra* § XIII.A. A POSA would have known that Sikha's multi-layer cathode structure could be readily applied to Kim's electrode assembly. *Id.* Sikha describes applying a slurry on a current collector, like Kim, but then simply performing a second slurry deposition step to form a second cathode material layer on the first. EX1003, ¶215. Thus, modifying Kim in view of Sikha would have involved only the routine application of known slurry deposition methods, as taught by each of Kim and Sikha, and thus would not have presented any unreasonable technical challenges. *Id.*, ¶¶215-216.

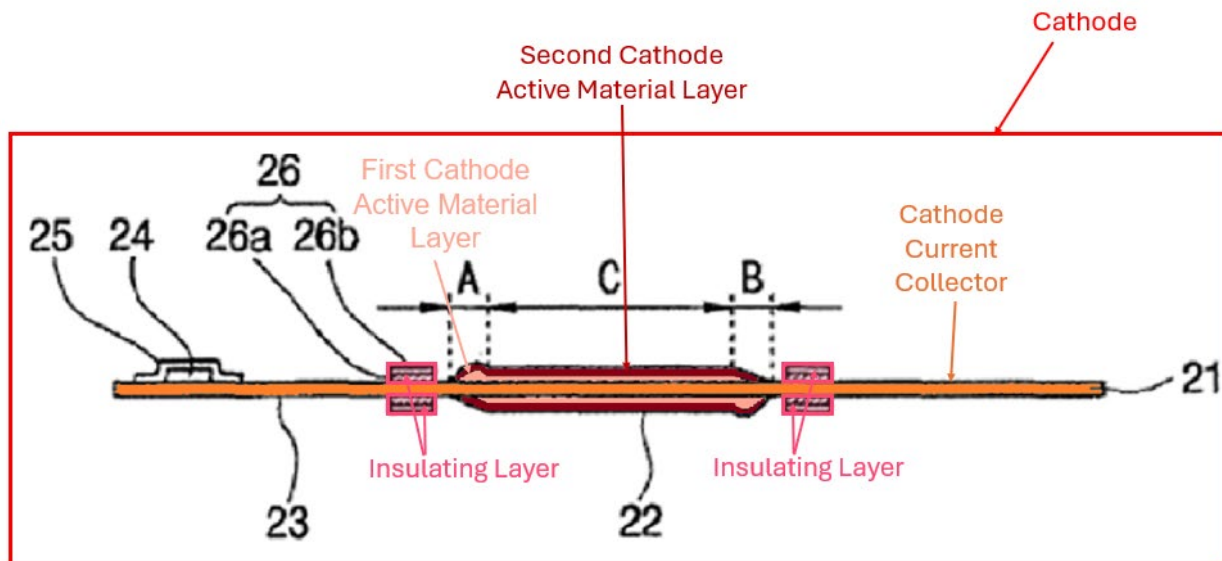
A POSA would have known that Sikha's multi-layer cathode structure would have resulted in thicker and denser electrodes with faster charging and higher capacity, power, and efficiency, as compared to Kim's single-layer cathode

structure. EX1003, ¶216. A POSA would have understood that these benefits could be realized simply by substituting Sikha's multi-layer cathode structure in place of Kim's positive electrode coating portion. EX1003, ¶217.

Thus, a POSA would have found it obvious to modify Kim in view of Sikha to include a multi-layer cathode structure. EX1003, ¶218.

5. 1.D

Kim discloses “an insulating member” “disposed on one side of the positive or negative electrode non-coating portion.” EX1007, 2:29-45; *see also id.*, 4:37-50 (“positive electrode plate 20 also includes an insulating member 26”). Kim's insulating member 26 is the same as the recited insulating layer. EX1003, ¶219.

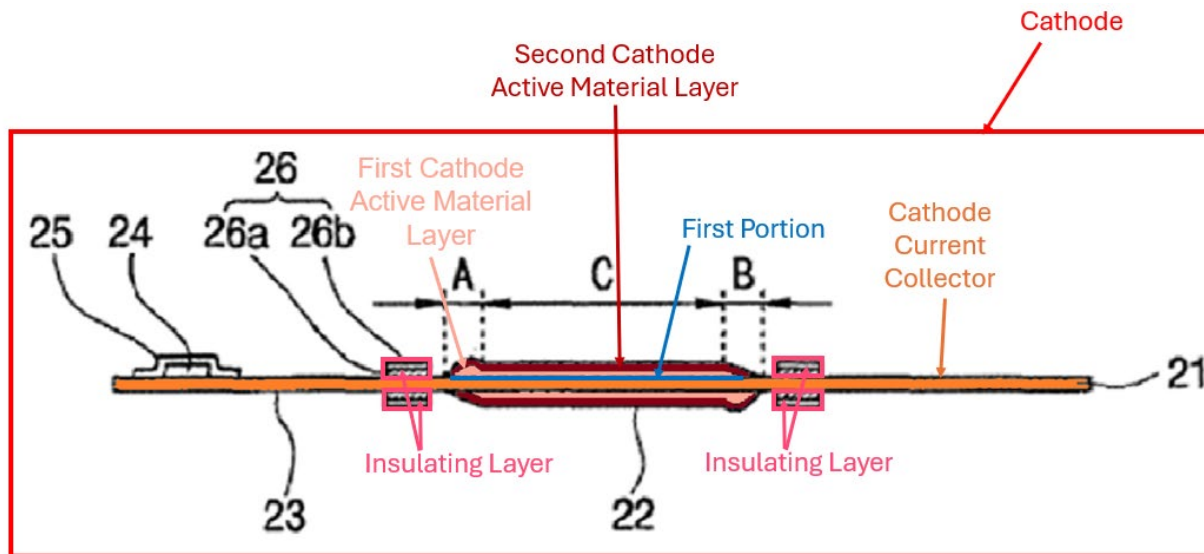


EX1007, FIG. 2B (annotated); EX1003, ¶219.

6. 1.E

Kim-Sikha teaches this claim element. EX1003, ¶220. The proposed combination of Kim-Sikha would result in first cathode active material layer

disposed on (and thus covering a portion of) Kim's current collector 21, and a second cathode active material layer disposed over the first cathode active material layer. *Id.* This is the structure explicitly taught by Sikha. *Id.* The combination of Kim-Sikha is depicted in the below annotated Figure 2B of Kim:



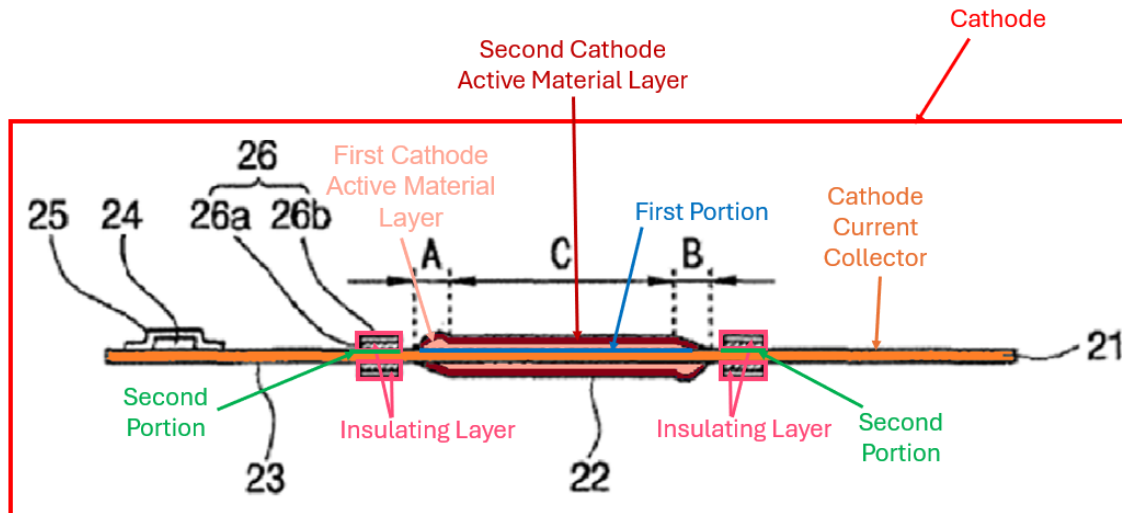
EX1007, FIG. 2B (annotated); EX1003, ¶220.

This limitation is the logical result of the above combination of Kim-Sikha. *Supra* § XIII.A.3; EX1003, ¶221. Thus, it would have been obvious to modify Kim in view of Sikha to arrive at this claim limitation for the same reasons as those discussed above. EX1003, ¶221.

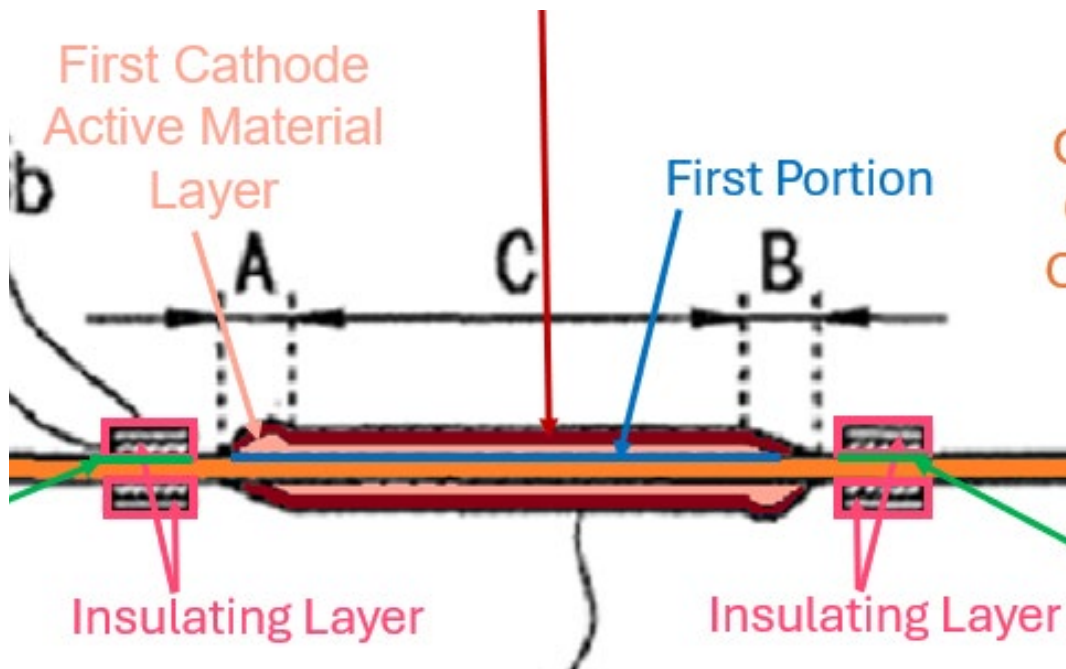
7. 1.F

Kim's positive electrode collector 21 includes a non-coating portion 23 that is not coated by the positive electrode active material but is covered by insulating member 26. EX1007, 3:58-4:2. Kim's insulating member 26 is "adhered to the positive electrode non-coating portion 23 and formed adjacent to at least one of the

ends of the positive electrode coating portion 22.” *Id.*, 4:37-43, FIG. 2B. EX1003, ¶222.



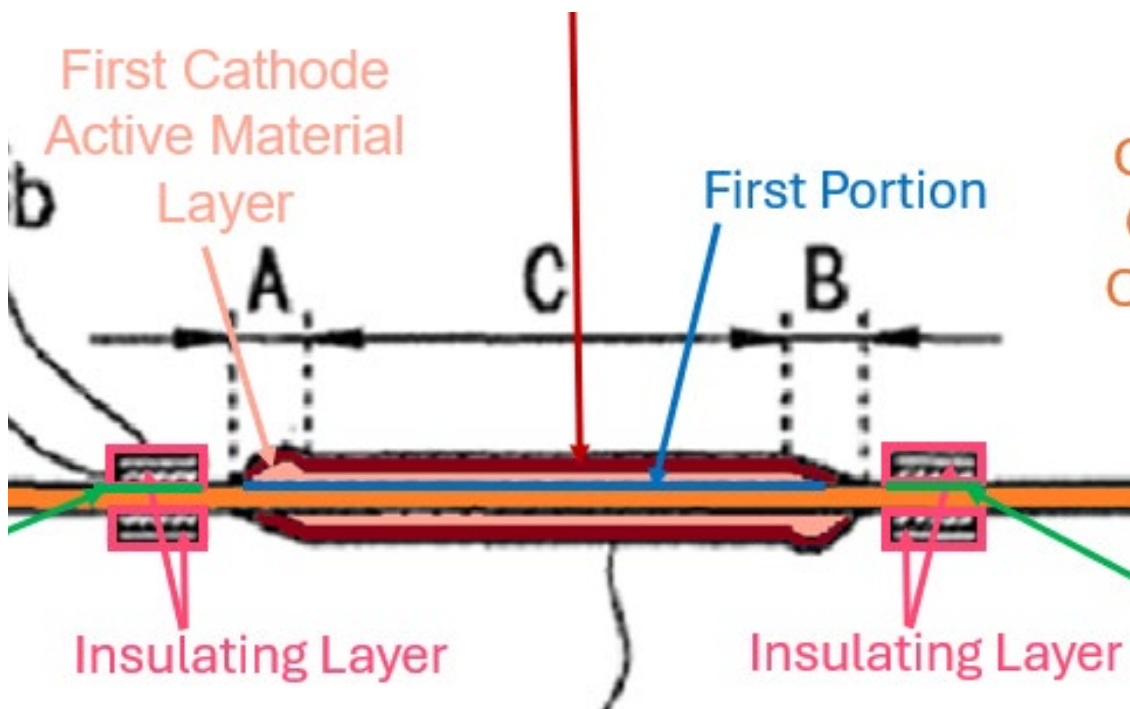
EX1007, FIG. 2B (annotated); EX1003, ¶222.



EX1007, FIG. 2B (annotated as above, abridged and enlarged); EX1003, ¶222.

8. 1.G

Kim-Sikha teaches this claim element. EX1003, ¶223. Kim-Sikha teaches two cathode active layers, as discussed above, comprising a first cathode active material layer disposed on (and thus covering a portion of) Kim's current collector 21, and a second cathode active material layer disposed over the first cathode active material layer. *Id.* The modification of Kim-Sikha is shown in the below annotated Figure 2B of Kim:



EX1007, FIG. 2B (annotated, abridged, and enlarged); EX1003, ¶223.

Kim-Sikha teaches this claim element in at least two different ways. *Id.*

First, Kim describes that insulating member 26 may have a thickness that is “equal to” the thickness of positive electrode coating portion 22. EX1007, 6:58-7:13. In Kim-Sikha, positive electrode coating portion 22 would be *replaced* with

Sikha's first cathode material layer 210 and second cathode material layer 220.

EX1003, ¶225. Thus, in Kim-Sikha, the thickness of insulating member 26 would be equal to the combined thickness of first cathode material layer 210 and second cathode material layer 220. *Id.* Because at least some of the combined thickness is attributable to second cathode material layer 220, a POSA would understand that the thickness of insulating member 26 would necessarily be greater than the thickness of the first cathode material layer 210 alone. *Id.* Thus, the proposed modification of Kim-Sikha renders obvious this claim element. *Id.*

Second, this conclusion is further supported by the thickness ranges expressly disclosed by Kim and Sikha. EX1003, ¶226. Kim describes insulating member 26 has a thickness that is “about 24 μm or more, so that the insulating member 26 can prevent damage from the non-uniform regions A and B and be capable of insulating.” EX1007, 6:58-61. Kim further teaches that the thickness of insulating member 26 as being “equal to or less than the thickness of the positive electrode coating portion 22,” to avoid increasing the thickness of the electrode assembly. *Id.*, 6:61-65.

Sikha similarly describes that “the first cathode material layer 210 has a thickness between about 10 μm to about 150 μm ,” and describes a specific example of a cathode structure in which the first cathode material layer “may have an average thickness from about 1 to 80 microns.” EX1008, [0038], [0068].

In isolation, the above disclosures alone suggest that insulating member 26 may be formed to have a thickness that is, at least in some cases, larger than the thickness of first cathode material layer 210. EX1003, ¶226. However, Sikha also describes that second cathode material layer 220 “may have a thickness from about 10 to 80 microns.” EX1008, [0068]. Taken altogether, a POSA would understand that, in Kim-Sikha, insulating member 26 could be formed to have a thickness of, for example, 160 μm (equal to the thickness of first cathode material layer 210 of 80 μm plus the thickness of second cathode material layer 220 of 80 μm) while still satisfying Kim’s objective of not increasing the thickness of the electrode assembly. EX1003, ¶226. Accordingly, Kim-Sikha renders obvious this claim element. *Id.*

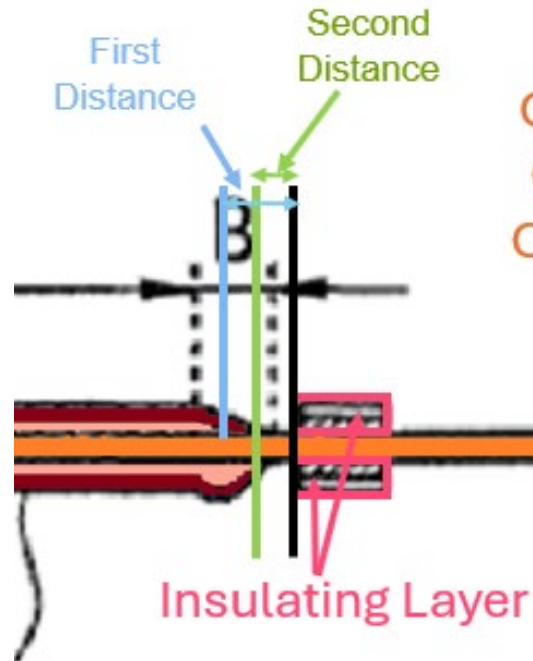
Moreover, Kim-Sikha explicitly motivates another combination that would independently satisfy this limitation. EX1003, ¶226. Sikha explains that “the thickness ratio of the first cathode material layer 210 to the second cathode material layer 220 is between about 5:1 to 1:5.” EX1008, [0068]. Applying the endpoint ratio of 1:5 to Sikha’s teaching that second cathode material layer 220 may have a thickness of 80 μm yields a first cathode material layer 210 thickness of 16 μm (that is, 1/5 of 80 μm). Kim teaches that insulating member 26 has a thickness of at least about 24 μm . EX1007, 6:58-61. Thus, under this embodiment, the thickness of insulating member 26 would be greater than the thickness of first

cathode material layer 210. EX1003, ¶227. Accordingly, this element is rendered obvious by Kim-Sikha. *Id.*

C. Claim 2

Kim-Sikha teaches this claim element. EX1003, ¶228. Kim’s “insulating member 26 may be formed adjacent to at least one of the ends of the electrode coating portion 22” with “a distance” provided therebetween. EX1007, 6:25-57. Kim’s insulating member 26 may be “spaced 3.5 mm or less apart from the end part of the positive electrode coating portion 22.” *Id.*, 6:50-52.

In Kim-Sikha, a distance would be provided between insulating member 26 and each of first cathode active material layer 210 (the claimed “first distance”) and second cathode active material layer 220 (the claimed “second distance”), as taught by Kim. EX1007, 6:25-57. Each of these distances would be greater than zero and less than or equal to 3.5 mm. EX1003, ¶228. And, as explained by Dr. Zhu, the configuration of the first and second cathode active material layers would mean that the second distance is necessarily less than the first distance, as shown below. *Id.* Thus, Kim-Sikha renders obvious this limitation. *Id.*



EX1007 (Kim), FIG. 2B (annotated, abridged, and enlarged); EX1003, ¶228.

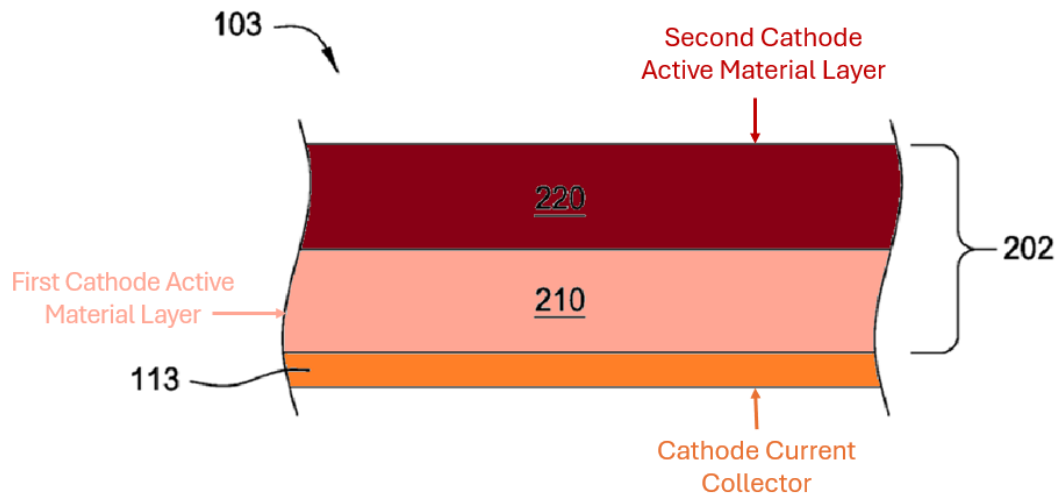
D. Claim 3

Kim-Sikha teaches this claim element. EX1003, ¶229. Kim’s insulating member 26 may be “spaced 3.5 mm or less apart from the end part of the positive electrode coating portion 22.” EX1007, 6:50-52. In Kim-Sikha, the distance between insulating member 26 and first cathode active material layer 210 would be greater than zero and less than or equal to 3.5 mm, as described by Kim. EX1007, 6:49-52. This range overlaps, and thus renders obvious, the recited range of “from about 0 mm to about 83 mm.” EX1003, ¶230.

E. Claim 4

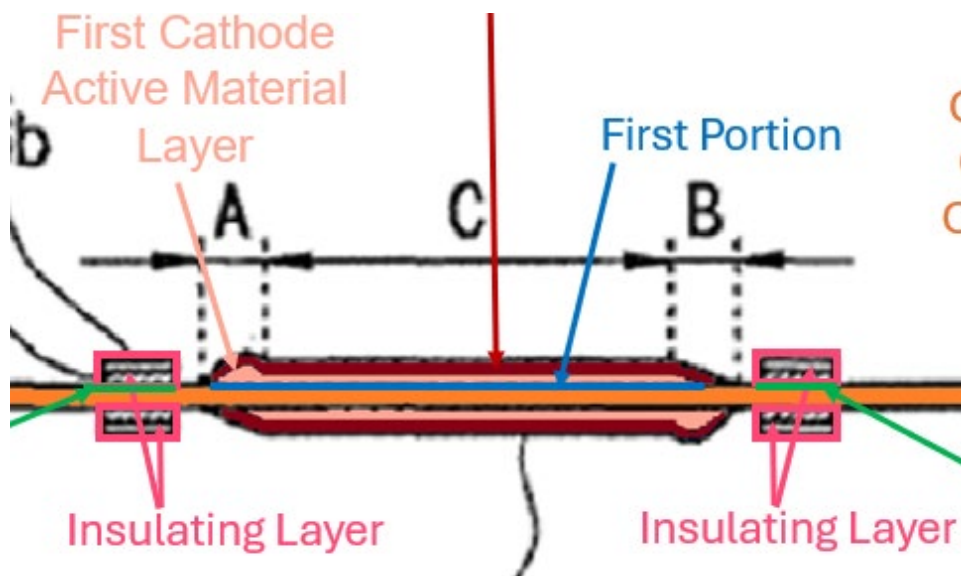
Kim-Sikha teaches this claim element. EX1003, ¶231. Sikha’s “second slurry mixture comprising a cathodically active material is deposited on the first cathode material layer 210 to form a second cathode material layer 220.” EX1008,

[0053]. Sikha's slurry deposition results in a second cathode material layer 220 that completely covers first cathode material layer 210, as shown in Sikha:



EX1008, FIG. 2C (annotated); EX1003, ¶231.

In Kim-Sikha, Kim's positive electrode coating portion 22 would be replaced with Sikha's first cathode material layer 210 and second cathode material layer 220, as shown below:



EX1007, FIG. 2B (annotated, abridged and enlarged); EX1003, ¶232.

Thus, Kim-Sikha renders obvious this claim limitation. EX1003, ¶233.

F. Claim 5

Kim-Sikha teaches this claim element. EX1003, ¶234. Kim describes the thickness of the active material layer is at least about 24 μm or more. EX1007, 6:58-65; EX1003, ¶234. Sikha describes that “the first cathode material layer 210 has a thickness between about 10 μm to about 150 μm ,” or “from about 1 to 80 microns.” EX1008, [0038], [0068].

In Kim-Sikha, the thickness of Sikha’s first cathode material layer 210 would be between 10 and 80 μm . EX1003, ¶235. This range overlaps with, and thus renders obvious, the recited range of from about 0.1 μm to about 20 μm . *Id.*

G. Claim 6

Kim-Sikha teaches this claim element. EX1003, ¶236. Sikha’s first cathode material layer 210 and second cathode material layer 220 may use “different cathodically active materials” “for each layer.” EX1008, [0063]. These may include “lithium cobalt oxide (LiCoO_2)” (the claimed “lithium cobaltate”), “ $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ ” (the claimed “lithium vanadium phosphate”), “ LiMn_2O_4 ” (the claimed “lithium manganate”), “iron olivine (LiFePO_4)” (the claimed “lithium iron phosphate”), “ LiVOPO_4 ” and “ LiVPO_4F ” (the claimed “oxy-lithium-vanadium phosphate” and a fluorinated oxy-lithium vanadium phosphate), “ $\text{Na}_5\text{V}_2(\text{PO}_4)_2\text{F}_3$ ” (a fluorinated version of the claimed “oxy-sodium-vanadium phosphate”), and

“ $\text{LiNi}_x\text{Co}_{1-2x}\text{Mn}_x\text{O}_2$ (‘NMC’)” (the claimed “lithium nickel cobalt manganese oxide”), as well as other similar compounds.” EX1008, [0041]; EX1003, ¶236.

In Kim-Sikha, Kim’s positive electrode coating portion 22 would be replaced with Sikha’s first cathode material layer 210 and second cathode material layer 220. EX1003, ¶237. And the first cathode material layer 210 would be formed of one of the above materials listed by Sikha, where Sikha describes many materials selected from the recited Markush group of materials. *Id.*

H. Claim 7

Kim-Sikha teaches this claim element. EX1003, ¶238. Sikha’s first slurry mixture may “comprise a **solid binding agent** or precursors for forming a solid binding agent” as well as “**electro-conductive materials.**” EX1008, [0044], [0046] (emphasis added).

Sikha’s **binding agent** may include “**styrene butadiene rubber (SBR),**” “**carboxymethylcellulose (CMC),**” and “**polyvinylidene fluoride (PVDF).**” EX1008, [0044] (emphasis added).

Sikha’s “**electro-conductive materials**” “may be selected from the group comprising: **graphite, graphene hard carbon,**” “**acetylene black (AB),**” and “**carbon black (CB).**” EX1008, [0046] (emphasis added).

In addition, Sikha's "second slurry mixture may be similar to the first slurry mixture" and "may comprise "cathodically active materials and at least one of a binder, electro-conductive material and a solvent." *Id.*, [0053].

In Kim-Sikha, Kim's positive electrode coating portion 22 would be replaced with Sikha's first cathode material layer 210 and second cathode material layer 220. EX1003, ¶242. The first cathode material layer 210 and the second cathode material layer 220 would be formed to include the "binding agent" and "electro-conductive materials" explicitly taught by Sikha, where Sikha describes many materials selected from the two recited Markush groups. *Id.*

I. Claim 8

Kim discloses that insulating member 26 "may include an adhesive layer and an insulating film adhered to one surface thereof," where "the insulating film may be formed of polypropylene, polyethylene terephthalate, or polyethylene naphthalate." EX1007, 4:40-50. Thus, Kim discloses an insulating layer comprising a polymer that is polypropylene, which is selected from the Markush group recited by claim 8. EX1003, ¶243.

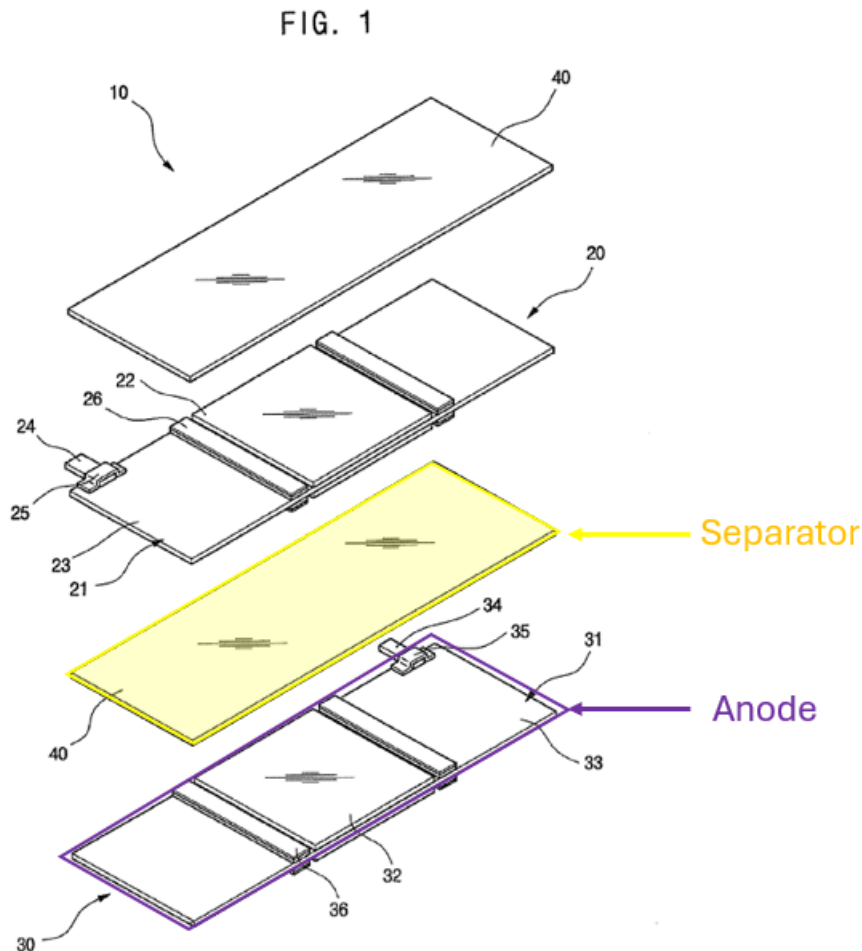
J. Claim 9

1. 9.P

Kim discloses an electrode assembly that "includes a first electrode plate ... 20, a second electrode plate ... 30 and a separator 40." EX1007, Abstract, 1:14-18, 3:45-49. The first (positive) electrode plate comprises an "active material" formed

3. 9.B

Kim's electrode assembly 10 includes "a separator 40" "disposed between the positive electrode plate and the negative electrode plate." EX1007, 2:29-45, 3:43-49, FIG. 1. Kim's separator is the same as the recited separator. EX1003, ¶246.



EX1003, ¶246 (EX1007, FIG. 1 (annotated)).

4. 9.C-9.J

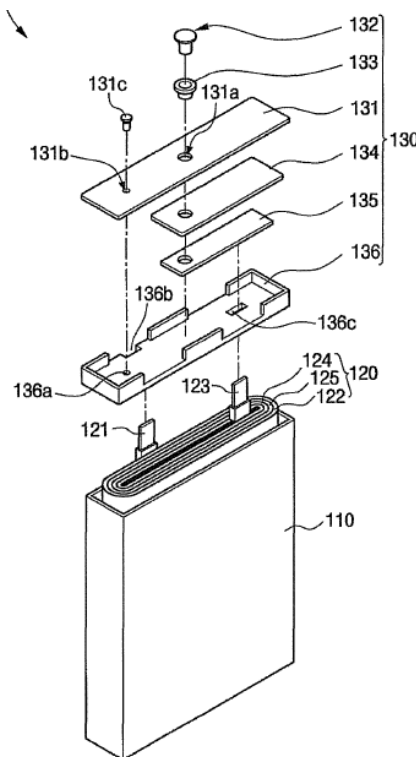
Kim-Sikha renders obvious these limitations for the same reasons as those above regarding claim 1. *Supra* §XIII.B. EX1003, ¶247-254.

5. 9.K

Kim's "separator 40" is "disposed between the positive electrode plate and the negative electrode plate" to control "migration of lithium ions between the positive electrode plate 20 and the negative electrode plate 30." EX1007, 2:29-45, 3:43-49, 5:44-56, FIG. 1. Kim's separator is disposed in the same position and for the same function as the recited separator. EX1003, ¶255.

6. 9.L

Kim's "positive electrode plate 20, the negative electrode plate 30, and the separator 40," are "stacked and wound in a jelly-roll type electrode assembly." EX1007, 3:50-57, FIG. 3. Thus, Kim's anode, separator, and cathode are wound to form an electrode assembly, as claimed. EX1003, ¶256.



EX1007, FIG. 3.

K. Claim 10

Kim-Sikha renders obvious these limitations for the same reasons as for claim 2. *Supra* §XIII.C. EX1003, ¶257.

L. Claim 12

Kim-Sikha renders obvious this limitation for the same reasons as for claim 2. *Supra* §XIII.C. EX1003, ¶258. In particular, Kim's insulating member 26 may be "spaced 3.5 mm or less apart from the end part of the positive electrode coating portion 22. EX1007, 6:25-57.

In Kim-Sikha, a distance between insulating member 26 and first cathode active material layer 210 (the claimed "first distance") would be greater than zero and less than or equal to 3.5 mm, as described by Kim. EX1007, 6:25-57. This range overlaps, and thus renders obvious, the range of first distance that is, at a minimum, between 0 mm and 4 mm, as recited by claim 12 (in the limit that D is zero). EX1003, ¶259.

M. Claim 13

Kim-Sikha renders obvious this limitation for the same reasons as for claims 2 and 12. *Supra* §§ XIII.C and XIII.L; EX1003, ¶260.

In Kim-Sikha, a distance between insulating member 26 and second cathode active material layer 220 (the claimed "second distance") would be greater than zero and less than or equal to 3.5 mm, as described by Kim. EX1007, 6:25-57. This range overlaps, and thus renders obvious, the range of second distance that is, at a

minimum, between 0 mm and 4 mm, as recited by claim 13 (when D is zero).

EX1003, ¶261.

N. Claim 15

1. 15.P

Kim's electrode assembly may be used in a variety of electronic devices such as "various compact and handheld electronic/electrical appliances," including "cellular phones, notebook computers, camcorders, and like device." EX1007, 1:21-29. These electronic devices are of the same type as the electronic device recited by the '769 patent. EX1003, ¶262. Thus, Kim discloses the recited electronic device. *Id.*

2. 15.A-M

Kim-Sikha renders obvious these limitations for the same reasons as above regarding claim 9. *See above* §XIII.J. EX1003, ¶263-275.

O. Claims 16 and 18

Kim-Sikha renders obvious these limitations for the same reasons as above regarding claims 2 and 10 and claims 12 and 13, respectively. *Supra* §§ XIII.C, XIII.K-M; EX1003, ¶¶276-77.

XIV. GROUND 2B: CLAIM 8 IS OBVIOUS IN VIEW OF KIM, SIKHA, AND YAMAFUKU.

A. Obviousness Rationale

A POSA would have been motivated to modify the electrode assembly of Kim as modified in view of Sikha further in view of Yamafuku. EX1003, ¶278.

This is because doing so would have yielded predictable and well-known advantages in manufacturability, energy density, and mechanical robustness. *Id.*

Like Kim, Sikha, and the '769 patent, Yamafuku describes the structure of a cathode used in a wound-type electrode assembly of a lithium-ion battery.

EX1006, [0002], [0004], [0043], [0059]; EX1003, ¶279. A POSA would have understood that Yamafuku's assembly is compatible with Kim's wound-type electrode assembly that includes an anode, a cathode, and a separator. EX1003, ¶279.

Yamafuku recognizes that, in wound assemblies, the separator may undergo shrinkage that may lead to a short circuit. EX1003, ¶282. To avoid this, Yamafuku teaches using an insulating layer comprising a polymer resin and inorganic particles. *Id.*, ¶¶282-83. As the resin, Yamafuku describes "a non-aqueous binder" such as a "polyolefin," similar to Kim's polymer. *Id.* Yamafuku describes various possible inorganic particles, including, preferably, "SiO₂ particles, Al₂O₃ particles, boehmite (hydrated alumina), and alumina-silica composite oxide particles." EX1006, [0127]-[0136], *esp.* [0136].

A POSA would have recognized that the problem identified by Yamafuku may also be present in the similar electrode assembly of Kim-Sikha. EX1003, ¶285.

Given the similarities in structure and materials between Kim, Sikha, and Yamafuku, a POSA would not have experienced any unreasonable technical challenges in modifying Kim-Sikha further in view of Yamafuku. EX1003, ¶284.

And the predictable result of such a combination would have been a lithium-ion secondary battery having a wound-type electrode assembly that is more resilient to short circuits caused by shrinkage of the insulating layer. EX1003, ¶286.

Thus, it would have been obvious to a POSA to modify the electrode assembly of Kim-Sikha further in view of Yamafuku. EX1003, ¶286. And a POSA would have had a reasonable expectation of success in modifying Kim-Sikha further in view of Yamafuku by modifying Kim's insulating layer to include a polymer and inorganic particles, *id.*, ¶283, because such an insulating layer would have better insulation properties and avoid short circuits caused by shrinkage of the separator. *Id.*, ¶286.

B. Claim 8

Kim-Sikha-Yamafuku teaches these claim elements. EX1003, ¶287. Kim's insulating member 26 may include "polypropylene, polyethylene, terephthalate, or

polyethylene naphthalate.” EX1007, 4:45-50. Thus, Kim discloses the recited insulating layer comprising a polymer that is “polypropylene” or “polyethylene.” EX1003, ¶287.

Kim-Sikha-Yamafuku teaches an insulating layer comprising inorganic particles. EX1003, ¶288. Yamafuku describes forming an insulating layer comprising a resin of, for example, a “polyolefin” (e.g., the polypropylene and polyethylene disclosed by Kim) and inorganic particles “including, preferably, “SiO₂ particles, Al₂O₃ particles, boehmite (hydrated alumina), and alumina-silica composite oxide particles.” EX1006, [0127]-[0136], *esp.* [0136]. Thus, Kim-Sikha-Yamafuku teaches all the limitations recited by claim 8. EX1003, ¶288.

XV. GROUND 2C: CLAIMS 11 AND 17 ARE OBVIOUS IN VIEW OF KIM, SIKHA, AND LI.

A. Obviousness Rationale

A POSA would have been motivated to modify the electrode assembly of Kim-Sikha further in view of Li. EX1003, ¶289. This is because Li identifies a particular problem with the wound electrode structure of Kim-Sikha and describes a specific solution to that problem. *Id.*

Similar to Kim and Sikha, Li is directed towards a “lithium-ion battery having a winding structure” formed by winding “a positive electrode, a negative electrode, and a separator spaced between the positive electrode and the negative electrode.” EX1009, [0051], [0008]; EX1003, ¶290. Li recognizes a specific

problem with deformation and formation of dendritic fragments in wound-type lithium-ion battery electrode assemblies, such as that of Kim-Sikha. EX1009, [0003]; EX1003, ¶292.

To avoid such deformation and dendritic fragement, Li describes forming an insulating “protective layer” that is analogous to Kim’s insulating member 26. EX1009, [0017], FIG. 3; EX1003, ¶¶292-93. For example, both are formed on a non-coating portion of the cathode collector, may comprise an insulating resin, and may be formed by disposing an adhesive layer directly on the current collector. EX1003, ¶293. Thus, a POSA would recognize that Li’s protective layer 14 is analogous to Kim’s insulating member 26. EX1003, ¶293.

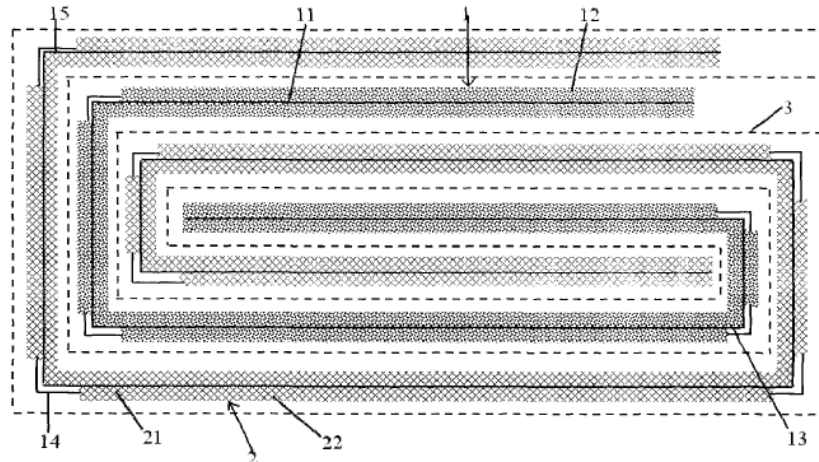
In Kim-Sikha-Li, Kim’s insulating member 26 would be disposed on non-coating regions of the cathode collector that form the “corner” regions of the resulting electrode assembly. EX1003, ¶294. This simple modification would not present any unreasonable technical challenges to a POSA. EX1003, ¶294. Thus, a POSA having knowledge of Li, which published years prior to Kim and Sikha, would have been motivated to modify the electrode assembly of Kim-Sikha to have an insulating layer at the corner of the electrode assembly, as explicitly taught by Li. *Id.*, ¶295.

A POSA would have had a reasonable expectation of success in modifying Kim-Sikha further in view of Li to adjust the spacing of the cathode active material

and insulating layers to have the insulating layer disposed at the corners of the assembly, EX1003, ¶294, because such a configuration would avoid the deformation and dendritic fragment problems that Li had identified years earlier. *Id.*, ¶295.

B. Claim 11

To the extent Kim and Sikha do not explicitly describe forming the insulating layer (including the first distance and the second distance) at a corner of the electrode assembly, Li does. EX1003, ¶296. Li's insulating protective layer 14 is formed in "the corner region[s] 13 of the positive electrode." EX1009, [0017]-[0019], [0031], [0035], FIG. 3; EX1003, ¶297.



EX1009, FIG. 3.

A POSA would have been motivated to adjust the positioning of Kim's insulating member to be formed in the corners of the winding-type electrode assembly, as explicitly taught by Li, to avoid deformation of the electrode assembly and the formation of dendritic fragments. EX1003, ¶298.

C. Claim 17

Kim-Sikha-Li renders obvious this limitation for the same reasons as above.

Supra §XV.B. EX1003, ¶299.

XVI. GROUND 2D: CLAIMS 14 AND 19 ARE OBVIOUS IN VIEW OF KIM, SIKHA, AND KAPLAN.

A. Obviousness Rationale

A POSA would have been motivated to modify the electrode assembly of Kim-Sikha further in view of Kaplan. EX1003, ¶300. This is because Kaplan describes a wound electrode assembly formatted as a prismatic cell that is useful in a large number of electronic devices, including digital cameras and cell phones. *Id.*

Kaplan, like Tanaka, Yamafuku, and the '769 patent, is directed towards “secondary lithium batteries, and in particular to lithium prismatic cells” that comprise “a prismatic-shaped housing that houses an anode, a cathode ... and a separator between the anode and the cathode” that are “wound” “to increase the surface area.” EX1010, [0001], [0007], [0038]; EX1003, ¶301.

Kaplan describes “prismatic cell type Li-ion secondary batteries” that “have desirable properties for use in digital cameras and other applications.” EX1010, [0007]. Kaplan specifically defines such a “prismatic cell” as having “at least four generally flat sides, and [having] one dimension (e.g., thickness) that is substantially smaller than two other dimensions (e.g., length and width).” *Id.*, [0015]. A “prismatic cell” that is “desirable” “for use in digital cameras” and other

electronic devices may “have a thickness of between about 2 mm and about 15 mm (e.g., between about 4 mm and about 10 mm).” *Id.*

Kaplan’s “prismatic cell” is analogous to Kim-Sikha. EX1003, ¶305. Both are wound-type electrode assemblies that include a cathode formed of an active lithium material, an anode formed of a carbon material, and a porous polymer separator and are used to power similar electronic devices. *Id.* Thus, a POSA would have understood that the electrode assembly of Kim-Sikha could be configured into the “prismatic cell” form factor described in Kaplan. *Id.*

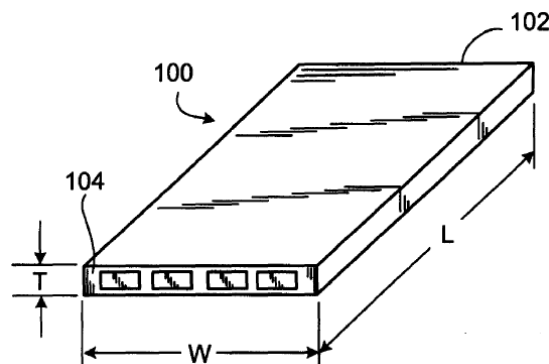
In Kim-Sikha-Kaplan, the wound electrode assembly would be configured to have “at least four generally flat sides” such that the thickness “is substantially smaller than two other dimensions.” EX1010, [0015]; EX1003, ¶306. As taught by Kaplan, the resulting assembly would be configured to “have a thickness of between about 2 mm and about 15 mm (e.g., between about 4 mm and about 10 mm).” EX1010, [0015]. This configuration would enable the electrode assembly to be used in, for example, “digital cameras” as well as “cell phones, MP3 players, and personal digital assistants (PDA’s).” EX1010, [0005], [0007]; EX1003, ¶195. And to the extent that Kaplan, which published in 2009, may not have foreseen the impending ubiquity of cell phones, a POSA by the time of Kim and Sikha, which published in 2014 and 2016, respectively, certainly would have.. *Id.*

And a POSA would have had a reasonable expectation of success in modifying Kim-Sikha further in view of Kaplan to configure the wound electrode assembly of Kim-Sikha to have the dimensions of a prismatic cell, EX1003, ¶306, because such a configuration would allow the resulting battery to be used to power a wide range of electronic devices including cell phones. *Id.*

B. Claim 14

To the extent Kim and Sikha do not explicitly describe an electrode assembly having a thickness D that is from about 1.5 mm to about 50 mm, Kaplan does. EX1003, ¶307.

Kaplan's "prismatic cell" has "at least four generally flat sides, and [] one dimension (e.g., thickness) that is substantially smaller than two other dimensions." EX1010, [0015]. Such a prismatic cell "can have a thickness of between about 2 mm and about 15 mm (e.g., between about 4 mm and about 10 mm)." *Id.* EX1003, ¶308.



EX1010, FIG. 1B.

Kaplan's "prismatic" wound-type electrode assembly is analogous to the wound-type electrode assembly of Kim-Sikha. *Supra* § XIX. Thus, a POSA would have been motivated to modify Kim-Sikha further in view of Kaplan to provide an electrode assembly with a form factor that could be used in portable electronic devices, such as a digital camera, cell phone, MP3 player, or PDA, as explicitly taught by Kaplan. EX1003, ¶309.

C. Claim 19

Kim-Sikha-Kaplan teaches this claim element for the same reasons as claim 14. *Supra* § XVI.C. EX1003, ¶310.

**XVII. CERTIFICATION THAT THE PATENT MAY BE CONTESTED VIA
INTER PARTES REVIEW BY PETITIONER AND STANDING (37
C.F.R. § 42.104(A))**

Petitioner certifies the '769 patent is available for IPR and Petitioner is not barred or estopped from requesting IPR of any '769 patent claim.

XVIII. MANDATORY NOTICES (37 C.F.R. § 42.8(A)(1))

Real Party-in-Interest (37 C.F.R. § 42.8(b)(1)): The real parties-in-interest are Zhuhai CosMX Battery Co., Ltd.; Chongqing CosMX Battery Co., Ltd.; Zhuhai CosMX Power Jinwan Subsidiary Co., Ltd.; Zhuhai CosMX Power Battery Co., Ltd.; Zhuhai CosMX Power Supply Co., Ltd.; Zhejiang CosMX Battery Co., Ltd.; Zhejiang CosMX Power Supply Co., Ltd.; and Chongqing CosMX Battery Co., Ltd.

Related Matters (37 C.F.R. § 42.8(b)(2)):

The '769 patent was asserted in the litigation *Ningde Amperex Technology Limited v. Zhuhai CosMX Battery Co., Ltd.*, Case No. 2:26-cv-00139 (E.D. Tex.), filed February 18, 2026, dismissed June 16, 2026.

Petitioner is concurrently filing a petition for *inter partes* review of Patent Owner's U.S. Patent No. 12,374,686 (IPR2026-00399) and 12,294,082 (IPR2026-00401).

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Service Information (37 C.F.R. § 42.8(b)(4)): Please direct all correspondence regarding this Petition to counsel at the above addresses and to PTAB@sternekessler.com and COSMXPTAB@leehayes.com. Petitioner consents to service by email at the addresses above.

XIX. PROCEDURAL STATEMENTS

This Petition is filed in accordance with 37 C.F.R. § 42.106(a). Concurrently filed herewith are a Power of Attorney and Exhibit List under 37 C.F.R. §§ 42.10(b) and 42.63(e), respectively. The required fee is paid through Deposit Acct. No. 19-0036 (Customer ID No. 45324). The Office is authorized to charge any fee deficiency, or credit any overpayment, to Deposit Acct. No. 19-0036 (Customer ID No. 45324).

XX. CONCLUSION

The challenged claims are unpatentable as anticipated and/or obvious and IPR is warranted.

Respectfully submitted,

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CLAIMS APPENDIX

Claim 1.P: A cathode, comprising:
1.A: a cathode current collector, having a first surface;
1.B: a first cathode active material layer, comprising a first cathode active material;
1.C: a second cathode active material layer, comprising a second cathode active material; and
1.D: an insulating layer, wherein
1.E.1: the first cathode active material layer is disposed between the cathode current collector and the second cathode active material layer and
1.E.2: [the first cathode active material layer] covers a first portion of the first surface of the cathode current collector,
1.F: and the insulating layer covers a second portion of the first surface of the cathode current collector that is different from the first portion,
1.G: wherein a thickness of the insulating layer is greater than a thickness of the first cathode active material layer.
Claim 2.P: The cathode according to claim 1, wherein
2.A: a first distance exists between the insulating layer and the first cathode active material layer in a longitudinal direction of the cathode current collector,
2.B: a second distance exists between the insulating layer and the second cathode active material layer in the longitudinal direction of the cathode current collector; and
2.C: the first distance and the second distance are respectively greater than or equal to 0 and the second distance is less than or equal to the first distance.
Claim 3: The cathode according to claim 2, wherein the first distance is from about 0 mm to about 83 mm.
Claim 4: The cathode according to claim 1, wherein the second cathode active material layer completely covers a surface of the first cathode active material layer.
Claim 5: The cathode according to claim 1, wherein the thickness of the first cathode active material layer is from about 0.1 μm to about 20 μm .
Claim 6: The cathode according to claim 1, wherein the first cathode active material and the second cathode active material are each independently selected

from the group consisting of lithium cobaltate, lithium iron phosphate, lithium manganese iron phosphate, sodium iron phosphate, lithium vanadium phosphate, sodium vanadium phosphate, oxy-lithium-vanadium phosphate, oxy-sodium-vanadium phosphate, lithium vanadate, lithium manganate, lithium nickelate, lithium nickel cobalt manganese oxide, lithium-rich manganese-based material, lithium nickel cobalt aluminum oxide, lithium titanate and combinations thereof.
Claim 7.P: The cathode according to claim 1, wherein
7.A: the first cathode active material layer and the second cathode active material layer each further comprise a binder and a conductive agent,
7.B: wherein the binder is selected from the group consisting of polyvinylidene fluoride, a vinylidene fluoride-hexafluoropropylene copolymer, polyamide, polyacrylonitrile, polyacrylate ester, polyacrylic acid, polyacrylate salt, sodium carboxymethyl cellulose, polyvinylpyrrolidone, polyvinyl ether, polymethyl methacrylate, polytetrafluoroethylene, polyhexafluoropropylene, styrene butadiene rubber and combinations thereof; and
7.C: the conductive agent is selected from the group consisting of carbon nanotubes, conductive carbon black, acetylene black, graphene, Ketjen black, carbon fibers and combinations thereof.
Claim 8.P: The cathode according to claim 1, wherein
8.A: the insulating layer comprises at least one of inorganic particles and a polymer, wherein the inorganic particles are selected from the group consisting of aluminum oxide, silicon dioxide, magnesium oxide, titanium oxide, hafnium oxide, tin oxide, cerium dioxide, nickel oxide, zinc oxide, calcium oxide, zirconium dioxide, yttrium oxide, silicon carbide, boehmite, aluminum hydroxide, magnesium hydroxide, calcium hydroxide, barium sulfate and combinations thereof; and
8.B: the polymer is selected from the group consisting of a homopolymer of vinylidene fluoride, a copolymer of vinylidene fluoride, a copolymer of hexafluoropropylene, polystyrene, polyphenylacetylene, sodium poly(vinyl acid), potassium poly(vinyl acid), polymethyl methacrylate, polyethylene, polypropylene, polytetrafluoroethylene and combinations thereof.
Claim 9.P: An electrochemical device, comprising
9.A: an anode,
9.B: a separator and
9.C: a cathode, wherein the cathode comprises
9.D: a cathode current collector, having a first surface;

9.E: a first cathode active material layer, comprising a first cathode active material;
9.F: a second cathode active material layer, comprising a second cathode active material; and
9.G: an insulating layer, wherein
9.H.1: the first cathode active material layer is disposed between the cathode current collector and the second cathode active material layer and
9.H.2: [the first cathode active material layer] covers a first portion of the first surface of the cathode current collector,
9.I: the insulating layer covers a second portion of the first surface of the cathode current collector that is different from the first portion,
9.J: wherein a thickness of the insulating layer is greater than a thickness of the first cathode active material layer; and
9.K: the separator is disposed between the anode and the cathode,
9.L: and the anode, the separator, and the cathode are wound to form an electrode assembly.
Claim 10: The electrochemical device according to claim 9, wherein a first distance exists between the insulating layer and the first cathode active material layer in a longitudinal direction of the cathode current collector, a second distance exists between the insulating layer and the second cathode active material layer in the longitudinal direction of the cathode current collector; and the first distance and the second distance are respectively greater than or equal to 0 and the second distance is less than or equal to the first distance.
Claim 11: The electrochemical device according to claim 10, wherein the first distance and the second distance are disposed at a corner of the electrode assembly.
Claim 12: The electrochemical device according to claim 10, wherein the first distance between the insulating layer and the first cathode active material layer in the longitudinal direction of the cathode current collector satisfies the following formula: $0 \leq \text{the first distance} \leq \pi/4 D + 4 \text{ mm}$.
Claim 13: The electrochemical device according to claim 10, wherein the second distance between the insulating layer and the second cathode active material layer in the longitudinal direction of the cathode current collector satisfies the following formula: $0 \leq \text{the second distance} \leq \pi/4 D + 4 \text{ mm}$.

Claim 14: The electrochemical device according to claim 9, wherein a thickness D of the electrode assembly is from about 1.5 mm to about 50 mm.
Claim 15.P: An electronic device, comprising
15.A: an electrochemical device, wherein the electrochemical device comprises
15.B: an anode,
15.C: a separator and
15.D: a cathode, wherein the cathode comprises
15.E: a cathode current collector, having a first surface;
15.F: a first cathode active material layer, comprising a first cathode active material;
15.G: a second cathode active material layer, comprising a second cathode active material; and
15.H: an insulating layer, wherein
15.I.1: the first cathode active material layer is disposed between the cathode current collector and the second cathode active material layer and
15.I.2: [the first cathode active material layer] covers a first portion of the first surface of the cathode current collector,
15.J: the insulating layer covers a second portion of the first surface of the cathode current collector that is different from the first portion,
15.K: wherein a thickness of the insulating layer is greater than a thickness of the first cathode active material layer; and
15.L: the separator is disposed between the anode and the cathode,
15.M: and the anode, the separator, and the cathode are wound to form an electrode assembly.
Claim 16: The electronic device according to claim 15, wherein a first distance exists between the insulating layer and the first cathode active material layer in a longitudinal direction of the cathode current collector, a second distance exists between the insulating layer and the second cathode active material layer in the longitudinal direction of the cathode current collector; and the first distance and the second distance are respectively greater than or equal to 0 and the second distance is less than or equal to the first distance.
Claim 17: The electronic device according to claim 16, wherein the first distance and the second distance are disposed at a corner of the electrode assembly.
Claim 18.P: The electronic device according to claim 16, wherein

18.A: the first distance between the insulating layer and the first cathode active material layer in the longitudinal direction of the cathode current collector satisfies the following formula: $0 \leq \text{the first distance} \leq \pi/4 D + 4 \text{ mm}$; and

18.B: the second distance between the insulating layer and the second cathode active material layer in the longitudinal direction of the cathode current collector satisfies the following formula: $0 \leq \text{the second distance} \leq \pi/4 D + 4 \text{ mm}$.

Claim 19: The electronic device according to claim 15, wherein a thickness D of the electrode assembly is from about 1.5 mm to about 50 mm.

**CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME
LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE
REQUIREMENTS (37 C.F.R. § 42.24(d))**

1. This Petition for *Inter Partes* Review complies with the type-volume limitation of 14,000 words, comprising 13,895 words, excluding the parts exempted by 37 C.F.R. § 42.24(a)(1).

2. This Petition for *Inter Partes* Review complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word in 14-point Times New Roman font.

Respectfully submitted,

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CERTIFICATE OF SERVICE (37 C.F.R. §§ 42.6(e), 42.105(a))

The undersigned hereby certifies that on July 21, 2026, true and correct copies of the foregoing **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,916,769** and all associated exhibits were served in their entirety on the following party via FedEx Express®:

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*Patent Owner's Correspondence Address of Record
for U.S. Patent No. 10,916,769*

Respectfully submitted,

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