UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD

IKEA Supply AG

Petitioner

v.

Everlight Electronics Co., Ltd.,

Patent Owner

U.S. Patent No. 9,905,742 to Hsieh *et al.* IPR Case No.: IPR2024-00987

Declaration of Dr. Michael S. Lebby Regarding U.S. Patent No. 9,905,742

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Ex-1003 – Declaration of Dr. Michael S. Lebby Regarding U.S. Patent No. 9,905,742

1. Introduction and Summary of Opinions

1. My name is Michael S. Lebby. I have been retained as an expert witness by counsel for Petitioners IKEA Supply AG ("IKEA") in the above captioned proceeding. I have been asked to provide my opinion regarding the validity or invalidity of the U.S. Patent No. 9,905,742 ("the '742 patent") purportedly assigned to Patent Owner Everlight Electronics Co., Ltd. ("Everlight"). My analysis in this report relates to claims 1, 2, 5-16, and 20-22 of the '742 patent (collectively, the "Challenged Claims").

2. It is my opinion that claims 1, 2, 5-16, and 20-22 of the '742 patent are anticipated by U.S. Patent Application Publication No. US2014/0054629 ("Kim") (Ex-1004).

3. It is my opinion that claims 1, 5-14, 16, and 20-22 of the '742 patent are anticipated by U.S. Patent No. 7,825,426 ("Kobayakawa") (Ex-1005).

4. It is my opinion that claims 1, 2, 5-16, and 20-22 of the '742 patent are anticipated by U.S. Patent Application No. US2014/0117403 ("Hayashi") (Ex-1006).

5. It is my opinion that claims 2 and 15 of the '742 patent are obvious over Kobayakawa in view of Kim or Hayashi.

6. To the extent that claims 1, 2, 5-16, and 20-22 are not anticipated by Kim, Kobayakawa, or Hayashi, the differences are minor and inconsequential and

therefore claims 1, 2, 5-16, and 20-22 are obvious over Kim, Kobayakawa, and/or Hayashi.

7. This report contains a statement of the opinions that I have formed regarding the validity/invalidity of the Challenged Claims to date and provides the bases and reasons for my opinions. I have provided my opinion as to the level of skill of a person of ordinary skill in the art (POSITA) and a POSITA's common general knowledge at the time of the alleged invention, which I understand to be 2014 based on the priority claim of the '742 patent. I may offer additional opinions based on further review of materials in this proceeding, including opinions and/or testimony of other experts, including those of Everlight.

8. I am being compensated for my time in connection with this matter at my standard hourly rate of $450/hour. My compensation is not affected by my opinions or the outcome of this proceeding. I do not have any financial interest in the outcome of this proceeding.

9. I reserve the right to amend and/or supplement my opinions to respond to any declarations, reports, or testimony from any of Everlight's expert(s) or witnesses; any briefs or pleadings that Everlight may file; any other filings relating to validity/invalidity of the Challenged Claims, any proposals regarding the level of skill of a POSITA, and/or the interpretation of claim terms that are proposed by Everlight or the Patent Trial and Appeal Board ("the Board"). I also reserve the right

to prepare and rely on demonstrative exhibits concerning the opinions and their bases as an aid for trial or to assist the Board in connection with this proceeding.

2. Summary of My Qualifications

2.1 Education, Employment, and Research

10. I am currently the CEO of Lightwave Logic, a company engaged in developing optical polymer modulators for the fiber optic communications industry (including both data communications and telecommunications). I am also the CEO and CTO of Oculi LLC, where I perform expert witness consulting concerning photonics, optoelectronics, semiconductors, and fiber optic equipment technology. I am also currently a technical expert for the Photonics Unit of the European Commission, where I participate in organizing workshops and lectures, evaluating photonics proposals, and advising the European Commission on projects. I was voted the Photonic Integrated Circuits Conference Entrepreneur and Business Leader of the Year in March 2018.

11. A copy of my curriculum vitae (CV) is attached as Exhibit 1023. As set forth more fully in my CV, over the course of my 40-year career in optoelectronics, I have worked in nearly every aspect of optoelectronics, including light-emitting diodes ("LEDs"), LED packaging, and LED fabrication. Accordingly, I have experience and expertise relating to epitaxial wafer growth, LED/device fabrication, implementation of LEDs/devices into packages, and packaging

materials such as plastics, metallic-based, semiconductor-based, and ceramic-based. I have also designed LED/device packages (*e.g.*, through-pin, surface mount, flip-chip and various combinations thereof) for printed circuit board mounting. Many of the designed packages were implemented in modules and sub-system/luminaire applications, *i.e.*, fixtures in which LED packages are incorporated. The modules have been fiber-optic, display, lighting, and sensing-based. For example, I have designed optoelectronic devices such as LEDs, laser diodes, photodiodes, and solar cells, with a focus on efficient optical device design that maximizes LED/device performance.

12. I am a chartered engineer in the United Kingdom, which is a status equivalent to a United States professional engineer. I started my career in 1977 at the Ministry of Defense (United Kingdom) in the Royal Electrical and Mechanical Engineer division as a telecommunications apprentice. At the Ministry of Defense, I also studied material and characterization issues of Gallium Arsenide (GaAs) and Indium Phosphide (InP) optoelectronic devices as well as semiconductor device design, fabrication, and characterization, and particularly with materials using III-V semiconductors. I also worked on ceramic-based radiofrequency (RF) electronic packaging that included low-temperature co-fired ceramic.

13. I attended the University of Bradford, where I obtained a Bachelor degree of Engineering (Electrical Engineering), with honors, in 1984, an M.B.A. in

1985, and a Ph.D. (Electrical Engineering) in 1987. My Ph.D. thesis related to the characterization and fabrication of both optoelectronic and electronic semiconductor devices. In 2004, I was awarded a Doctor of Engineering (a Doctorate degree higher than a Ph.D.) from the University of Bradford for my "Technical Contributions to Optoelectronics." This was only the second time in the University of Bradford's history that a Doctor of Engineering was granted based on industry experience.

14. At the same time, I attended the University of Bradford and afterward from 1985 to 1989, I worked as a researcher in the Photonics Research Department of AT&T Bell Labs ("Bell Labs"). At Bell Labs, I focused my research on novel device designs using III-V semiconductor material systems that included FETs, bipolar transistors, LEDs, laser diodes, and photodetectors. My research at Bell Labs became the subject of my Ph.D. thesis.

15. After I completed my Ph.D. at the University of Bradford and my work at Bell Labs, I became a Research and Development Manager ("R&D Manager") in the photonics division of Motorola's Corporate R&D Labs from 1989 to 1998. My responsibilities at Motorola included research and development of optical interconnects, displays, LEDs, and laser devices, as well as the packaging and reliability of mobile product prototypes. While at Motorola, I was the inventor or co-inventor of over 150 utility patents. In 1998, I received a special award from the

Chairman of Motorola for exemplary patent accomplishments. At that time, I had the highest number of issued utility patents in the history of Motorola.

16. LEDs, LED packaging, and LED fabrication were an integral part of my work at Motorola. In the early 1990s, full-color LED displays were not viable. Mature LED technologies at the time included Phosphide (Gallium Arsenide Phosphide (GaAsP) and/or Aluminum Indium Gallium Phosphide (AlInGaP)) and Aluminum Gallium Arsenide (AlGaAs)-based LEDs that produced visible red and orange colors with good emission properties. Gallium Phosphide (GaP)-based LEDs that produced a green color had low emission output. Blue wavelength emission LEDs were only available using pure Silicon Carbide (SiC) on Silicon Carbide (SiC) substrate wafers, with extremely low emission output. I worked closely with Motorola's mobile divisions on new and novel display prototypes to research and develop how best to innovate with full color red, green, and blue displays. In the early 1990s, single (red wavelength) and dual (orange and red wavelength) color displays were designed and made into LED packaged prototypes. After consumer testing, it was found that full-color LED displays were more attractive and then a number of alternative technologies were evaluated, such as Liquid Crystal Displays (LCDs), organic LEDs (OLEDs), and, in the late 1990s, Gallium Nitride (GaN) and Indium Gallium Nitride (InGaN) materials grown onto Sapphire. I designed packages for these devices, which included standard Transistor Output (TO) cans,

over-molded plastic dual in-line (DIL) solutions, and ceramic and semiconductor-based technology.

17. As an R&D Manager at Motorola, I worked on a number of other projects, with a particular interest in miniature displays using technologies such as LEDs, organic LEDs, lasers, and LCDs, as well as technological problems related to package lenses and molding unique and innovative shapes. One of the devices I worked on at Motorola was the Vertical-Cavity Surface-Emitting Laser ("VCSEL"). This device design required special attention to optical efficiency and distributed Bragg reflectors ("DBR"), as well as transparent packaging similar to the approach in LED packaging. I also initiated Motorola's work in optical interconnect (Optobus™) technology, and I was involved in research and development of the IC chip designs that this parallel interconnect module utilized. In this project, transparent plastics were developed and processed over-molded onto standard metallic lead frames for both light-emitting devices (e.g., LEDs, VCSELs) as well as photodetectors, which collect light and convert it into an electronic signal. These transparent lead frame packages were developed in volume production at Motorola.

18. I also worked on GaAs-based LED opto-couplers, which are optoelectronic packages that optically isolate the LED from a photodetector in a plastic package. These optoelectronic packages are usually designed with either a glass transparent plate or transparent organic polymer positioned between the LED

and the photodetector. My work at Motorola also addressed full color display and display electronics composed of red, green, and blue LEDs, and specifically how to package these technologies to allow for high electrical, optical, and thermal performance. I also worked with displays that included large arrays of visible LEDs (i.e., 10,000 LEDs on a chip) and phosphor technology. I also worked on photonics prototypes, which were subject to optimized optical device design and optical/transparent packaging, and consumer products that utilized LEDs in opto-coupler, display, and imager platforms that were all driven using standard electronic ICs and electronic signaling, as well as packages that included transparent plastic packaging varieties where the transparent plastic material was molded to a variety of conventional stamped metallic lead frames and flexible tape automated bonding (TAB) using materials such as Kapton®.

19. In 1998, I left Motorola to join TE Connectivity (previously Tyco Electronics) as Director of Technology and Business Development, where I helped develop technology strategy for optical communications products for the Global Optoelectronics Division. My work included designing and characterizing LED- and laser-based packages and modules for customer qualification specifications.

20. In 1999, I joined Intel Capital ("Intel") as Director of Business Development, and also as a corporate investor. My work at Intel included sourcing, negotiating, and closing private placement equity deals in the optical networking,

component, and semiconductor industries. My work at Intel also included investigating the investment in photonic devices, packaging, and modules, as well as LEDs, lasers, and displays. I also was one of the founders of Intel's silicon photonics division, which worked to establish a fabrication facility in South San Jose to investigate the integration of silicon FET electronics with optoelectronics into the same silicon semiconductor wafer.

21. From 2005 to 2010, I became the Executive Director, President, and CEO of the Optoelectronic Industry Development Association (OIDA), a trade association that represented photonics manufacturers in the fields of fiber optics, display, sensing, defense, aerospace, LED lighting, and motor vehicles. I was responsible for organizing technical conferences, workshops, and forecasts using industry roadmaps that featured LEDs, fiber optics, optics, fiber, optical sensors, displays, and their associated packaging.

22. In 2010, I became the General Manager and CTO of Translucent, Inc., a start-up company that developed and manufactured silicon and rare earth oxide-based epitaxial semiconductor wafers. Part of my work there was to help develop novel platforms for the growth of GaN and InGaN onto silicon and the growth of single crystal layers of GaN/InGaN/AlN onto single crystal rare earth oxides for LED fabrication. I also researched various epitaxial semiconductor layer structures for improved LED performance during my time at Translucent.

23. I joined Glyndŵr University from 2013 to 2015 as a Professor of Optoelectronics, where I focused on the design, simulation, and testing of 100G/400G photonic integrated circuits, optoelectronic integrated circuits, laser diodes, optics, and solar cells.

24. From 2013 to 2015, I was also the President and CEO of OneChip Photonics Corporation, where I served as an elected independent board member focusing on the technical and business operational strategy for communications based on InP photonic integrated circuits and optoelectronic integrated circuits.

25. Over the course of my career, I have also given a number of peer-reviewed presentations, speeches, and talks at workshops and conferences, including on optoelectronic devices, optoelectronic components, and packaging technology.

2.2 Patents

26. I am a named inventor of over 200 issued patents or published patent applications, as set forth more fully in my CV. I am a named inventor of the following exemplary patents relating to LEDs, LED packaging, and LED fabrication:

- U.S. Patent No. 5,416,870, entitled Optoelectronic interface device and method with reflective surface, issued May 16, 1995;
- U.S. Patent No. 5,708,280, entitled Integrated electro-optical package and method of fabrication, issued January 13, 1998;

- U.S. Patent No. 5,358,880, entitled Method of manufacturing closed cavity LED, issued October 25, 1994;
- U.S. Patent No. 5,563,900, entitled Broad spectrum surface emitting LED, issued October 8, 1996;
- U.S. Patent No. 5,699,073, entitled Integrated electro-optical package with carrier ring and method of fabrication, issued December 16, 1997;
- U.S. Patent No. 5,741,724, entitled Method of growing gallium nitride on a spinel substrate, issued April 12, 1998;
- U.S. Patent No. 5,739,800, entitled Integrated electro-optical package with LED display chip and substrate with drivers and central opening, issued April 14, 1998;
- U.S. Patent No. 5,818,404, entitled Integrated electro-optical package, issued October 6, 1998; and
- U.S. Patent No. 7,605,531, entitled Full color display including LEDs with rare earth active areas and different, issued October 20, 2009.

2.3 Publications

27. I have authored or co-authored numerous publications, which are set forth fully in my CV. I am an author or co-author of the below exemplary publications relating to LEDs, LED packaging, and LED fabrication:

- F. Erdem Arkun, Rytis Dargis, Andrew Clark, Robin S. Smith, Michael S. Lebby, Jeffrey M. Leathersich and F. Shahedipour-Sandvik, *Growth of GaN by MOCVD on Rare Earth Oxide on Si(111)*, ECS Transactions, Oct. 31, 2013.
- Rytis Dargis, Andrew Clark, Erdem Arkun, Radek Roucka, David Williams, Robin S. Smith, and Michael S. Lebby, Epitaxial Si and Gd_2O_3 Heterostructures – Distributed Bragg Reflectors with Stress Management Function for GaN on Si Light Emitting Devices, ECS Transactions, 2013.
- F. Erdem Arkun, Rytis Dargis, Robin Smith, David Williams, Andrew Clark, Michael S. Lebby, *Integrated High Reflectivity Silicon Substrates for GaN LEDs*, Physica Status Solidi, Jan. 13, 2012.
- David Williams, Andrew Clark, Erdem Arkun, Aleta Jamora, Gary Vosters, Michael S. Lebby, *Silicon Light Emitting Device Based on Rare Earth Oxide Superlattice*, 7th IEEE International Conference on Group IV Photonics, Bejing, China, Sep. 2010.
- Wenbin Jiang, Michael S. Lebby, *Packaging of Optical Components and Systems*, Wiley Encyclopedia of Electrical Electronics and Engineering, 27 Dec., 1999.

- Wenbin Jiang, Michael S. Lebby, *Semiconductor Laser and Light Emitting Diode Fabrication*, Handbook of Fiber Optic Data Communication, February 2002.

28. I believe that my education and experience give me general expertise, and I consider myself to be an expert, in the area of LEDs, LED packaging, and LED fabrication, including the technologies described and claimed in the '742 patent.

2.4 Prior Testimony

29. I have previously served as a testifying expert witness in patent cases as set forth more fully in my CV. I have been recognized as an expert in the LED field including LED packaging in numerous jurisdictions and by the USPTO in invalidity proceedings including:

- Jiaxing Super Lighting Electric Appliance Co., LTD and Obert Inc. v. Current Lighting Solutions, LLC d/b/a GE Current., No. 6-22-CV-00534-ADA (W.D. Tx Filed 16th Sep 2022);
- LG Electronics Inc., v. TCL Electronics Holdings Ltd. (f/k/a TCL § Multimedia Technology Holdings, Ltd.) et al., No. 2-22-CV-0122-JRG (W.D. Tx. Filed 14th Oct 2022);
- *Amazon.com Inc., v. Epistar Corp.,* No. 6-22-CV-00526-ADA (W.D. Tx. Filed 24th May 2022)

- Certain integrated circuits, and electronic devices and products containing the same, No. 337-TA-1287 (ITC Filed 1st Dec 2021);
- *LedComm LLC., v. IKEA US Retail LLC et al.*, No. 6-22-CV-00302-ADA (W.D. Tx. Filed 21st Mar 2022);
- Jiaxing Super Lighting Electric Appliance Co., LTD and Obert Inc. v. Maxlite Inc., No. 19-CV-04047 (C.D. Cal. Filed 8th May 2019); and
- Cree Lighting, Wolfspeed, Ideal Industries Lighting, v. CAO Lighting, No. IPR2022-00848 (PTAB Filed 8th April 2022).

2.5 Expertise

30. Based on my education and experience, I consider myself to be an expert in the fields of LED and LED packaging related to the technologies described and claimed in the ’742 patent.

3. Person of Ordinary Skill in the Art (POSITA)

31. I understand that validity/invalidity are determined from the perspective of a person of ordinary skill in the art, or POSITA, at the time of the alleged invention. I understand the alleged invention date to be the earliest effective filing date of the application that issued as the ’742 patent, which I understand to be May 23, 2014.

32. In determining the appropriate level of ordinary skill for a POSITA, my understanding is that the following factors can be considered: the inventor’s

educational background and experience, the types of problems encountered in the art, prior art solutions to those problems, the rapidity with which innovations are made in the art, the sophistication of the technology, the educational background and experience of those working in the art, and the like.

33. After a review of the ’742 patent, I am of the opinion that a POSITA at the relevant time of the alleged invention of the ’742 patent would have had (1) a Bachelor’s degree in electrical engineering, physics, or a comparable field of study, and (2) at least three years of professional experience with semiconductor optoelectronic devices and packaging. This description is approximate, and a higher level of education or skill might make up for less experience, and additional experience could make up for a lower education level (for example, an M.S. in any of the above fields and two years of practical experience would qualify one as a POSITA).

34. I consider myself to be a person of at least ordinary skill in the art for the ’742 patent. As of 1988, I had a Bachelor’s degree in electrical engineering and at least three years of professional experience with semiconductor optoelectronics devices and packaging, including LED leadframe manufacturing and design. I received a Bachelor’s degree in electrical engineering in 1984 and by no later than 1988, had at least three years of professional experience with semiconductor optoelectronics devices and packaging through my Ph.D. and post-doctoral research

performed at Bell Labs (thesis related to the characterization and fabrication of optoelectronic and electronic semiconductor devices). As such, be a person of at least ordinary skill in the art in 2014, which corresponds to the priority date of the '742 patent.

35. All of the opinions I express herein are from the perspective of a POSITA at the time of the alleged invention date, the earliest alleged priority date of the '742 patent.

4. Materials Considered

36. I have considered information from various sources in forming my opinions. Besides drawing from more than forty-year career in optoelectronics, I have also reviewed the '742 patent, its file history, IKEA's Petition for *inter partes* review ("Petition"), each exhibit attached to the Petition, and any other documents or references discussed in this declaration.

5. Legal Standards Applied in the Report

37. I am not an attorney and will not offer opinions on the law. I was asked to apply the following legal standards in forming my opinions.

38. I understand that for an invention claimed in a patent to be found patentable, it must be, among other things, new and not obvious from what was known before the invention was made. My understanding of the legal standards for anticipation and obviousness are set forth below.

39. I was instructed that IKEA has the burden of proving that the Challenged Claims of the ’742 patent are anticipated by or obvious in view of the prior art by a preponderance of the evidence in this proceeding. I was instructed that “a preponderance of the evidence” is evidence sufficient to show that a fact is more likely true than it is not. I used that standard in my analysis.

40. I was instructed to evaluate whether an invention is new and not obvious in view of the legal standards below and what is referred to as “prior art.” I understand that “prior art” generally includes patents and printed publications (e.g., books, journal publications, articles on websites, product manuals, etc.) that existed before the earliest filing date (the “effective filing date”) of the claims in the ’742 patent. I understand that whether a printed document qualifies as prior art to the ’742 patent is a legal conclusion, so I was asked to assume for my analysis that the documents applied in my report are prior art to the Challenged Claims.

41. I was instructed that in my anticipation and obvious analysis, I should compare the Challenged Claims to the prior art. I was instructed that in this analysis, the ’742 patent claims must be interpreted in accordance with certain standards of claim construction. I was instructed that claim construction is a question of law for the Court to decide. The claim construction I was asked to use is provided below.

5.1 Anticipation

42. I was instructed that the following standards govern the determination of whether a patent claim is "anticipated" by the prior art. I have applied these standards in my evaluation of whether the claims of the patent would have been anticipated by the prior art.

43. I was instructed that, for a patent claim to be "anticipated" by the prior art, each and every limitation of a claim must be found, expressly or inherently, in a single prior art reference as recited in the claim. I understand that a prior art reference inherently discloses a claim limitation if the claim limitation is necessarily present or the natural result of the combination of elements explicitly disclosed in the prior art reference. I understand that the inherency inquiry is distinct from the question of obviousness.

44. I was instructed that if a reference incorporates other documents by reference, the incorporating reference and the incorporated reference(s) should be treated as a single prior art reference for purposes of analyzing anticipation.

5.2 Obviousness

45. I was instructed that a claimed invention is not patentable if it would have been obvious to a POSITA at the time the invention was made.

46. I was instructed that a patent may not be obtained even though the invention is not identically disclosed or anticipated by the prior art, if the differences

between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a POSITA to which said subject matter pertains.

47. I understand that the following standards govern the determination of whether a claim in a patent is obvious. I have applied these standards in my evaluation of whether the asserted claims of the patent at issue here would have been considered obvious as of the relevant priority date. I have been asked to assume that the priority date for the claims at issue here is May 23, 2014.

48. I understand that to find a claim in a patent obvious, one must consider certain factual questions regarding the claimed invention and the prior art. Specifically, I understand that the question of whether an alleged invention is obvious requires consideration of four factors (although not necessarily in the following order):

- The scope and content of the prior art;
- The differences between the prior art and the claims at issue;
- The ordinary level of skill in the art/knowledge of a POSITA; and
- Whatever objective factors indicating obviousness or non-obviousness may be present in any particular case (commonly referred to as "secondary considerations of non-obviousness").

49. In addition, I understand that the obviousness inquiry should not be done based on hindsight, but must be done using the perspective of a POSITA as of the priority date of the patent claim.

50. I was instructed that the secondary considerations of non-obviousness may include: commercial success of products covered by the patent claims; a long-felt need for the invention; failed attempts by others to make the invention; copying of the invention by others in the field; unexpected results achieved by the invention; praise of the invention by those in the field; the taking of licenses under the patent by others; expressions of surprise by experts and those skilled in the art at the making of the invention; and the patentee proceeded contrary to the accepted wisdom of the prior art. I also understand that any of this evidence must be specifically connected to the invention rather than being associated with the prior art or with marketing or other efforts to promote an invention. I am not presently aware of any evidence of "objective factors" suggesting the claimed subject matter is not obvious, and reserve my right to address any such evidence if it is identified in the future. I understand that objective factors of obviousness include near simultaneous invention by another.

51. I understand that an indication of obviousness is the combination of familiar elements according to known techniques to yields predictable results. I also understand that an example of a solution in one field of endeavor may make that solution obvious in another related field. I also understand that market demands or

design considerations may prompt variations of a prior art system or process, either in the same field or a different one, and that these variations will ordinarily be considered obvious variations of what has been described in the prior art. When there is such a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, it is likely the product, not of innovation, but of ordinary skill and common sense.

52. I also understand that if a POSITA can implement a predictable variation, that variation may be considered obvious. I understand that for similar reasons, if a technique has been used to improve one device, and a POSITA would recognize that it would improve similar devices in the same way, using that technique to improve the other device is an indication that the technique would have been obvious unless its actual application yields unexpected results or challenges in implementation.

53. I understand that the obviousness analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, but instead can consider the "ordinary innovation" and experimentation that yields predictable results, which include inferences and creative steps that a POSITA would employ.

54. I understand that, to make an obviousness determination, it will sometimes be necessary to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art. I understand that all these issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. It is my understanding that motivation to combine prior art to form the claimed invention includes motivation or suggestions in a reference, common sense, the level of ordinary skill, and motivation derived from the nature of the problem to be solved.

55. I understand that an invention that might be considered an obvious variation or modification of the prior art may be considered non-obvious if one or more prior art references discourages or lead away from the line of inquiry disclosed in the reference(s). A reference does not "teach away" from an invention simply because the reference suggests that another embodiment of the invention is better or preferred. My understanding of the doctrine of teaching away requires a clear indication that the combination should not be attempted (*e.g.*, because it would not work or explicit statements saying the combination should not be made).

5.3 Claim Construction

56. I understand that the claim construction is for the USPTO. I understand that a claim construction order was recently issued in the Walmart-Everlight Litigation (Ex-1016). I have applied those constructions here (Ex-1016). For instance, when defining electrode and/or housing cross sections below, the Court defined the cross sections as "plane surfaces formed by cutting a solid" (Ex-1016 at 2-3). I note that the claim 1 element "the housing cross section and the electrode portion cross section are not level with one another" was found indefinite (Ex-1016 at 3). To the extent that the claim is definite, I apply the plain and ordinary meaning of the claims to a POSITA. The prior art is so close to the claims that that whatever the "not level" limitation means, the prior art references satisfy the claim regardless of whether a Court has determined that the claim is indefinite.

6. Technical Background

57. In this section, I describe engineering that was well-known to a POSITA prior to 2014.

6.1. Light Emitting Diodes (LEDs)

58. A light-emitting diode (LED) is a semiconductor die that emits light when electric current flows through it. LEDs are well-known semiconductors dating back to as early as 1907.

59. LEDs can be made from a variety of semiconductor materials to emit different colors of visible light. For example, red LEDs, which were first introduced in the 1970s, can be made from Gallium Arsenide Phosphide (GaAsP), Gallium Phosphide (GaP), and Aluminum Gallium Arsenide (AlGaAs). Yellow LEDs, also demonstrated as early as 1972, can be made from GaAsP, GaP, and Aluminum Indium Gallium Phosphide (AlInGaP). And blue LEDs were made commercially available in 1989.

60. As the ’742 patent recognizes, LEDs are known to have several advantages including, “a long service life, a small volume, high resistance to shock, low heat generation and low power consumption,” and as such “have been widely used as indicators or light sources in household appliances” (Ex-1001, ’742 patent, 1:28-32).

61. LED chips are typically small and fragile. Thus, “[t]o impart the LEDs with good reliability, most of the LEDs are subjected to a packaging process to form durable light emitting devices” (Ex-1001, ’742 patent, 1:38-41).

62. LED packaging serves several purposes. For example, LED packaging provides electrically connection between the LED and a larger circuit; protects the device from environmental contaminants that would harm the semiconductor device (e.g., via encapsulation); provides an effective path for heat dissipation and thermal sinking to protect the chip from thermal degradation; permits effective transmission

of light; and allows for optical manipulation of the output light, for example with lenses. This was all well-known to a POSITA well before 2014.

63. Most LEDs are mounted within a package. The package includes several subcomponents, namely the LED, a surface or place where the LED is mounted (or as the '742 patent describes, a "carrier" or "housing"), and two electrical leads (or "electrodes" in the '742 patent's parlance). The package is then encapsulated in a material that both protects the LED and allows the light emitted by the LED to escape the package. The two leads provide electricity to the LED, with the positive electrode being the anode and the negative electrode being the cathode. This was all well-known to a POSITA well before 2014.

64. As the '742 patent describes, "[i]n recent years, a dicing-type carrier leadframe has been developed by manufacturers," whereby a "plastic body is molded on a metal sheet material, then a die bonding process, a wire bonding process and an encapsulation process are performed, and then the metal sheet material and the plastic body are diced away simultaneously to form individual light emitting devices that are separate from each other" (Ex-1001, '742 patent, 1:42-49).

65. The type of LED package manufacturing described in the '742 patent was well-known and widely used prior to 2014.

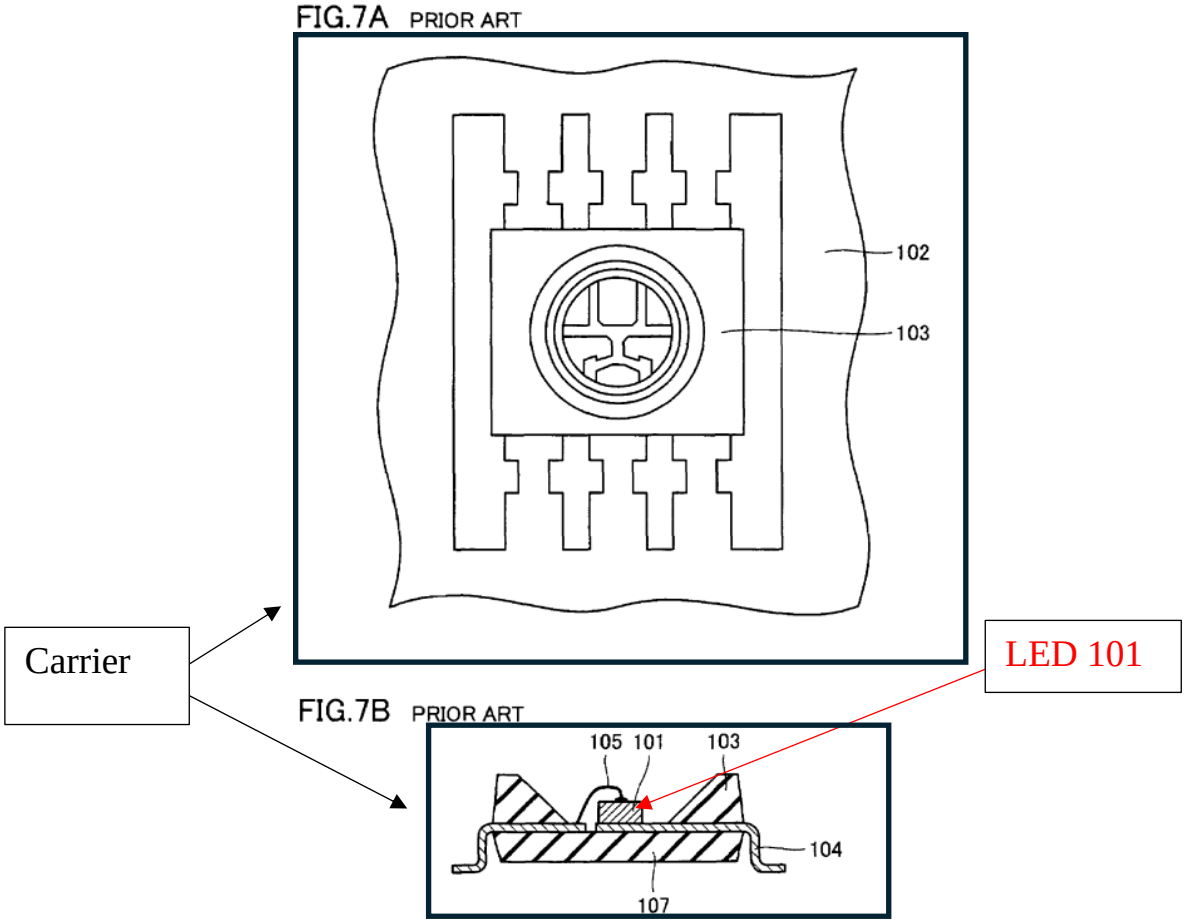
6.2. LEDs Carried in a Carrier Housing were Well-Known Prior to 2014

66. Prior to 2014, LEDs were commonly contained in a carrier housing. For example, in its "Background" section the '742 patent describes that prior to the '742 patent LEDs were die bonded to "a plastic body" (*i.e.*, a "carrier" or "carrier housing") (*See* Ex-1001, '742 patent, 1:42-46).

6.2.1. Chikugawa

67. U.S. Patent No. 7,161,190 to Chikugawa ("Chikugawa") (Ex-1017) issued on January 9, 2007 and matured from a patent application filed on August 1, 2005. Because Chikugawa issued on January 9, 2007 and matured from an application filed on August 1, 2005, I was instructed that Chikugawa is prior art to the '742 patent.

68. The below annotated version of "prior art" Chikugawa FIGs. 7A and 7B illustrate an LED 101 that is carried in a housing.



Figures 7A and 7B of Carey (Annotated)

6.2.2. Carey

69. Likewise, U.S. Patent No. 6,274,924 to Carey et al. ("Carey") (Ex-1018), which issued on August 14, 2001 and matured from an application filed on November 5, 1998, illustrates an LED carried in a carrier housing. Because Carey issued on August 14, 2001, I was instructed that Carey is prior art to the '742 patent.

70. For example, the below annotated version of Carey FIG. 2 shows a package or "carrier" with an LED die 16 mounted in a heat-sinking slug 10 in an "insert-molded leadframe 12" that "is a filled plastic material molded around a metal

frame" (i.e., an LED in a housing) (see Ex-1018, Carey, 2:20-58). Carey's package/carrier also has electrodes protruding from the side of the lead frame 12, and an optical lens 20 that "may be added by mounting a pre-molded thermoplastic lens and an encapsulant (not shown) or by casting epoxy to cover the LED or by a cast epoxy lens over the encapsulant (not shown)" (Ex-1018, Carey, 2:31-34).

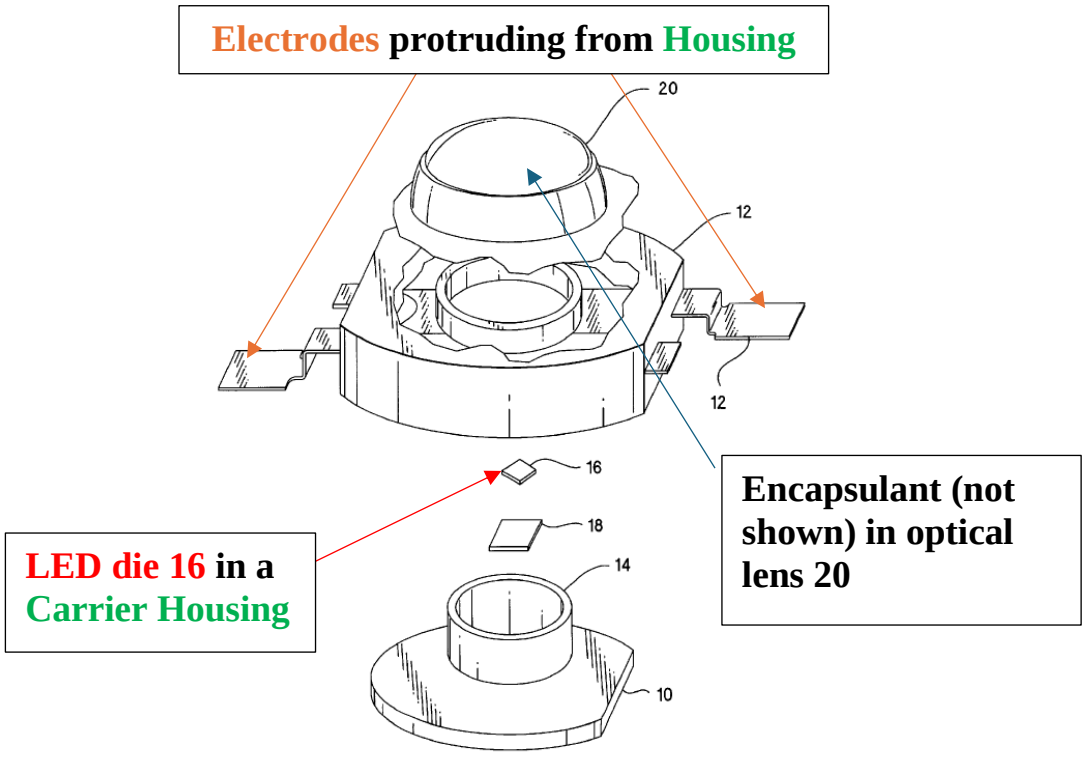


Figure 2 of Carey (Annotated)

6.2.3. Bogner

71. U.S. Patent No. 8,097,937 to Bogner et al. ("Bogner") (Ex-1019), which issued on January 17, 2012 and matured from a patent application filed on October 10, 2003, also illustrates a similar configuration. Because Bogner issued on January 17, 2012 and matured from an application filed in October 2003, I was instructed that Bogner is prior art to the '742 patent.

72. As shown in the below annotated version of Bogner FIG. 4, a radiation-emitting chip 5 (i.e., an LED) is mounted on a mounting area 11 of a thermal connecting part 4 in the housing base body 1 (Ex-1019, Bogner, 8:6-67). The Bogner

package/carrier also includes electrical connecting parts 12a, 12b (i.e., electrodes) that protrude from the housing body 1.

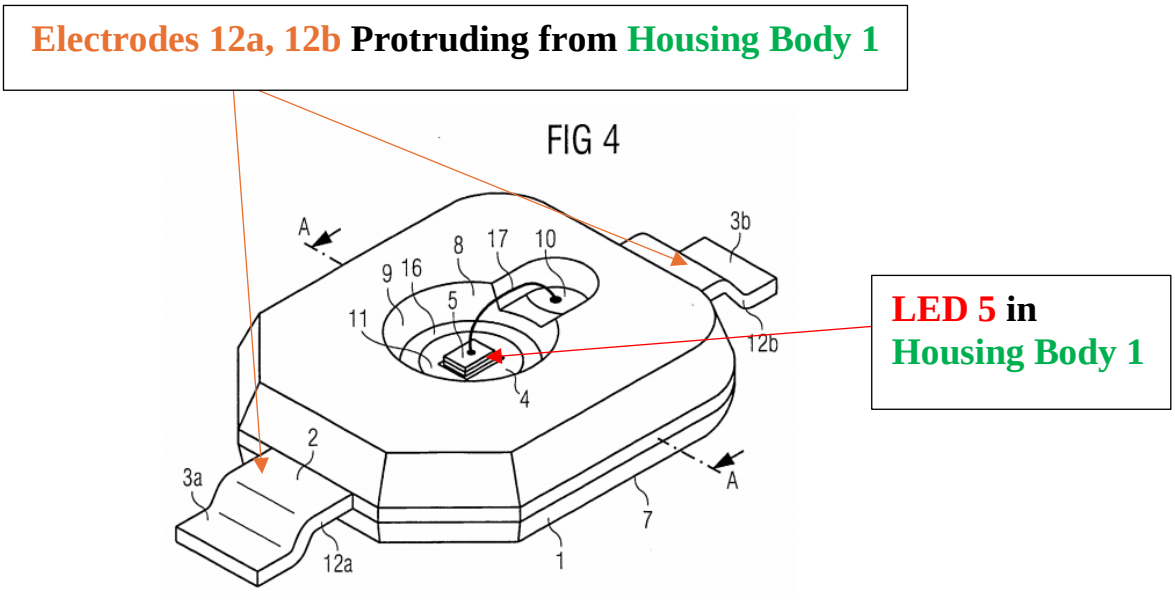


Figure 4 of Bogner (Annotated)

73. While not explicitly called out in the Figures, Bogner also teaches that the LED 5 "The chip is, preferably, at least partially sheathed by an encapsulation compound, preferably, a plastic compound, in particular, a casting resin or a molding compound" (Ex-1019, Bogner, 5:31-34).

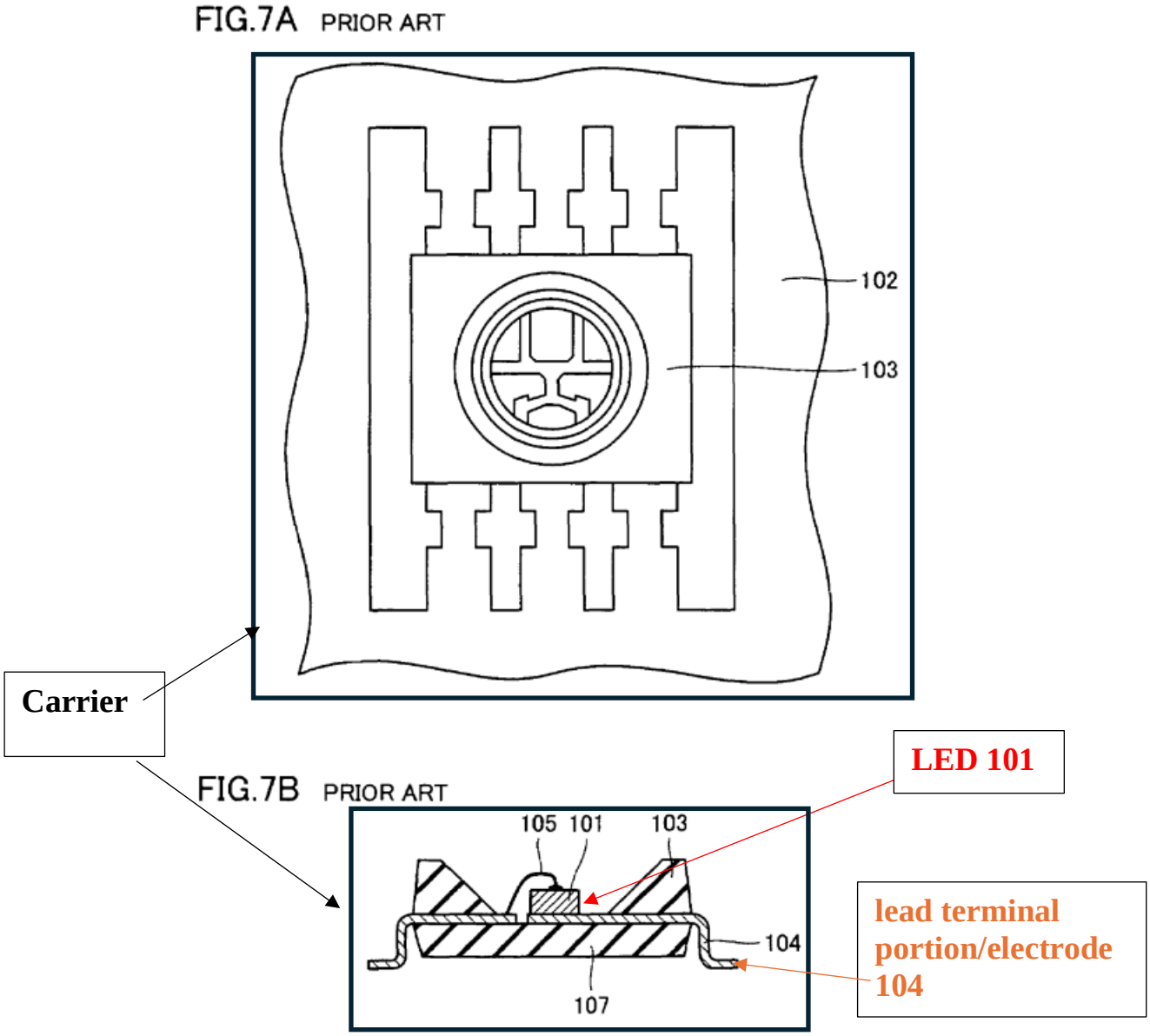
74. Chikugawa, Carey, and Bogner each exemplify that LED packages/carriers with LEDs mounted in housings that were commonplace and widely used before 2014.

6.3. LEDs Carried in a Carriers with Electrodes were Well-Known Prior to 2014

75. Prior to 2014, a POSITA knew that LEDs were commonly carried in packages/carriers that included electrodes.

6.3.1. Chikugawa

76. For example, the below annotated version of "prior art" Chikugawa FIGs. 7A and 7B illustrate an LED 101 that is carried in a housing. And Chikugawa further describes that the LED 101 is mounted on a "[l]ead frame 102 … [that] has a lead terminal portion 104," which are electrodes (Ex-1017, Chikugawa, 1:37-38).



Figures 7A and 7B of Carey (Annotated)

6.3.2. Carey

77. Similarly, the below annotated version of Carey FIG. 2 shows a package or "carrier" with an LED die 16 mounted in a heat-sinking slug 10 in an "insert-molded leadframe 12" that "is a filled plastic material molded around a metal frame" (*i.e.*, an LED in a housing) (*See* Ex-1018, Carey, 2:20-58). Carey's package/carrier

also has electrodes protruding from the side of the lead frame 12, and an optical lens 20 that "may be added by mounting a pre-molded thermoplastic lens and an encapsulant (not shown) or by casting epoxy to cover the LED or by a cast epoxy lens over the encapsulant (not shown)" (Ex-1018, Carey, 2:31-34).

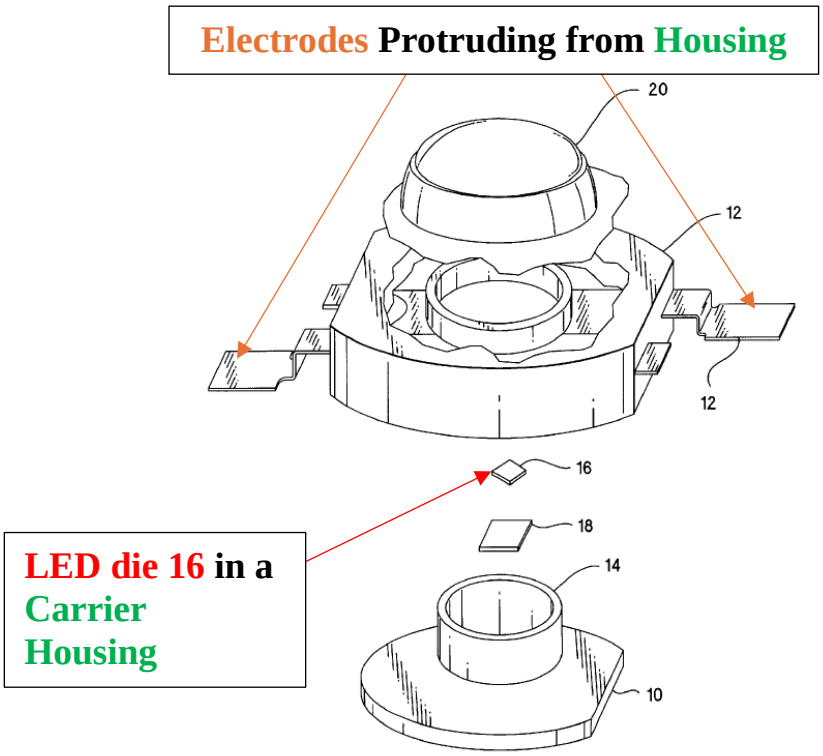


Figure 2 of Carey (Annotated)

6.3.3. Bogner

78. As shown in the below annotated version of Bogner FIG. 4, a radiation-emitting chip 5 (i.e., an LED) is mounted on a mounting area 11 of a thermal connecting part 4 in the housing base body 1 (*See* Ex-1019, Bogner, 8:6-67). The

Bogner package/carrier also includes electrical connecting parts 12a, 12b (i.e., electrodes) that protrude from the housing body 1.

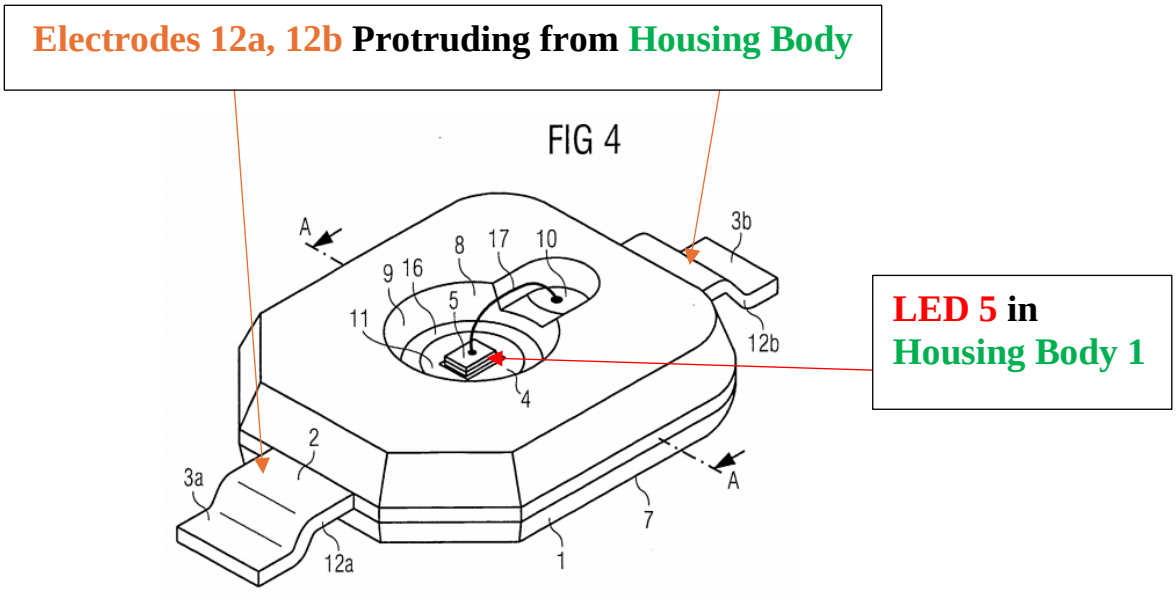


Figure 4 of Bogner (Annotated)

79. While not explicitly called out in the Figures, Bogner also teaches that the LED 5 "The chip is, preferably, at least partially sheathed by an encapsulation compound, preferably, a plastic compound, in particular, a casting resin or a molding compound" (Ex-1019, Bogner, 5:31-34).

80. Chikugawa, Carey, and Bogner each exemplify that LED packages/carriers with LEDs mounted in housings were commonplace and widely in use before 2014.

6.4. Manufacturing of LED's Packaging by Dicing Lead Frames was Known

81. Mass producing lead frames and dicing lead frames was known to a POISTA and widely used before 2014. In my experience, lead frame dicing has been used since the 1970s.

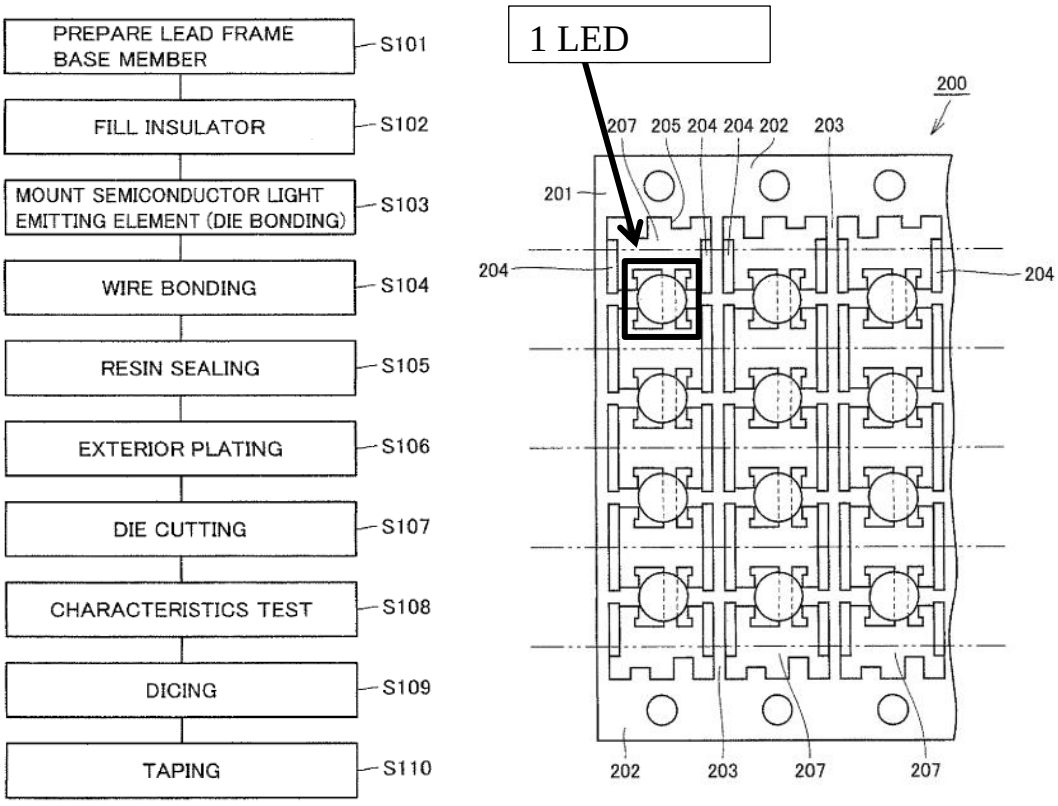
6.4.1. Takada

82. U.S. Patent No. 8,415,681 to Takada ("Takada") (Ex-1012) issued on April 9, 2013 and matured from a patent application filed on March 12, 2008. Because Takada issued on April 9, 2013 and matured from a patent application filed on March 12, 2008, I was instructed that Takada is prior art to the '742 patent.

83. Takada, for example, illustrates a dicing a lead frame in FIG. 4, which is reproduced below. With respect to dicing lead frames, Takada describes that "a dicing apparatus is used to cut multiple lead frame 200 along the outer shape of the semiconductor light emitting devices arranged in a matrix (i.e., along the alternate long and two short dashes line in FIG. 4)" (Ex-1012, Takada, 11:3-6). With such a lead frame design, "the singulation is performed, where the plurality of semiconductor light emitting devices are cut from multiple lead frame 200, each being separated into a single semiconductor light emitting device having single lead frame 1 and resin portion 2 surrounding lead frame 1" (Ex-1012, Takada, 11:7-12).

84. In the well-known LED package manufacturing process described in Takada, multiple LED packages are formed by, for example, stamping a metal sheet

to form metal frames, depositing a resin over at least part of the metal, and dicing the sheet to form individual LED packages (Ex-1012, Takada, 11:3-12; FIGs. 11-16). Takada FIG. 11 is one example of an LED manufacturing process, and Takada FIG. 12 illustrates LED packages singulation into individual packages.



Figures 11 & 12 of Takada (Annotated)

85. Takada further describes that "while each semiconductor light emitting device is connected to support frame (cradle) 202 by resin base member 207, the devices are electrically independent. Accordingly, in the subsequent step (S108), it is possible to perform a semiconductor light emitting device characteristics test for each multiple lead frame" (Ex-1012, Takada, 14:48-53). As shown in the above

Takada Fig. 11, the "CHARCTERISTIC TEST" at S108 is preformed prior to "DICING" at S108.

6.4.2. Abe

86. U.S. Patent No. 8,035,125 to Abe ("Abe") (Ex-1020) issued on October 11, 2011 and matured from an application filed on April 12, 2007. Because Abe issued on October 11, 2011 and matured from an application filed on April 12, 2007, I was instructed that Abe is prior art to the '742 patent.

87. As shown below, Abe FIG. 4 shows frame plate 20, which is a leadframe. Abe further describes that lead frame 20 has "a plurality of portions 3A corresponding to the lead frames 3 arranged in a matrix thereon," and that the "plurality of portions 3A corresponding to the lead frames 3 in which portions corresponding to the first electrode leads 11 and the second electrode leads 12 are punched out are arranged in a matrix" (Ex-1021, Abe, 8:40-47).

FIG. 4

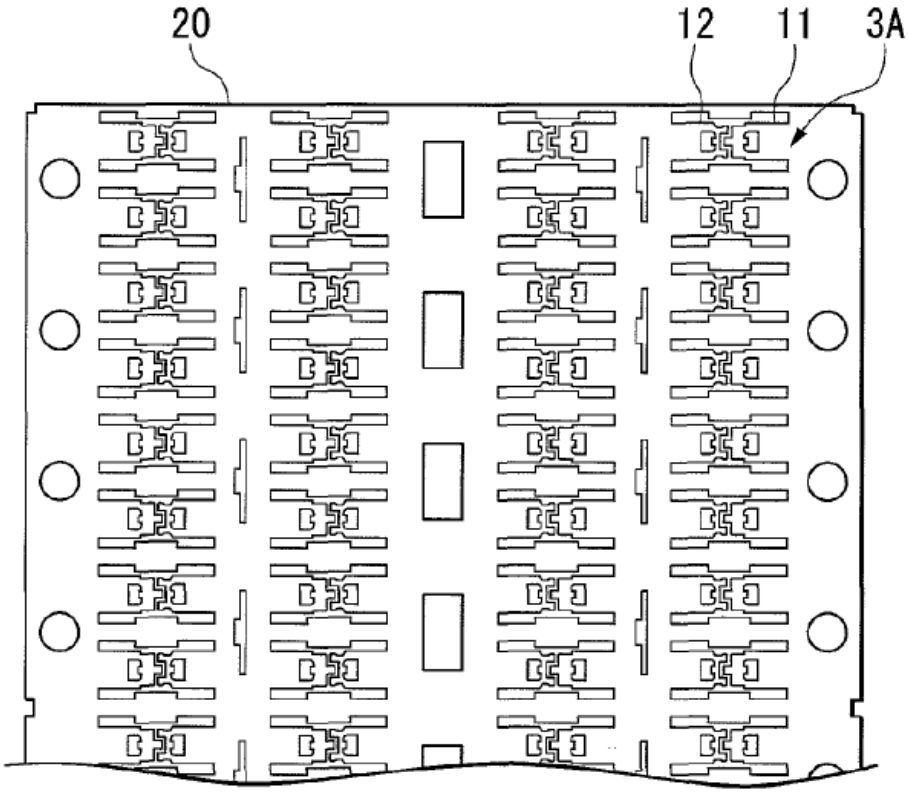


Figure 4 of Abe

6.4.3. Bando

88. Bando also shows a lead frame 110 in FIG. 4. Bando further describes such dicing-type lead frames as being used in the "conventional production of [] light emitting device[s]" where "a plurality of patterns for light emitting devices are formed in a lead frame 110 made of a sheet of conductive material (Ex-1009, Bando, 1:43-47). "Subsequently, the lead frame is subjected to production processes," and "is cut and separated into individual patterns," resulting in "a plurality of light emitting devices [being] produced at a time" (Ex-1009, Bando, 1:47-53).

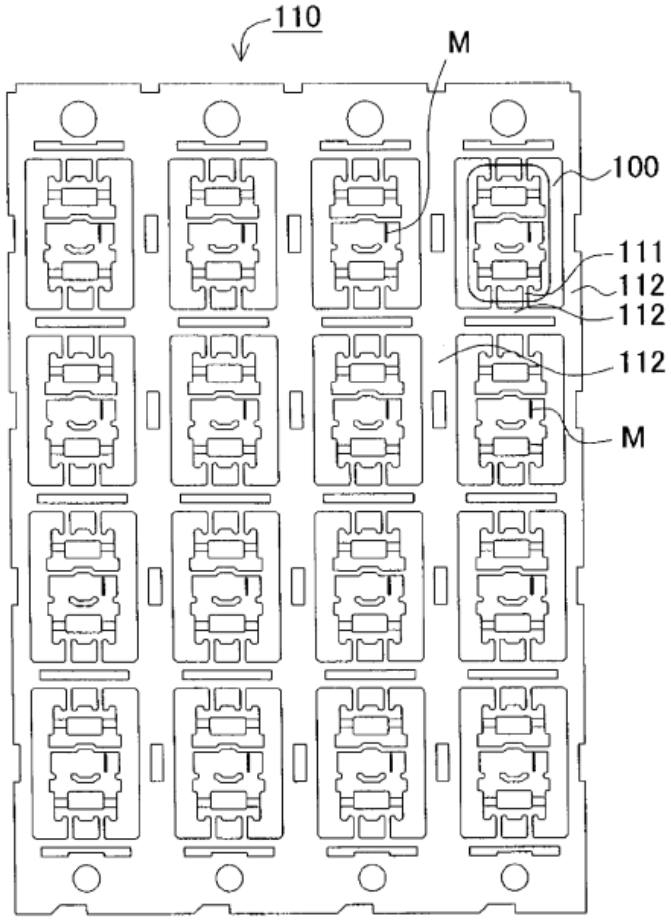


Figure 4 of Bando

6.4.4. Bierhuizen

89. World Intellectual Property Organization ("W.I.P.O") Publication No. WO2013118072A2 to Bierhuizen ("Bierhuizen") (Ex-1022) published on August 15, 2013. Because Bierhuizen published on August 15, 2013 and matured from an application filed on February 10, 2012, I was instructed that Bierhuizen is prior art to the '742 patent.

90. Bierhuizen also illustrates a well-known LED package manufacturing process. Bierhuizen describes an LED package manufacturing process that includes

testing the LED prior to dicing or singulation, as shown in the below Bierhuizen Figure 2.

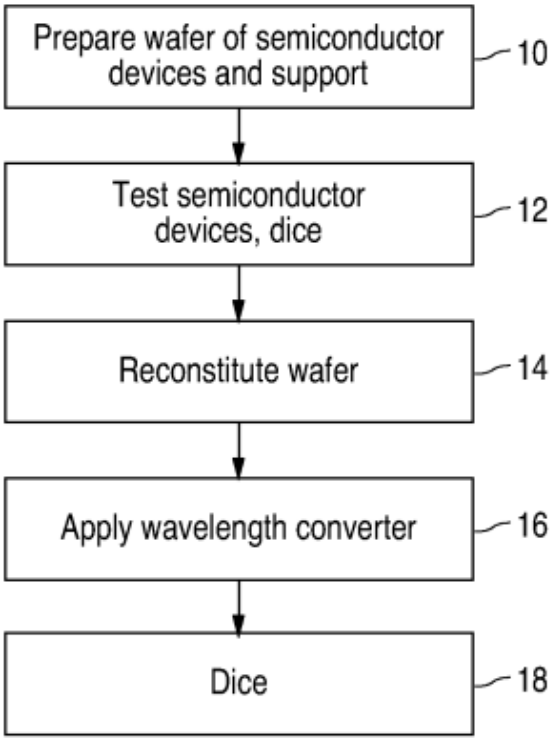


FIG. 2

Figure 2 of Bierhuizen

91. Bierhuizen's process allows "individual semiconductor devices on the wafer … to identify good devices, and optionally to identify characteristics of each device, such as the peak emission wavelength, brightness, etc." (Ex-1022, ¶ [0019]). Bierhuizen further describes that "[s]ince device testing is done before wavelength converting material is applied in stage 16 and only good devices are used, no wavelength converting material [i.e., encapsulant] is wasted on bad devices (i.e.

nonfunctional or non-light-emitting devices), which may reduce cost" (Ex-1022, ¶ [0020]). Bierhuizen also states that "based on the test described above in reference to stage 12, only devices that emit light within the same peak wavelength range are connected to substrate 28 in the reconstituted wafer, such that the wavelength converting material can be matched to the peak emission wavelength of the devices, which may improve yield" (Ex-1022, ¶ [0020]).

92. Takada, Abe, Bando, and Bierhuizen each exemplify that manufacturing and/or packaging LEDs by dicing leadframes was well-known before 2014.

7. The '742 Patent

93. The '742 patent issued on February 27, 2018 and matured from U.S. Patent Application No. 15/441,644 filed on February 24, 2017. The '742 patent also claims priority to a foreign patent application filed May 23, 2014.

7.1. The Relevant Technical Field

94. The '742 patent includes twenty-two claims, two of which are independent. Independent claim 1, is directed to a "light emitting device" that includes five structural components: (1) a resin housing; and (2) an electrode portion that comprises at (3) wing portion that comprises (4) a central area and (5) at least one edge area (Ex-1001 at 13:56-14:14). Independent claim 11 is similar and generally includes the similar structural components (Ex-1001 at 14:43-62).

95. As I explain in Section 6 above, each of the five structural components claimed in the ’742 patent was well-known and widely used before 2014.

7.2. The ’742 Patent’s LED Package

96. The ’742 patent describes LED packages with conventional LED components, such as an LED, protruding electrodes, and a housing, as I introduce in Section 6 above. The ’742 patent further describes different configurations of the claimed “electrode portion” relative to the “housing” (Ex-1001 at 14:6-49). But the ’742 patent fails to state that any of these structural configurations are supposedly inventive.

97. Rather, the ’742 patent generally describes that an LED “carrier” or package “includes a housing and at least one electrode portion” (Ex-1001 at 3:11-12). For instance, the carrier 110 of FIG. 1 comprises a housing 111 and two electrode portions 112 having wing portions 112A, and the wing portions 112A are “exposed outside of the housing” (Ex-1001 at 6:41-42). As shown in the below annotated FIG. 1, the “wing portions 112A” have a central protruding area 112A1 [purple] and two outer edge areas 112A2 [blue] (Ex-1001 at 3:27-30; 6:41-45).

'742 Patent FIG. 1 (Annotated)

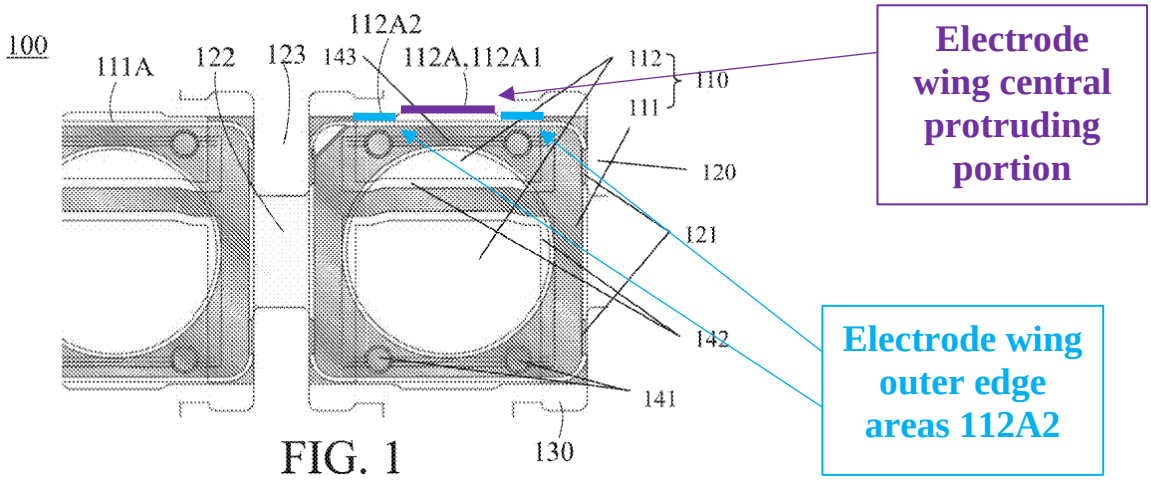


FIG. 1

98. In FIG. 1, "each of the edge areas 112A2 comprises an electrode portion cross section, and the electrode portion cross sections are level with a part of the housing cross section 111A of the housing 111" (Ex-1001 at 6:45-48).

'742 Patent FIG. 1 (Annotated)

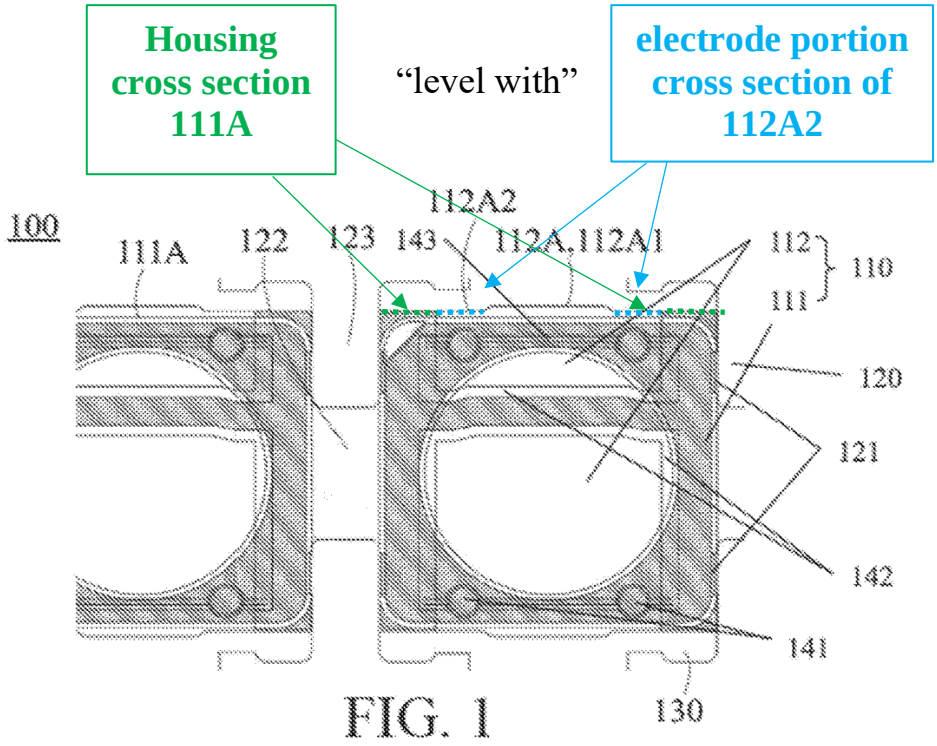


FIG. 1

99. The '742 discusses several variations of its LED packages, with their main differences being the shape of the electrode portion or "wing" that protrudes from the housing (*See e.g.*, Ex-1001 at FIG. 7-12). For example, FIGs. 7, 9, and 10 depict various examples in which both the central area 112A2 and the edge areas 112A1 protrude from the housing (Ex-1001 at 8:4-20; 8:38-59). In these examples, the central area 112A1 protrudes from the edge areas 112A2 (Ex-1001 at 8:4-20; 8:38-59).

742 Patent FIGs. 7, 9, and 10 (Annotated)

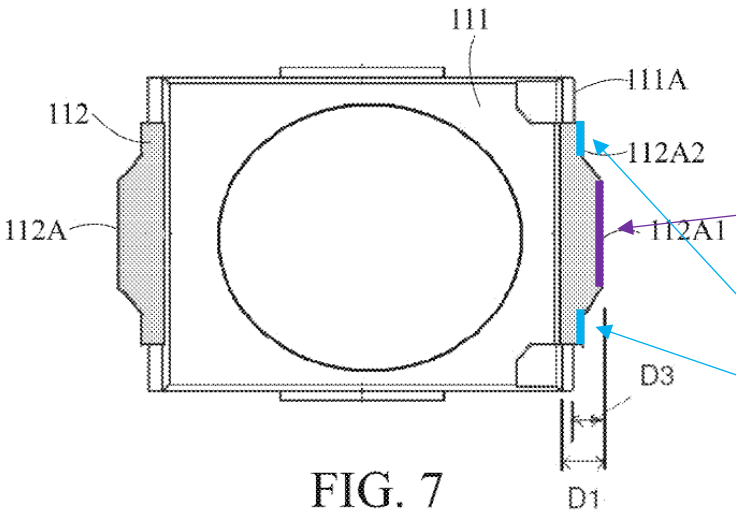


FIG. 7

Protruding Electrode wing 112A includes

Electrode wing central portion 112A1

protruding from

Electrode wing outer edge areas 112A2

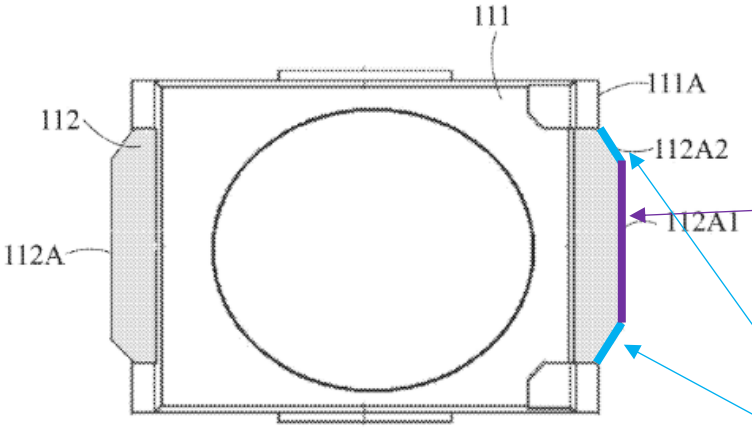


FIG. 9

Protruding Electrode wing 112A includes

Electrode wing central portion 112A1

protruding from

Electrode wing outer edge areas 112A2

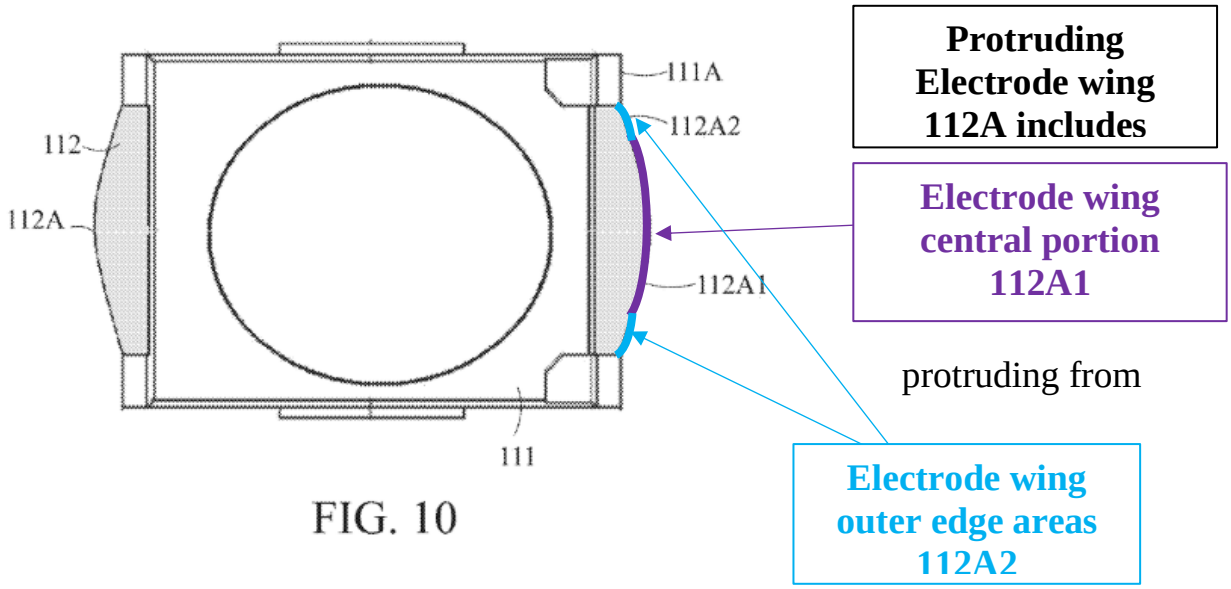


FIG. 10

100. In contrast, in the examples shown in FIG. 8 and 11, the electrode wing portion 112A is "recessed" within the housing cross section 111A (Ex-1001 at 8:21-27; 8:60-9:3). In each of these examples, central area 112A2 and the edge areas 112A1 are within the housing cross section 111A and do not protrude from the housing cross section 111A (Ex-1001 at 8:21-27; 8:60-9:3).

'742 Patent Figures 8 and 11 (Annotated)

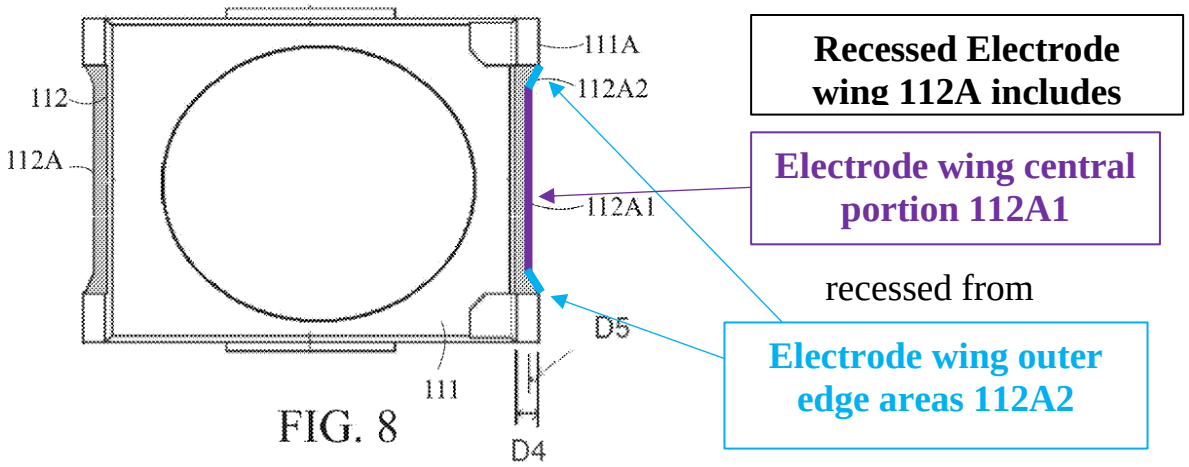


FIG. 8

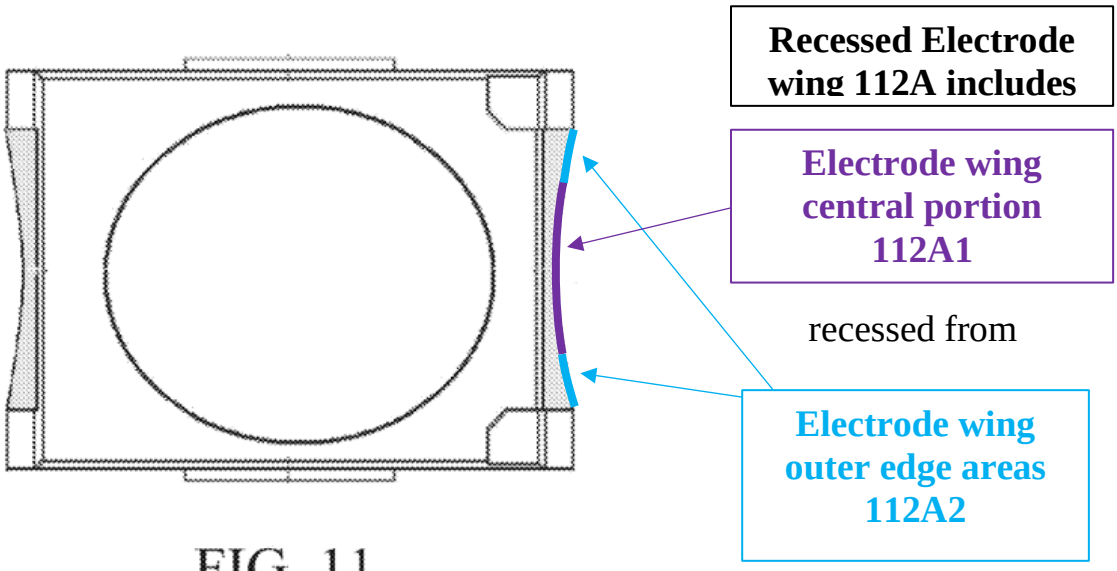


FIG. 11

101. FIG. 17A below illustrates an example with two carrier lead frames before they are cut from each other (Ex-1001 at 11:65-12:8). In this example, the housing cross section 111A may have a "curved surface e.g. rounded corner 111R" (Ex-1001 at 12:19-22). The '742 patent provides no alleged benefit from rounding a housing corner. The "electrode portion cross section of the electrode portion may also comprise a curved surface," though the curved surfaces are not limited to one curved surface (Ex-1001 at 12:24-26). In this embodiment, the housing cross section and the electrode cross section do not form a flat surface (Ex-1001 at 12:31-35).

’742 Patent FIG. 17D (Annotated)

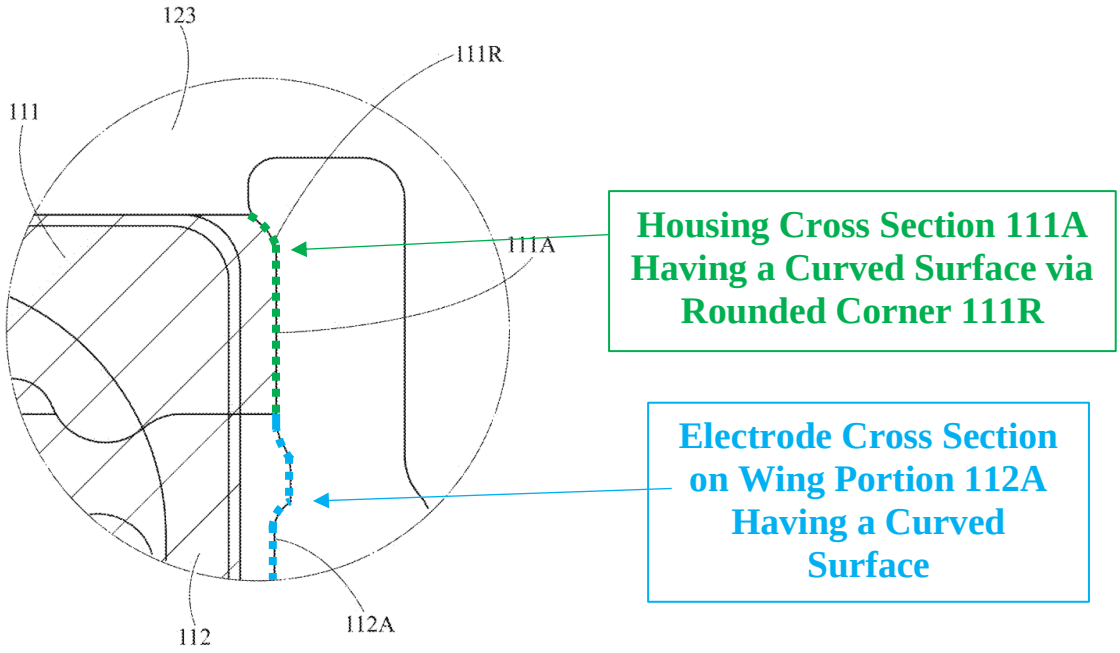


FIG. 17D

102. As the ’742 patent admits, LED packages having a plastic body molded on a metal sheet, an LED that was die bonding to the package, wire bonds for electrically connecting the LED to the electrode, and an encapsulant for encapsulating the LED were all well-known (Ex-1001 at 1:42-60). The ’742 patent does not provide much, if any, explanation of what was allegedly new or inventive about its disclosures of the very same structures.

7.3. The Claims of the ’742 Patent

103. Clams 1 and 11 are independent. Claim 1’s “light emitting device” has two main structural elements, an “at least one electrode portion” and a “resin housing” and claims relationships between these portions (Ex-1001 at 13:55-59).

104. Claim 1 is set forth below with claim identifiers for reference below:

Claim Limitation Identifier	**Claim Limitation**
preamble	A light emitting device comprising:
electrode portion	at least one electrode portion
resin housing	a resin housing containing a reflecting material and covering a portion of said at least one electrode portion
wing portion	wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction
central area and edge area	wherein the wing portion comprises: a central area; and at least one edge area having a length in the length-wise direction shorter than that of the central area, and
edge area protrudes	wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area,
electrode portion cross section	wherein the at least one electrode portion further comprises an electrode portion cross section,
housing cross section	wherein the resin housing comprises at least one housing cross section,

four corners	wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing, and
not level	wherein the at least one housing cross section is not level with the electrode portion cross section.

105. In sum, claim 1 recites "at least one edge area" and a "central area" that define half of what can be thought of as a "U-Shaped" electrode. As an example, some, but not all, of claim 1's limitations are shown below in FIGs. 17A and 17D the claimed "U-Shaped" electrode.

106. As shown in one package from FIG. 17A below, the light emitting device includes an electrode portion 112 (orange) and a resin housing (green) 111 having four corners.

'742 Patent FIG. 17A (Cropped and Annotated)

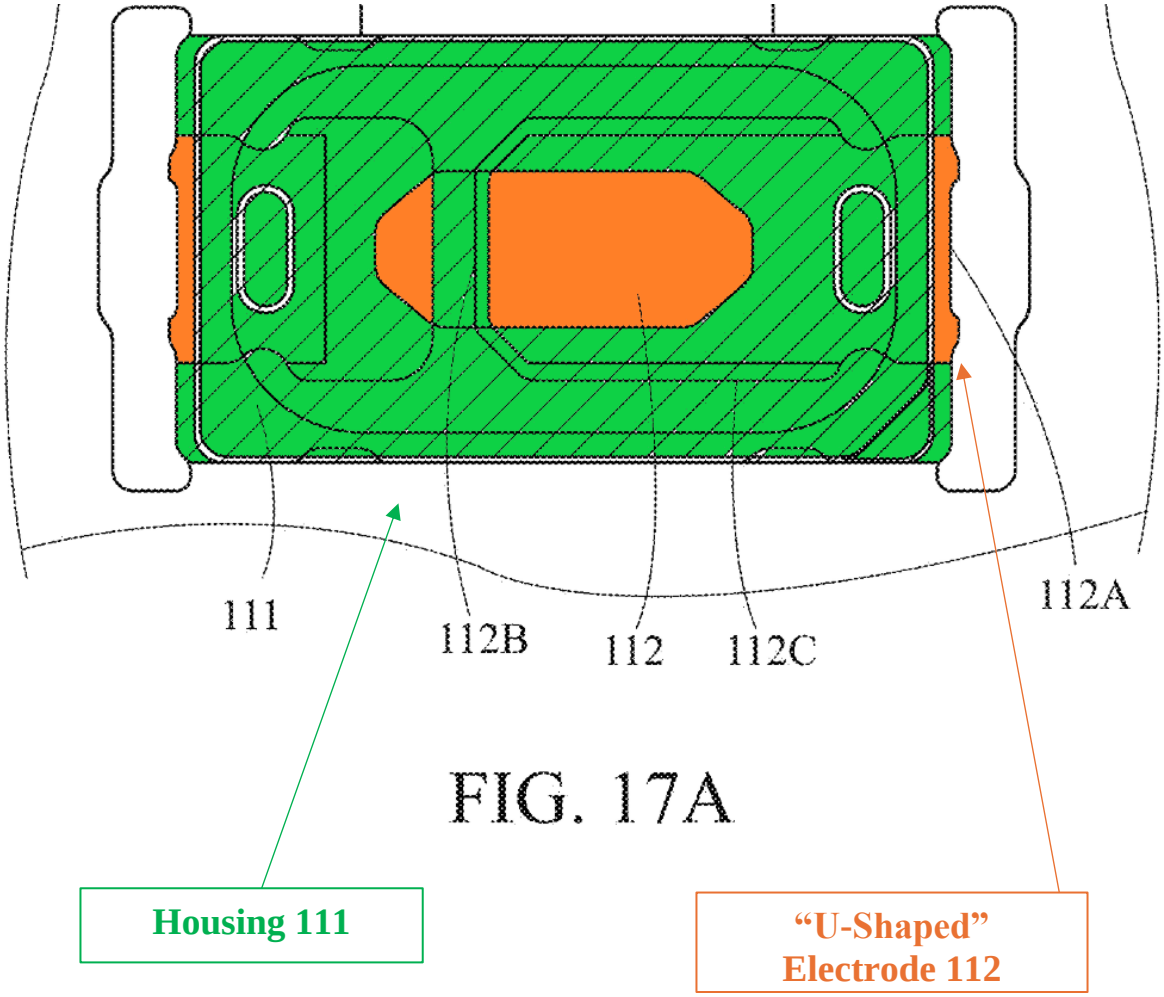
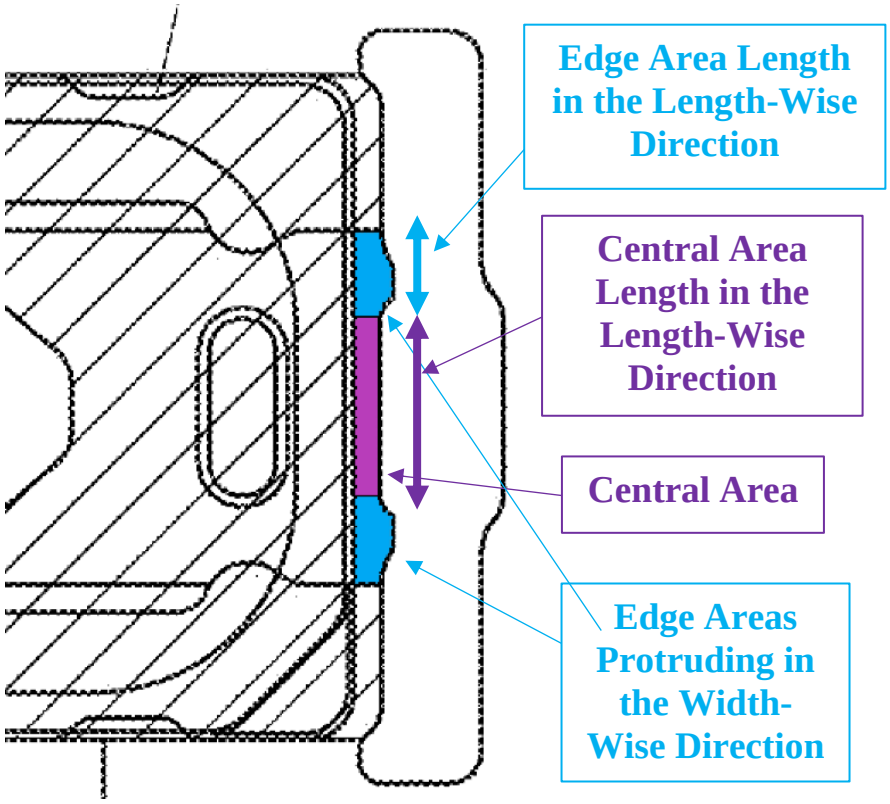


FIG. 17A

107. Additionally, as shown in the below annotated FIG. 17A, the "U-Shaped" electrode portion comprises "edge areas" (blue) and a "central area" (purple). Further, the "edge areas" have "a length in the length-wise direction shorter than that of the central area." Also, FIG. 17A's edge areas protrude "in the width-wise direction from an end portion of the central area."

'742 Patent FIG. 17A (Cropped and Annotated)



108. Claim 11 is set forth below with claim identifiers for reference below.

Claim Limitation Identifier	Claim Limitation
preamble	A light emitting device comprising:
electrode portion	at least one electrode portion having a wing portion;
resin housing	and a resin housing containing a reflecting material,
central area	wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing;

edge area	and at least one edge area protruding from an edge portion of the central area, in the first direction,
recessed	wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing,
electrode portion cross section	wherein the at least one electrode portion further comprises an electrode portion cross section,
housing cross section	wherein the resin housing comprises at least one housing cross section,
housing corner	wherein the at least one housing cross section is located in a vicinity of a comer of the resin housing, and
not level	wherein the at least one housing cross section is not level with the electrode portion cross section,
edge areas protrude	wherein the at least one edge area comprises two edge areas, wherein the two edge areas protrude from the central area in the first direction.

8. Overview of the Prior Art

8.1. Kim

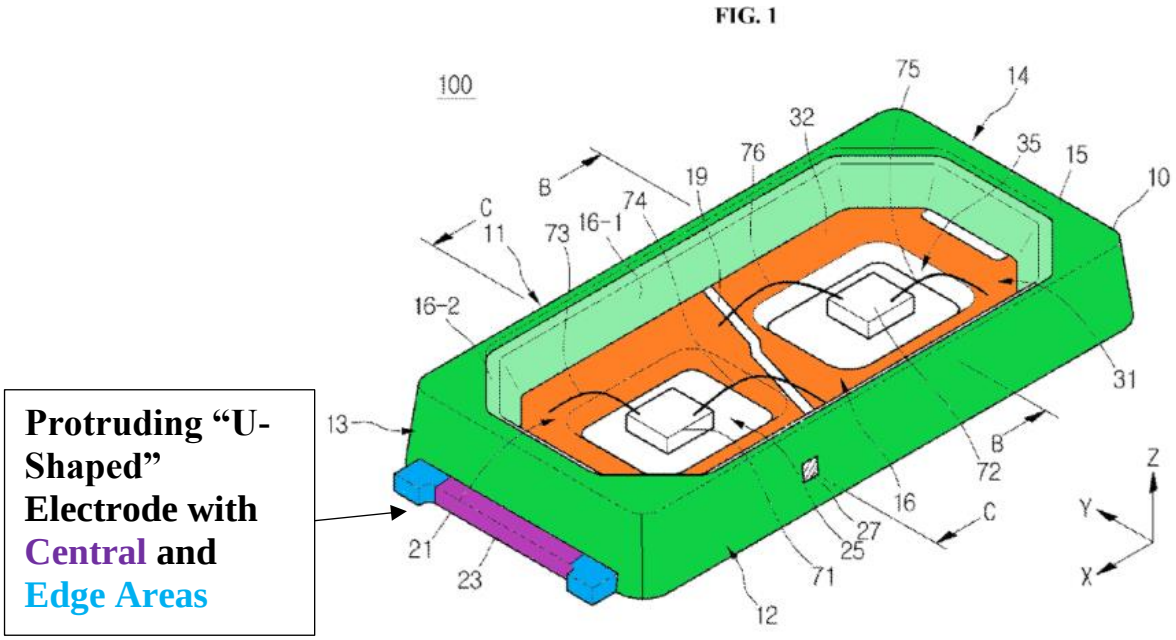
109. "Kim" refers to United States Patent Application Publication No. US2014/0054629 (Ex-1004) that published on February 27, 2014. Because Kim published in February 2017, I was instructed that Kim is prior art to the '742 patent.

110. Kim discloses an LED inside a reflective resin body 10 (green) or housing that its resin housing body 10 may contain a reflecting material such as "a

filler serving as a metal oxide such as TiO2 or SiO2 may be added … in order to increase reflection efficiency" (Ex-1004 at [0051]).

111. Kim discloses the same structure as claims 1 and 11 of the '742 patent. For example, as shown in the below annotated FIG. 1, Kim discloses a generally "U-Shaped" electrode (or "wing portion") protruding from the housing (green). Kim further discloses the exposed "U-Shaped" electrode further comprises two edge portions (blue) and a central portion (purple) that protrude from the resin housing 10 (green):

Kim Fig. 1 (Annotated)

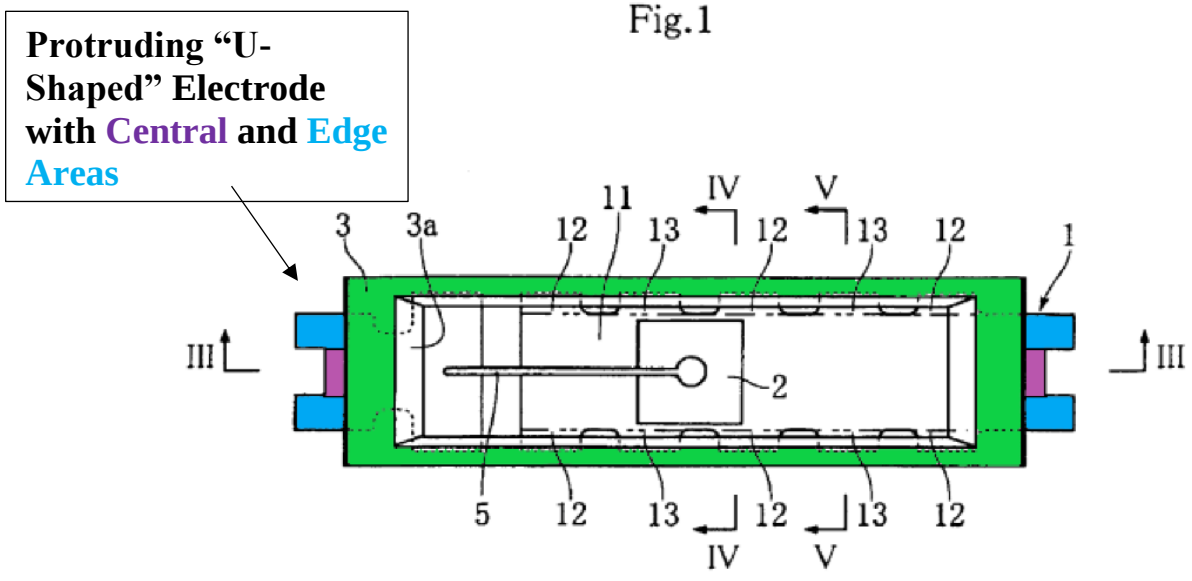


8.2 Kobayakawa

112. "Kobayakawa" refers to U.S. Patent No. 7,825,426, which issued on November 2, 2010 (Ex-1005). Because Kobayakawa issued on November 2010, I was instructed that Kobayakawa is prior art to the '742 patent.

113. Kobayakawa also discloses the same structure as claims 1 and 11 of the '742 patent. Kobayakawa discloses a semiconductor light-emitting device having a "case 3" (green) that for example is "made of a white resin" (Ex-1005 at 3:21-29). Kobayakawa also discloses a lead frame 1 having an exposed, "U-Shaped" electrode or "wing portion" that includes edge areas (blue) and a central area (purple) that extends from the resin housing 3 (green). The is shown in the below annotated Kobayakawa FIG. 1:

Kobayakawa Fig. 1 (Annotated)

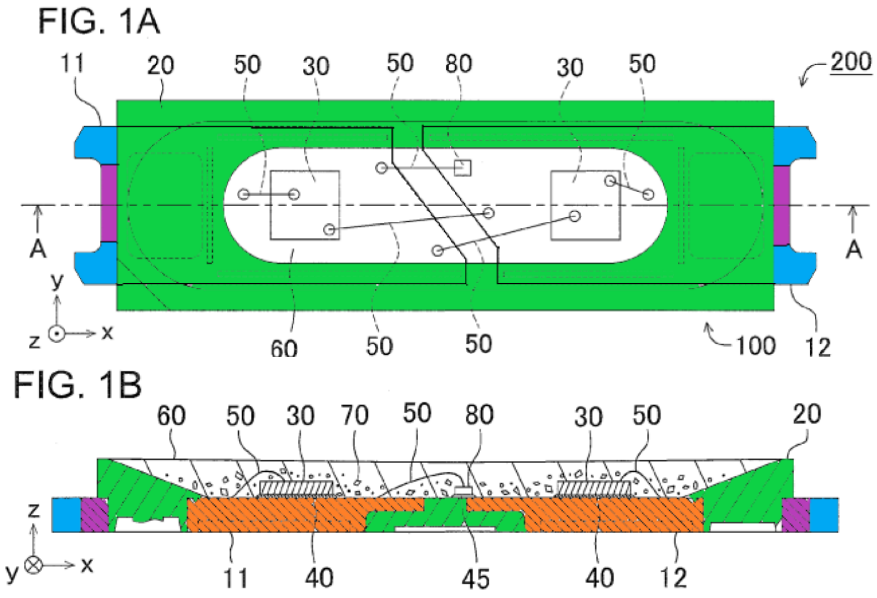


8.3 Hayashi

114. "Hayashi" refers to U.S. Patent Application Publication No. US2014/0117403, which published on May 1, 2014 (Ex-1006). Because Hayashi published on May 1, 2014, I was instructed that Hayashi is prior art to the '742 patent.

115. Hayashi discloses the same structure as claims 1 and 11 of the '742 patent. For example, as shown in the below annotated FIGs. 1A and 1B, Hayashi discloses a molded resin housing 20 (green) and a protruding "U-Shaped" electrodes 11, 12 that each have two edge areas (blue) and a central area (purple):

Hayashi Figs. 1A & 1B (Annotated)



9. The Challenged Claims are Unpatentable

9.1. Claims 1, 2, 5-16, and 20-22 are Anticipated by Kim

116. It is my opinion that Kim anticipates claims 1, 2, 5-16 and 20-22 of the ’742 patent.

9.1.1. Claim 1

117. For the reasons below, it is my opinion that Kim discloses each limitation of claim 1 of the ’742 patent, and thus claim 1 is anticipated by Kim.

9.1.1.1 Claim 1: “A Light Emitting Device Comprising …”

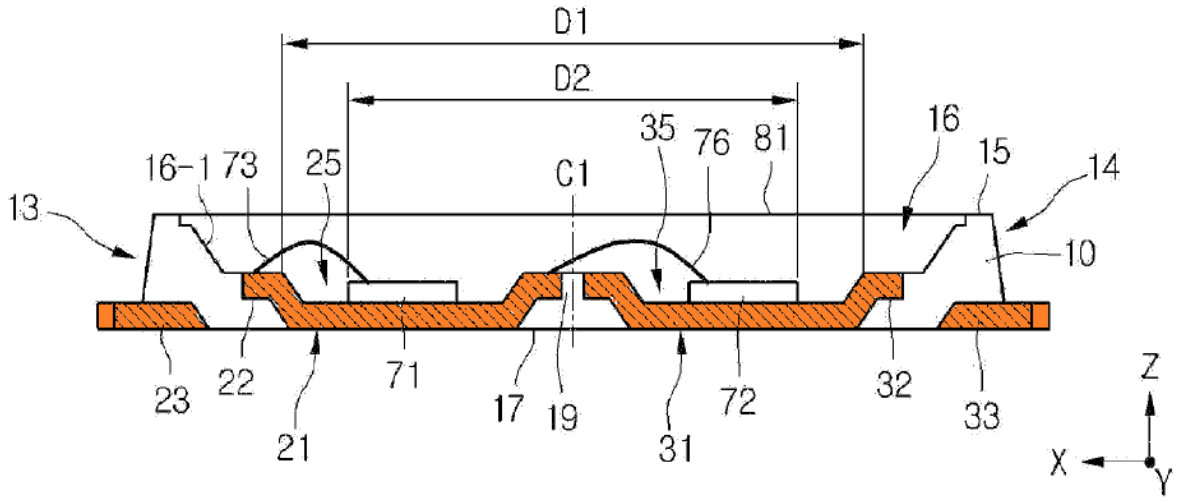
118. It is my opinion that Kim discloses “[a] light emitting device comprising…” via its “light emitting device 100” (Ex-1004 at [0050]).

9.1.1.2. Claim 1: “at Least one Electrode Portion”

119. It is my opinion that Kim discloses the “at least one electrode portion limitation of claim 1 through its lead frames 21, 31, which are shown in orange in the below annotated Kim FIG. 3 (Ex-1004 at ¶¶ [0050]; [0060]):

Kim Fig. 3 (Annotated)

FIG. 3

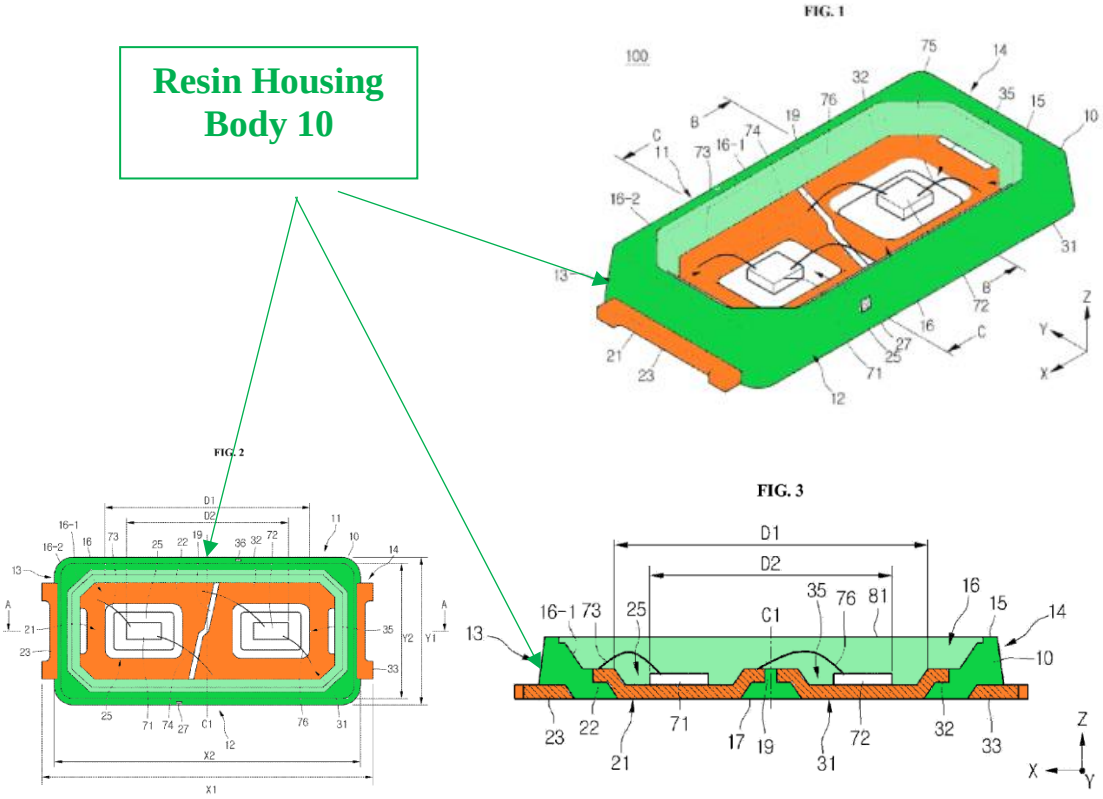


9.1.1.3. Claim 1: "a resin housing containing a reflecting material and covering a portion of said at least one electrode portion"

120. It is my opinion that Kim discloses the "resin housing containing a reflecting material and covering a portion of said at least one electrode portion" limitation of claim 1. For example, Kim' "body 10" is the claimed "resin housing containing a reflective material and covering a portion of said at least one electrode portion." Kim describes that its resin housing "body 10 may include at least one of a resin material, such as PPA (Polyphthalamide), Si, a metallic material, PSG (photosensitive glass, Al203, and PCB" (Ex-1004 at ¶ [0051]). Resins and metallic materials, such as those described in Kim are reflective. Indeed, Kim further states that a "filler serving as a metal oxide such as TiO2 or SiO2 may be added in an epoxy

or silicon material used for the body 10 in order to increase reflection efficiency" (Ex-1004 at ¶ [0051]). And as shown in the below annotated Kim FIGs. 1-3, the resin housing body 10, which is shown in green, covers a portion of the lead frames 21, 31 (e.g., "electrode portion"), which is shown in orange:

Kim FIGs. 1-3 (Annotated)



9.1.1.4. Claim 1: "wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction"

121. It is my opinion that Kim discloses the "wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction" limitation of claim 1.

122. For example, Kim's lead frame portions 23, 33 each correspond to the claimed "wing portion." As shown in the below annotated Kim FIGs. 1-3, the lead frame (or "wing") portions 23, 33, which are shown in red, are: (1) exposed outside of the resin housing body 10 (green), (2) extend in the "Y" (or "length-wise direction") direction along an edge of the resin housing body 10; and (3) protrude from the resin housing body 10 in an "X" (or width-wise) direction.

Kim FIGs. 1-3 (Annotated)

FIG. 1

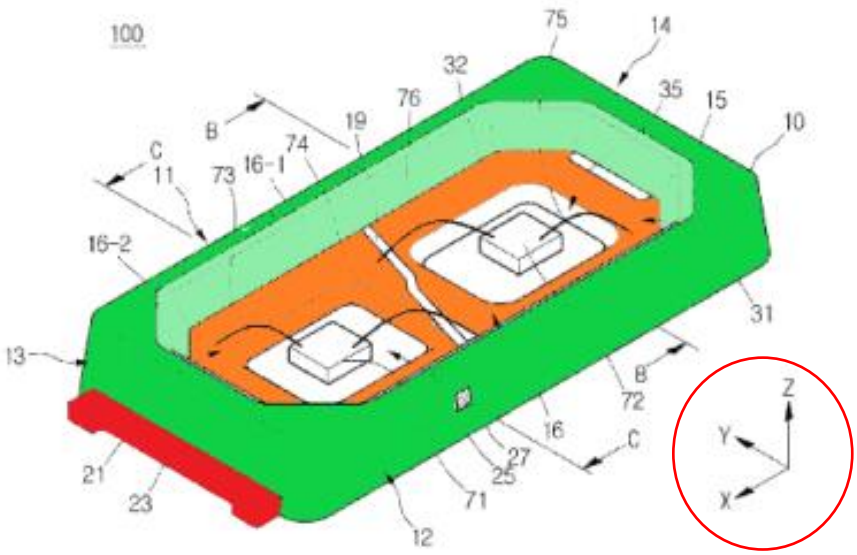


FIG. 2

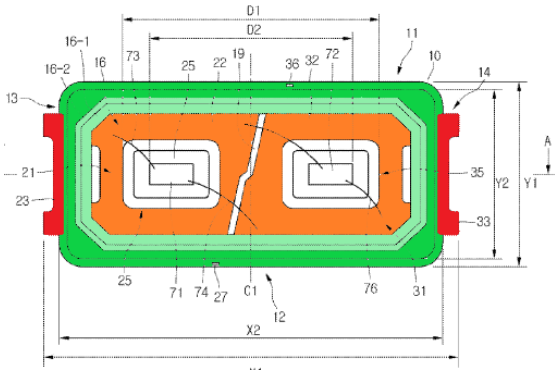
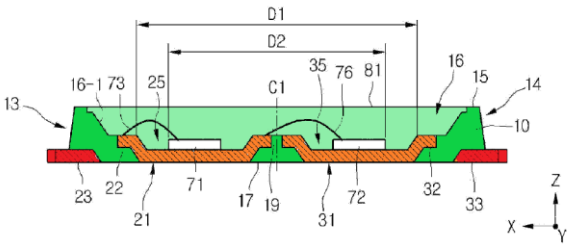


FIG. 3

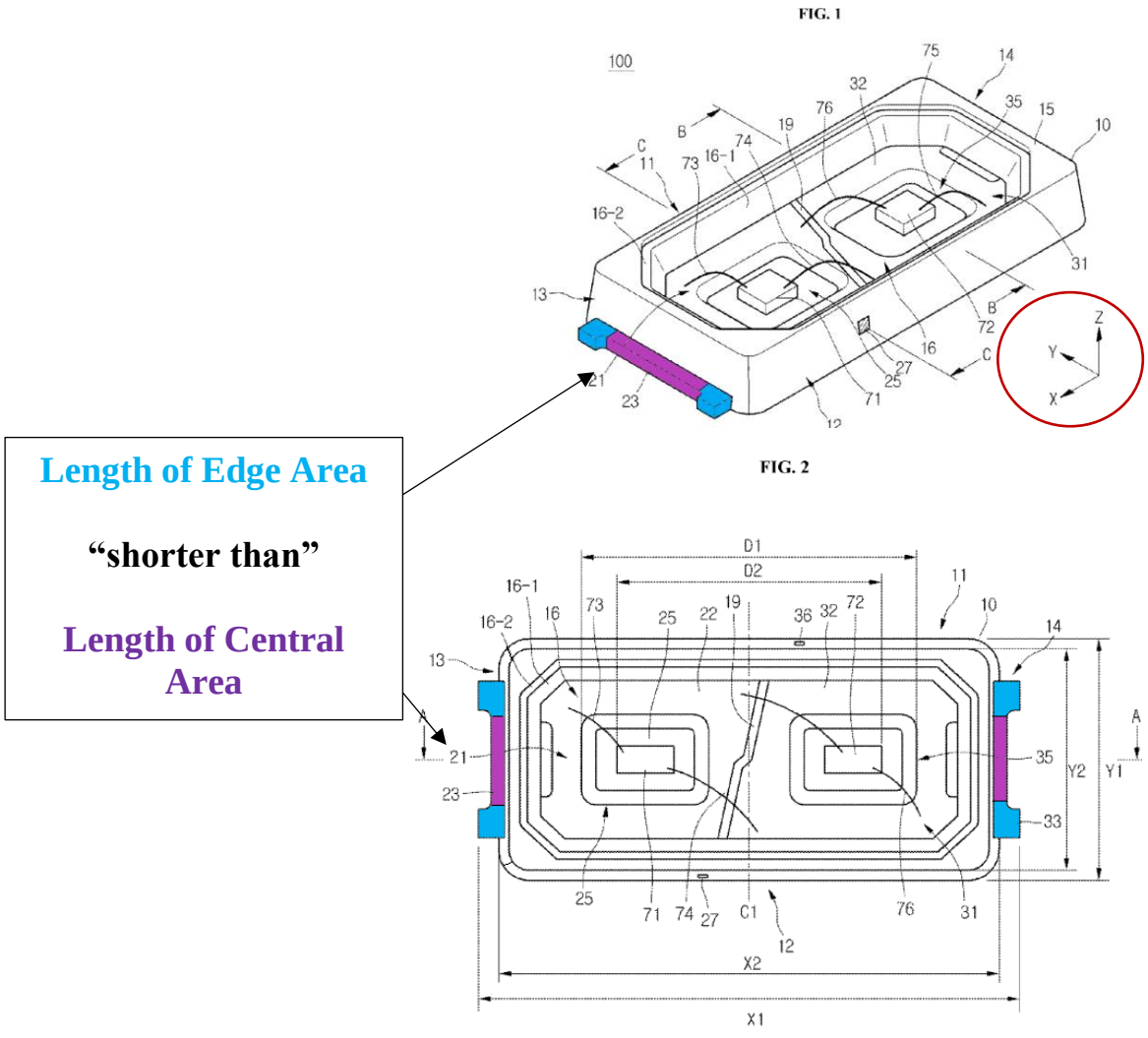


9.1.1.5. Claim 1: "wherein the wing portion comprises: a central area; and at least one edge area having a length in the length-wise direction shorter than that of the central area"

123. It is my opinion that Kim discloses the "wherein the wing portion comprises: a central area; and at least one edge area having a length in the length-wise direction shorter than that of the central area" limitation of claim 1.

124. For instance, Kim discloses that the lead frames 21, 31, which are the claimed electrode portion, each have a "central area" (shown in purple) and "at least one edge area" (shown in blue) having a length in the length-wise direction" (*i.e.*, "Y" direction) "shorter than that of the central area." This is shown in the below annotated Kim FIGs. 1 and 2.

Kim Figs. 1 & 2 Annotated



9.1.1.6. Claim 1: "wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area"

125. It is my opinion that Kim discloses the "wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area" limitation of claim 1.

126. For example, the below annotated Kim FIGs. 1 and 2 illustrates that the two edge areas (blue) on each of lead frames 21, 31 "protrude[] in the width-wise," or "X," "direction from an end portion of the central area [purple]":

Kim Figs. 1 & 2 (Annotated)

FIG. 1

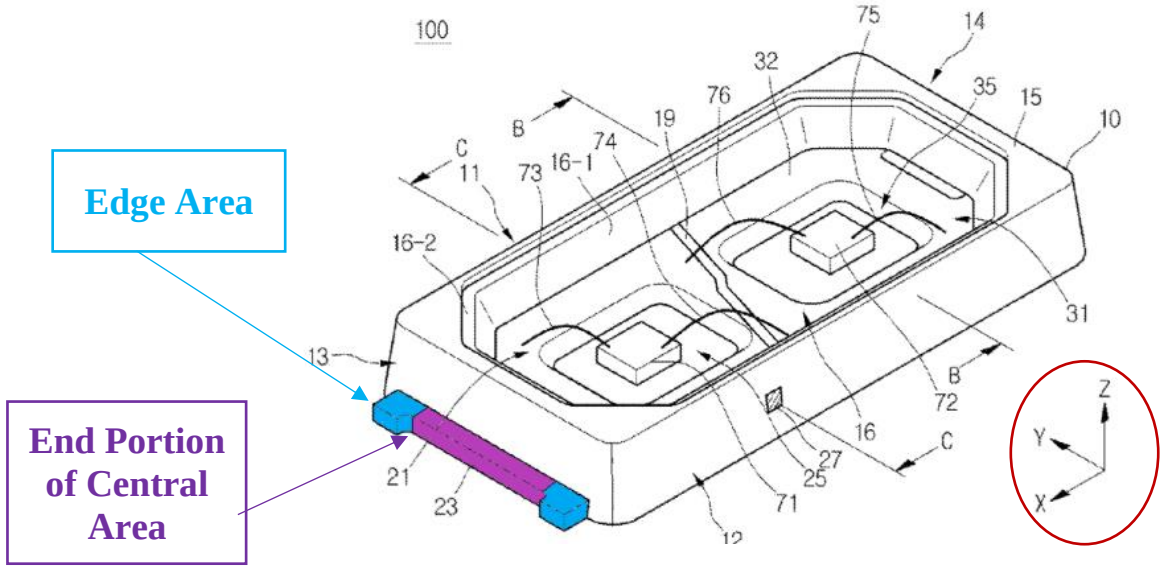
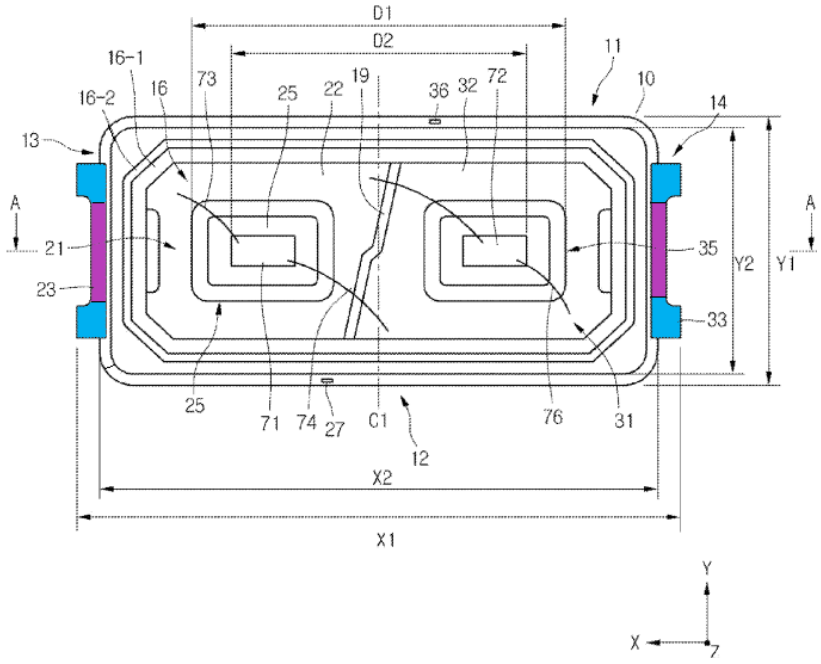


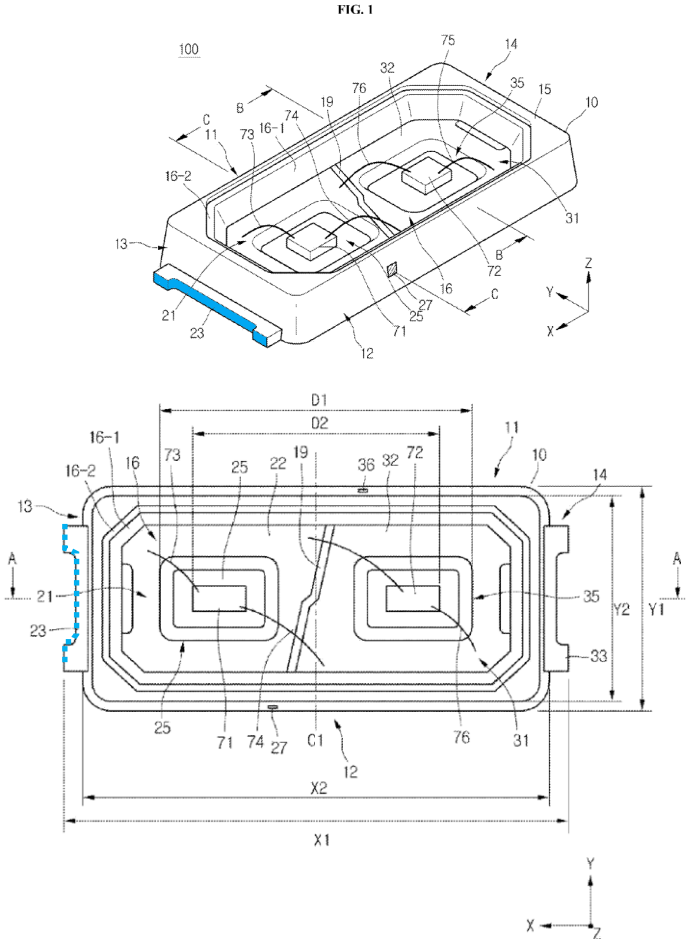
FIG. 2



9.1.1.7. Claim 1: "wherein the at least one electrode portion further comprises an electrode portion cross section"

127. It is my opinion that Kim discloses the "wherein the at least one electrode portion further comprises an electrode portion cross section" limitation of claim 1. As shown in the below annotated Kim FIGs. 1 and 2, Kim discloses a "electrode portion cross section," which is shown in blue, on the edge of the lead frame portion 23. Although not shown in the below annotation, a similar electrode portion cross section on the edge of lead frame potion 33.

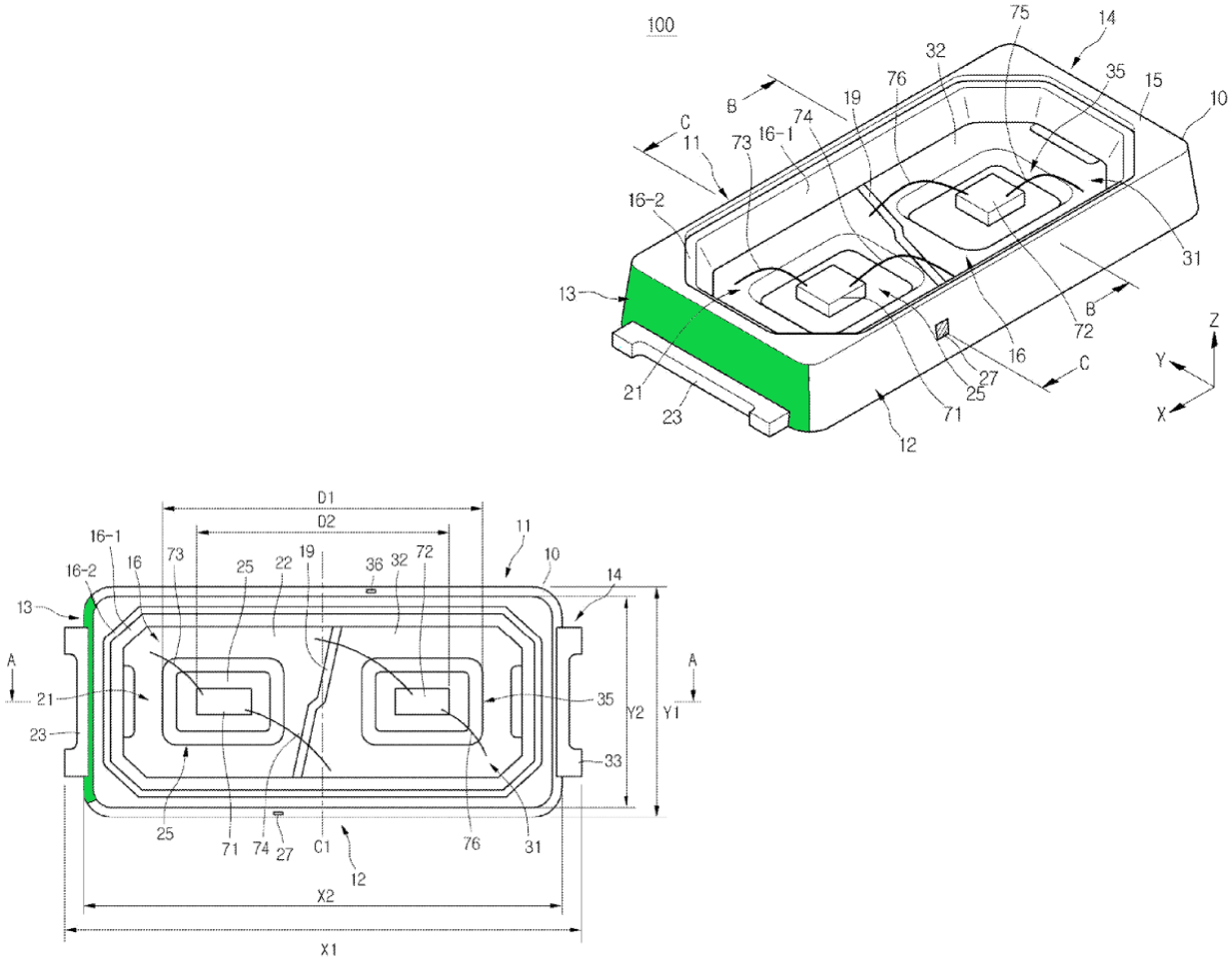
Kim FIGs. 1 and 2 (Annotated)



9.1.1.8. Claim 1: "wherein the resin housing comprises at least one housing cross section"

128. It is my opinion that Kim discloses the "wherein the resin housing comprises at least one housing cross section" limitation of claim 1. Kim discloses the claimed "housing cross section" on the edge of resin housing body 10, which is the claimed "resin housing." Kim's housing cross section is shown in green in the below annotated Kim FIGs. 1 and 2:

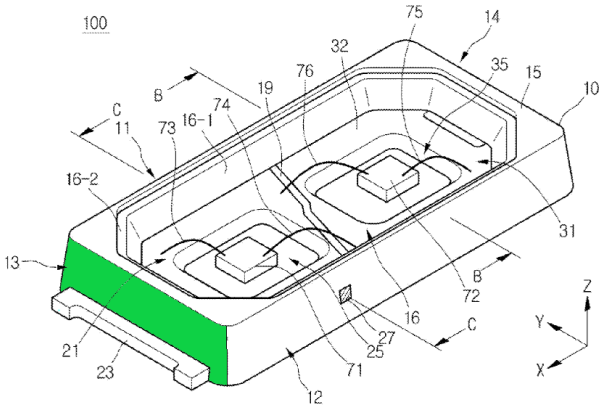
Kim FIGs. 1 and 2 (Annotated)

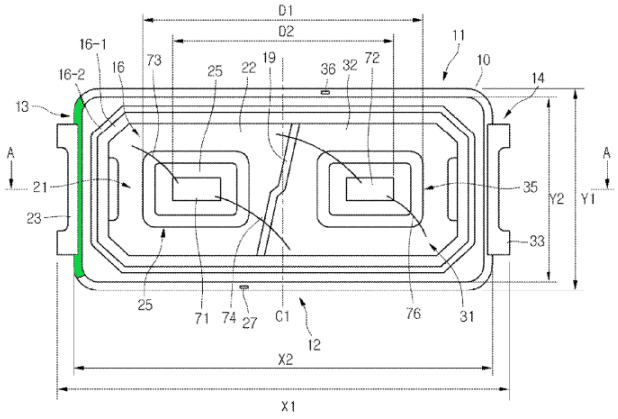


9.1.1.9. Claim 1: "wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing"

129. It is my opinion that Kim discloses the "wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing" limitation of claim 1. As shown in the below annotated Kim FIGs. 1 and 2, Kim's housing cross section on the edge of resin housing mold 10 is "in a vicinity of four corners of the resin housing." Further, while only housing cross-section is shown below, any number of "cross sections" can be drawn through Kim's resin housing body 10 that satisfies the claim limitation.

Kim FIGs. 1 and 2 (Annotated)

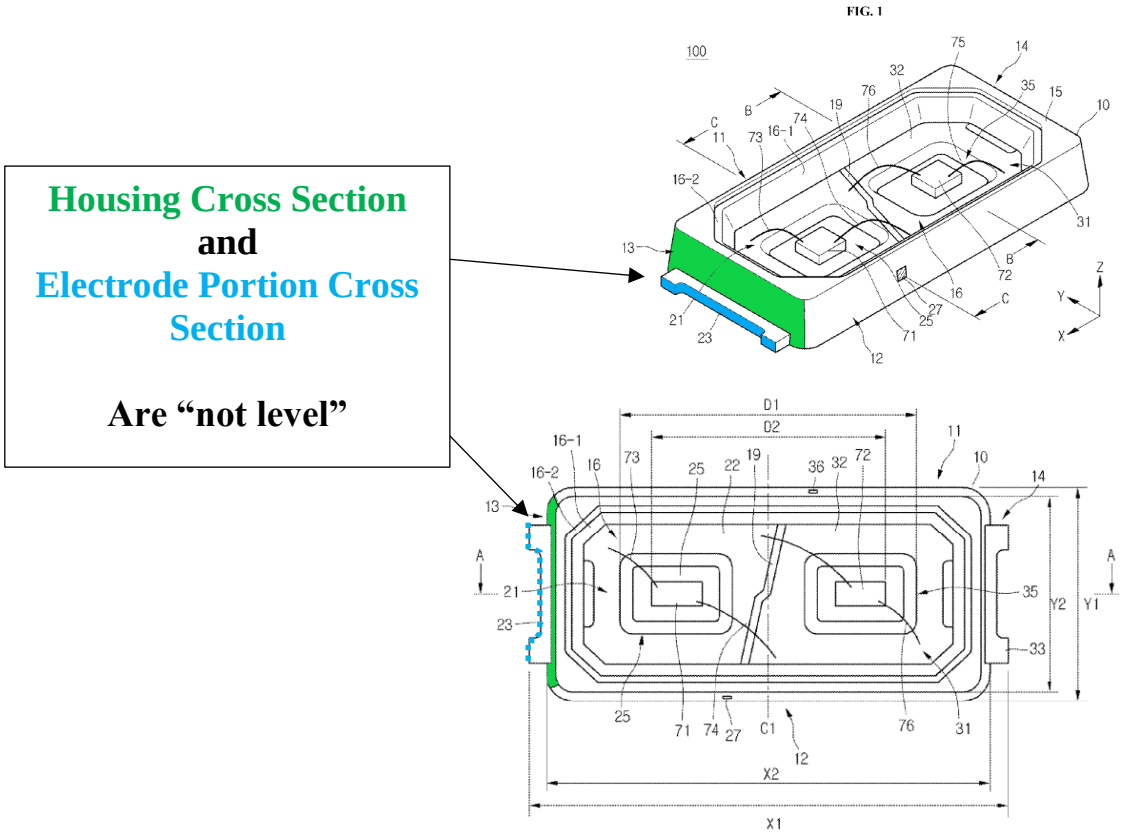




9.1.1.10. Claim 1: "wherein the at least one housing cross section is not level with the electrode portion cross section"

130. It is my opinion that Kim discloses the "wherein the at least one housing cross section is not level with the electrode portion cross section" limitation of claim 1. For example, as shown in the below annotated Kim FIGs. 1 and 2, Kim's housing cross section (green) "is not level with" (i.e., does not form a flat surface and/or is not parallel) the electrode portion cross section (blue and blue hashed line).

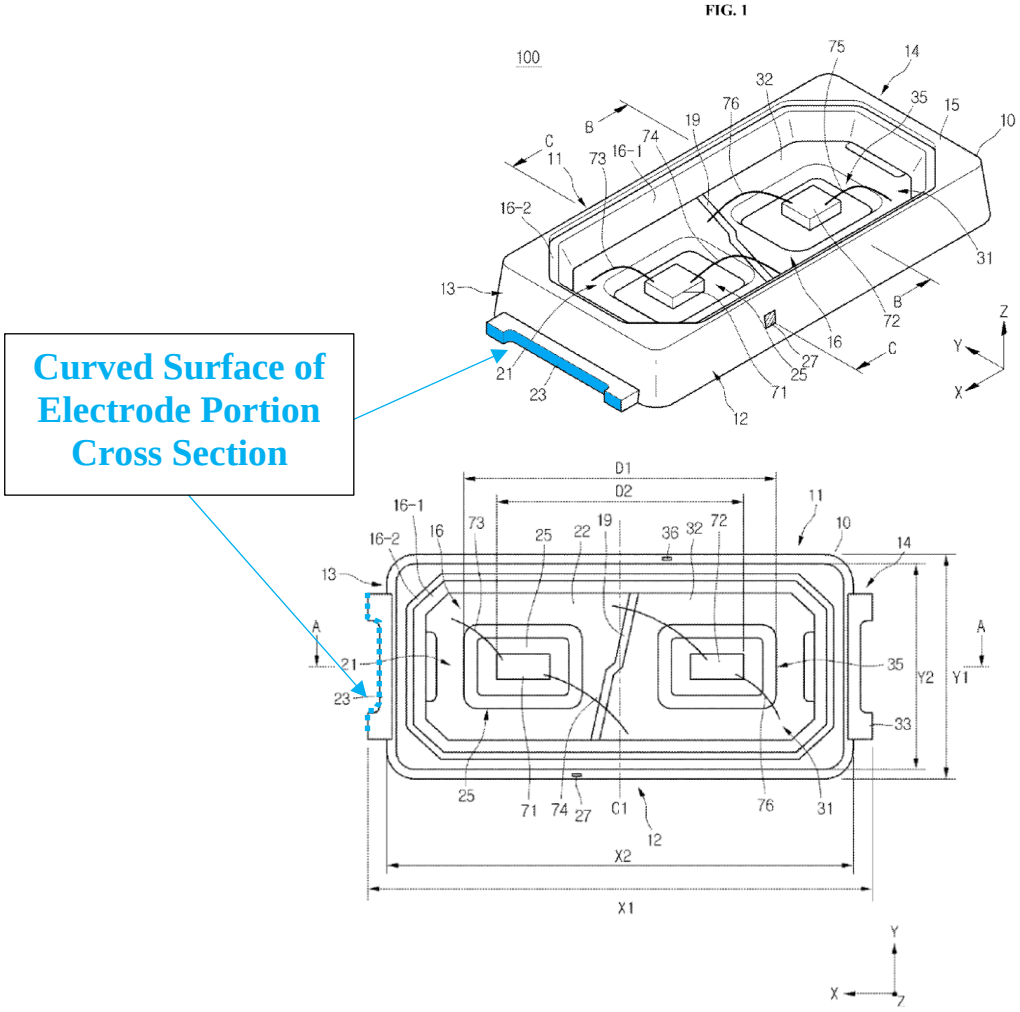
Kim FIGs. 1 and 2 (Annotated)



9.1.2. Claim 2: The light emitting device according to claim 1, wherein the electrode portion cross section comprises at least one curved surface.

131. It is my opinion that Kim discloses that the "electrode portion cross section comprises at least one curved surface," as required by claim 2 of the '742 patent, as shown in the below annotated Kim FIGs. 1 and 2:

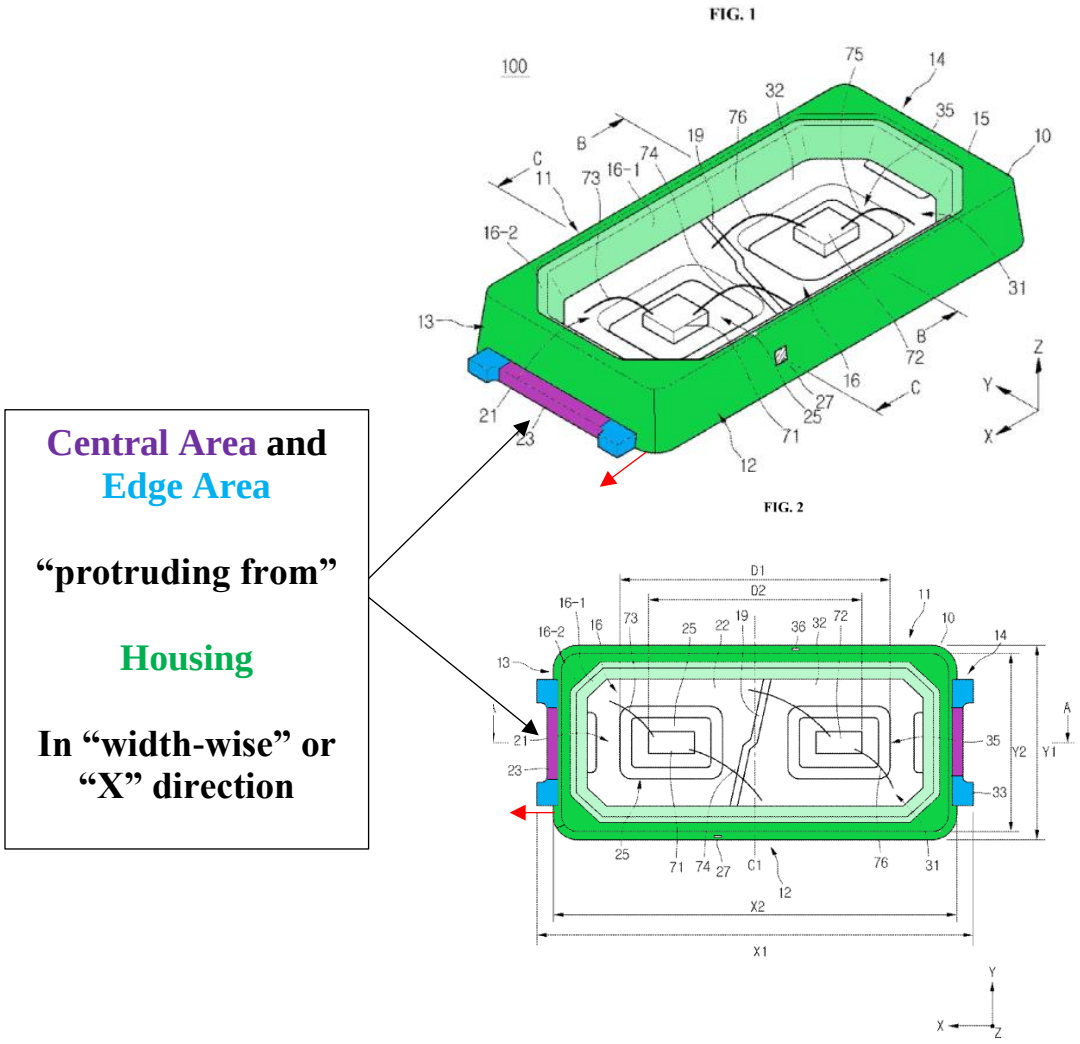
Kim FIGs. 1 and 2 (Annotated)



9.1.3. Claim 5: The light emitting device according to claim 1, wherein the central area and the at least one edge area protrude from the housing in the width-wise direction

132. It is my opinion that Kim discloses that the "central area and the at least one edge area protrude from the housing in the width-wise direction." For example, this is shown in the below annotated Kim FIGs. 1 and 2:

Kim FIGs. 1 and 2 (Annotated)



9.1.4. Claim 6: The light emitting device according to claim 1, wherein the at least one edge area comprises two edge areas

133. It is my opinion that Kim discloses that the "wherein the at least one edge area comprises two edge areas," as required by claim 6. As shown below both lead frame portions 23, 33 each comprise two edge areas (blue):

Kim FIGs. 1 and 2 (Annotated)

FIG. 1

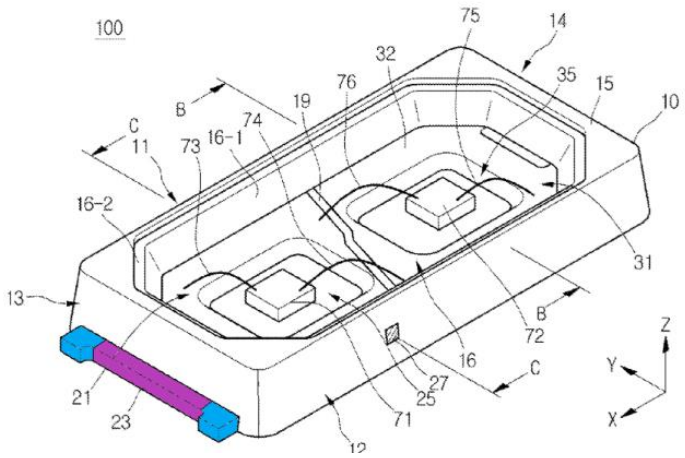
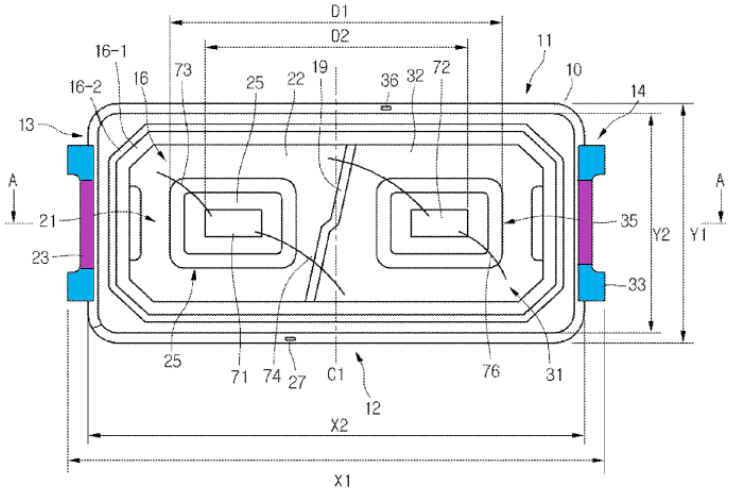


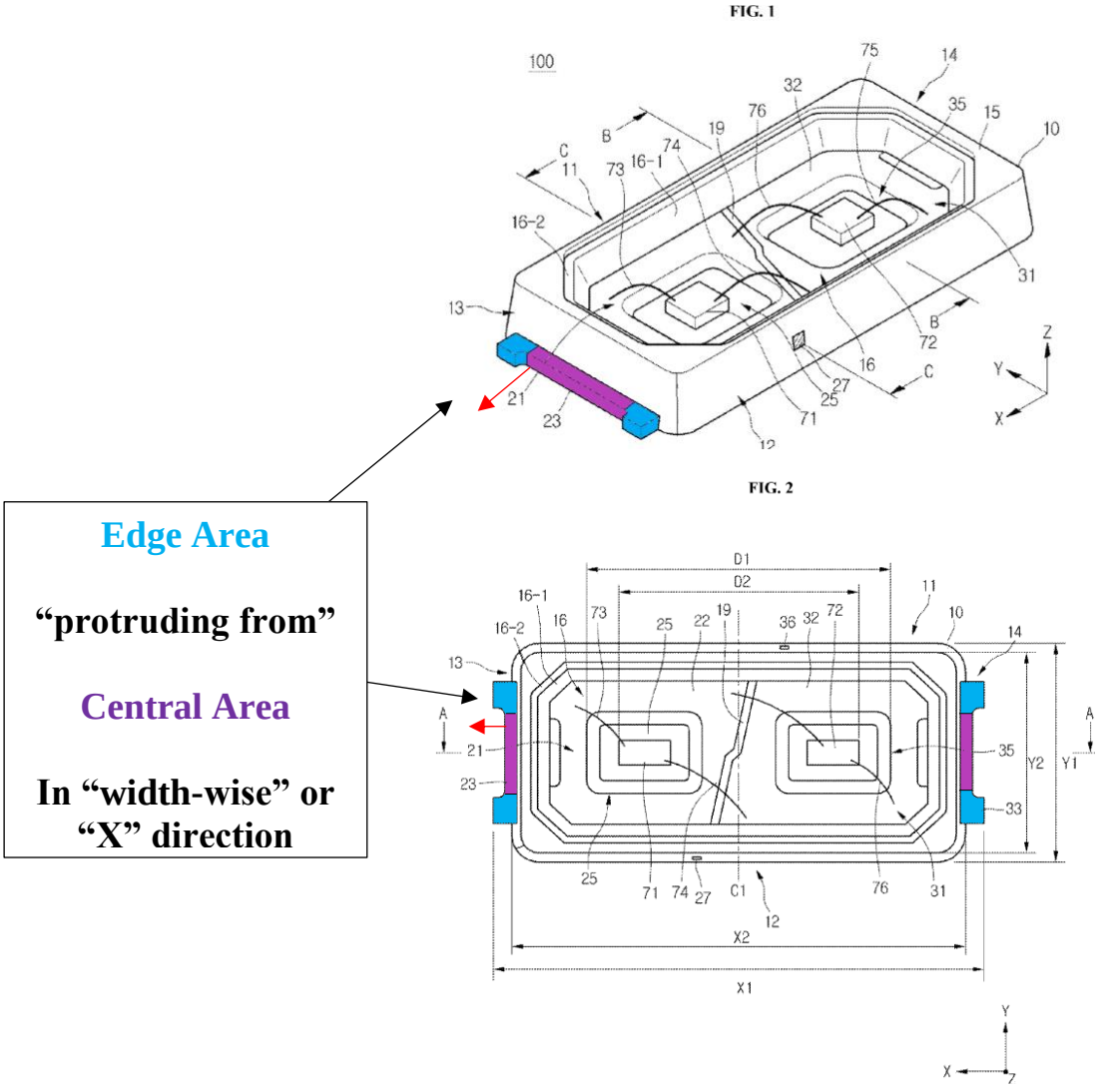
FIG. 2



9.1.5. Claim 7: The light emitting device according to claim 6, wherein the two edge areas protrude from central area in the width-wise direction

134. It is my opinion that Kim discloses that the "the two edge areas protrude from central area in the width-wise direction," as required by claim 7. For example, as shown in the below annotated Kim FIGs. 1 and 2, the two edge areas (blue) protrude from the central area (purple) in the "width-wise," or "X" direction:

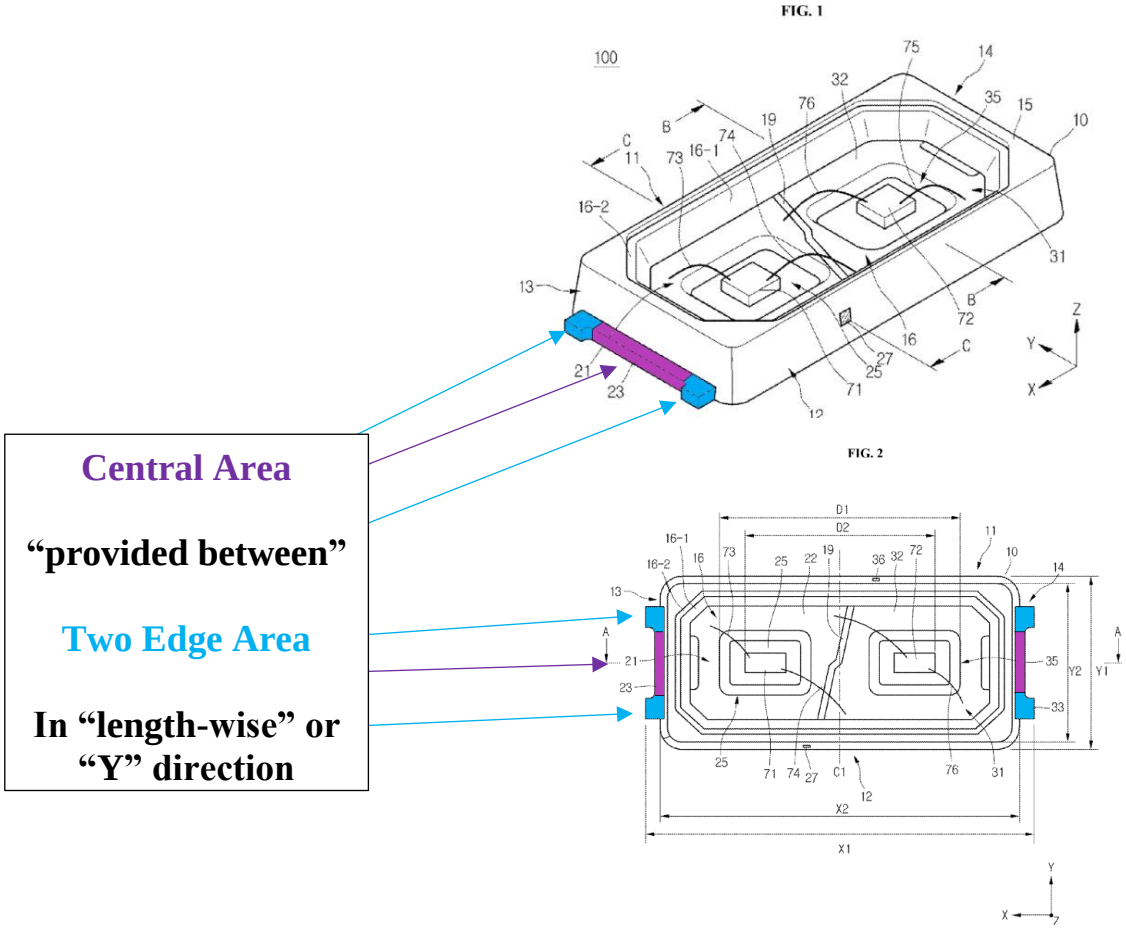
Kim FIGs. 1 and 2 (Annotated)



9.1.6. Claim 8: The light emitting device according to claim 6, wherein the central area is provided between the two edge areas along the length-wise direction

135. It is my opinion that Kim discloses that "wherein the central area is provided between the two edge areas along the length-wise direction," as required by claim 8. For example, as shown in the below annotated Kim FIGs. 1 and 2, the central area (purple) "is provided between the two edge areas [blue] along the length-wise," or "Y" direction:

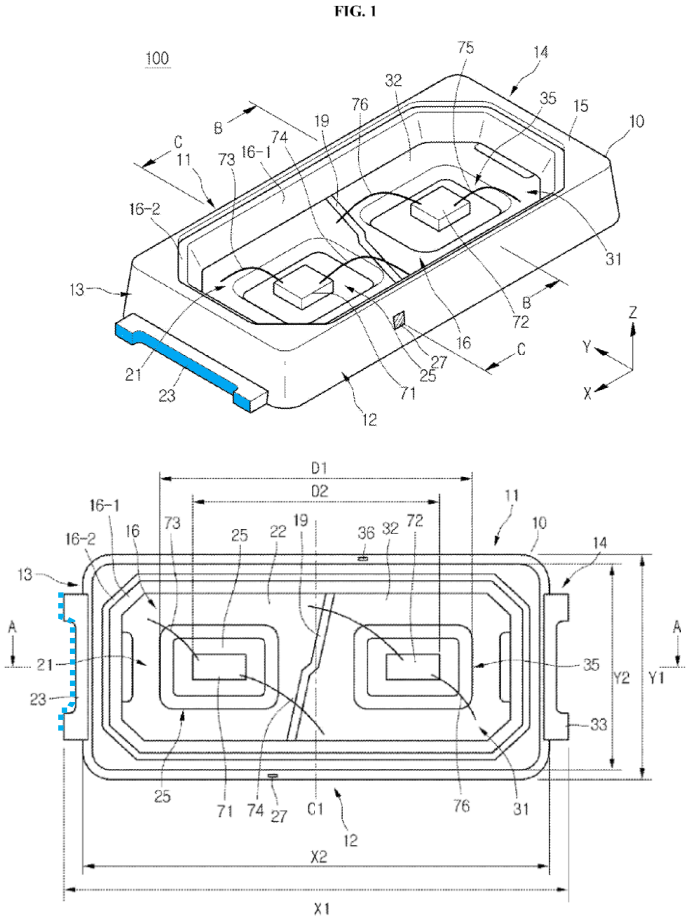
Kim FIGs. 1 and 2 (Annotated)



9.1.7. Claim 9: The light emitting device according to claim 1, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion

136. It is my opinion that Kim discloses that "the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion," as required by claim 9. For example, as shown in the below annotated Kim FIGs. 1 and 2, the electrode portion cross section (blue) "corresponds to at least a portion of an outer surface of the" lead frame portion 23, which is the claimed "wing portion." Although not shown, the same is true of the electrode portion cross section for lead frame portion 33.

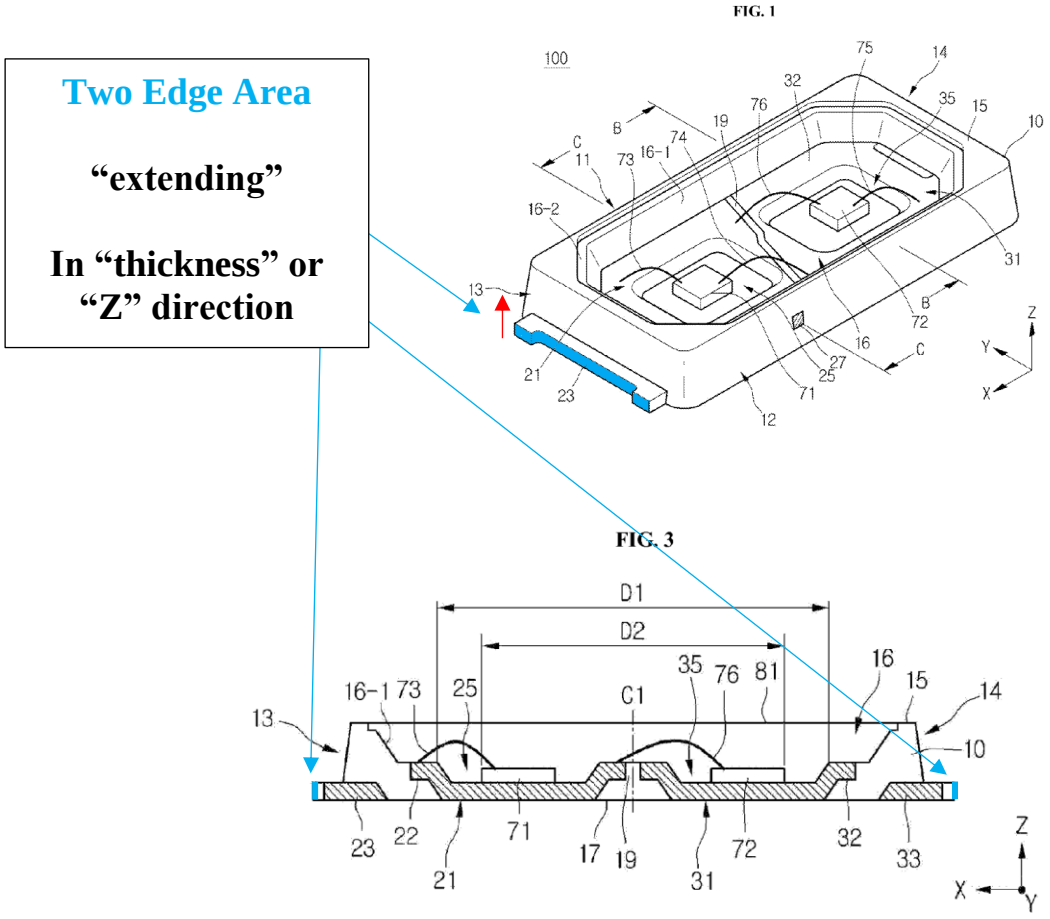
Kim FIGs. 1 and 2 (Annotated)



9.1.8. Claim 10: The light emitting device according to claim 9, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion

137. It is my opinion that Kim discloses that the "electrode portion cross section extends in a thickness direction of the at least one electrode portion," as required by claim 10. That the electrode portion cross section (blue) extends in a "thickness," or "Z" direction of the electrode portion is shown in the below annotated Kim FIGs. 1 and 3:

Kim FIGs. 1 and 3 (Annotated)



9.1.9. Claim 11

138. It is my opinion that Kim discloses each limitation of claim 11.

9.1.9.1. Claim 11: "A light emitting device comprising"

139. It is my opinion that Kim discloses a "[a] light emitting device" for the reasons I provide in Section 9.1.1.1 above.

9.1.9.2. Claim 11: "at least one electrode portion having a wing portion"

140. It is my opinion that Kim discloses "at least one electrode portion having a wing portion" for the reasons I provide in Section 9.1.1.2 above.

9.1.9.3. Claim 11: "resin housing containing a reflecting material"

141. It is my opinion that Kim discloses "resin housing containing a reflecting material" for the reasons I provide in Section 9.1.1.6 above.

9.1.9.4. Claim 11: "wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing"

142. It is my opinion that Kim discloses the "wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing," limitation of claim 11. For example, as shown in the below annotated Kim FIGs. 1 and 2, Kim's wing portion 23 comprises a central area (purple) that is "protruding from the housing [green] in a first ["X"] direction away from the housing":

Kim FIGs. 1 and 2 (Annotated)

Central Area

"protruding"

In "first" or "X" direction away from

Housing

FIG. 1

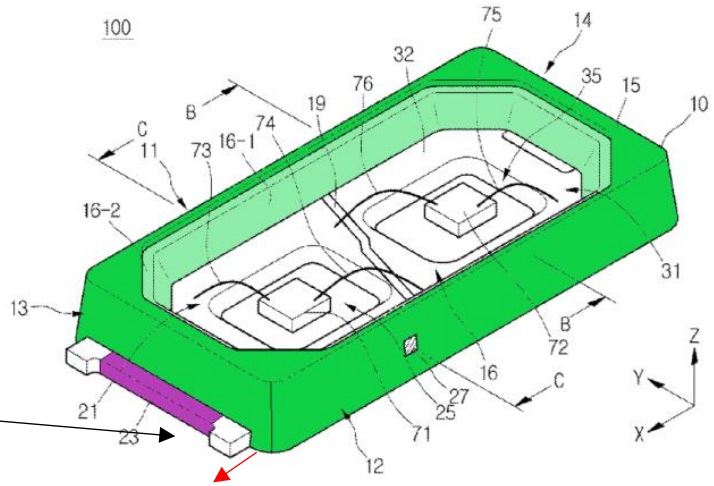
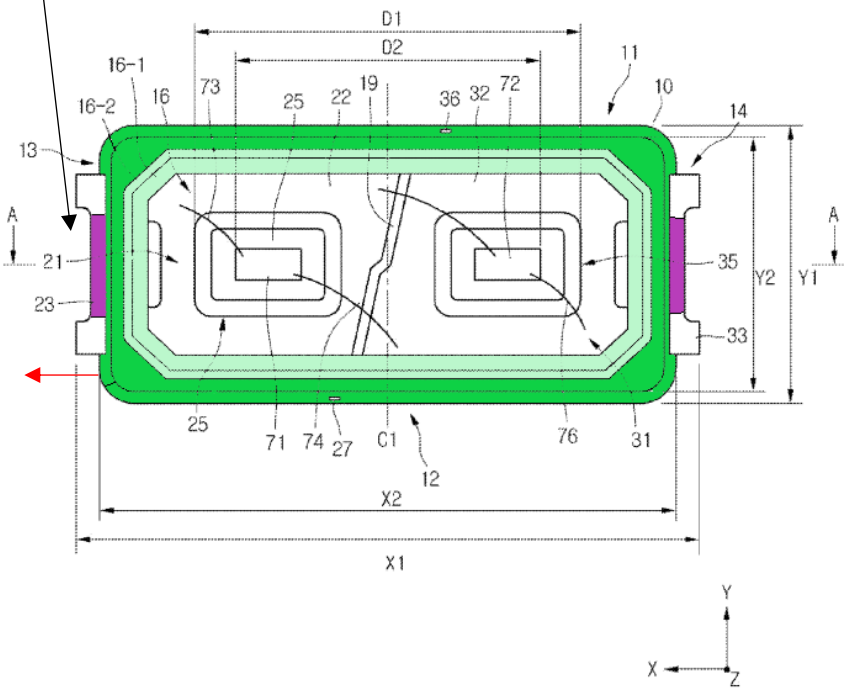


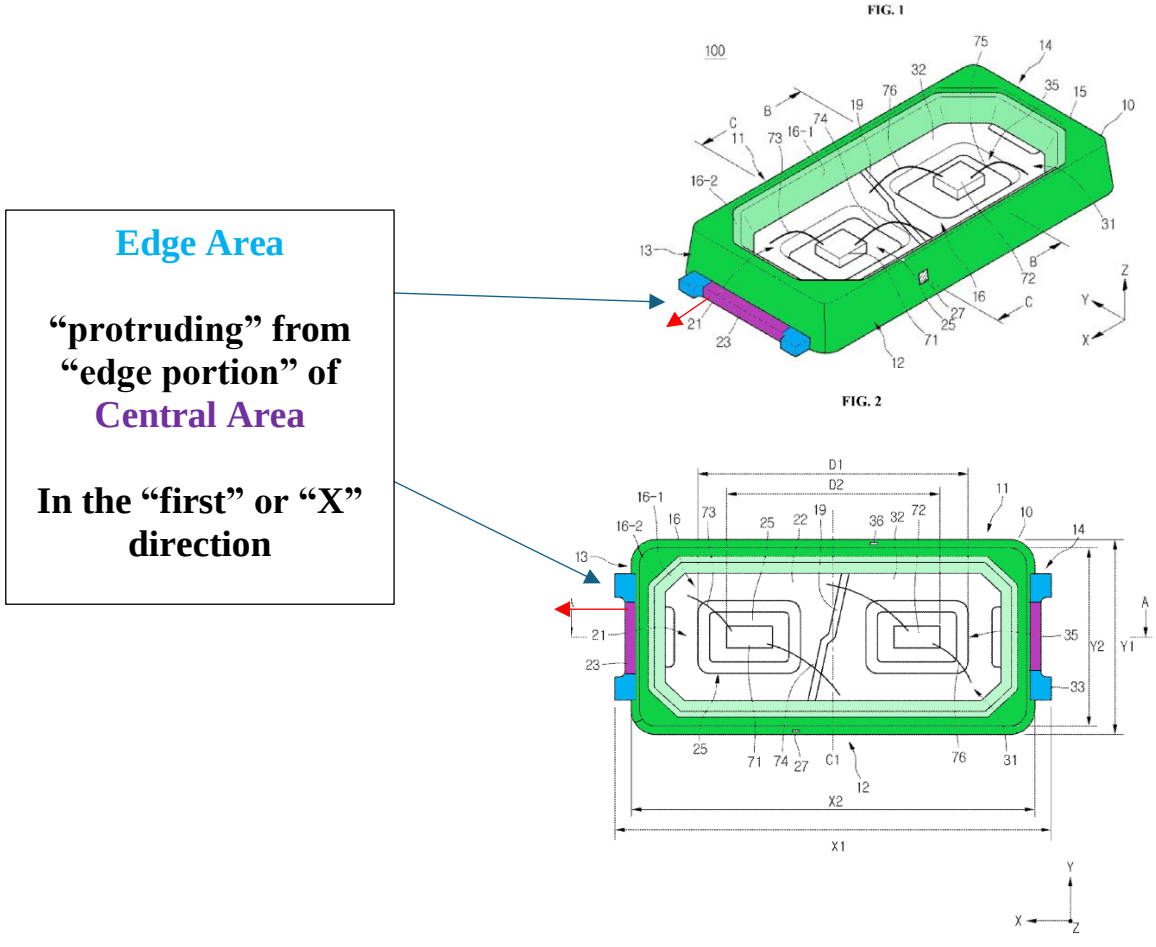
FIG. 2



9.1.9.5. Claim 11: "at least one edge area protruding from an edge portion of the central area, in the first direction"

143. It is my opinion that Kim discloses the "at least one edge area protruding from an edge portion of the central area, in the first direction" limitation of claim 11. For example, as shown in the below annotated Kim FIGs. 1 and 2, the edge area of lead frame portion 23, which is shown in blue, protrudes "from an edge portion of the central area" in the "X" or "first direction":

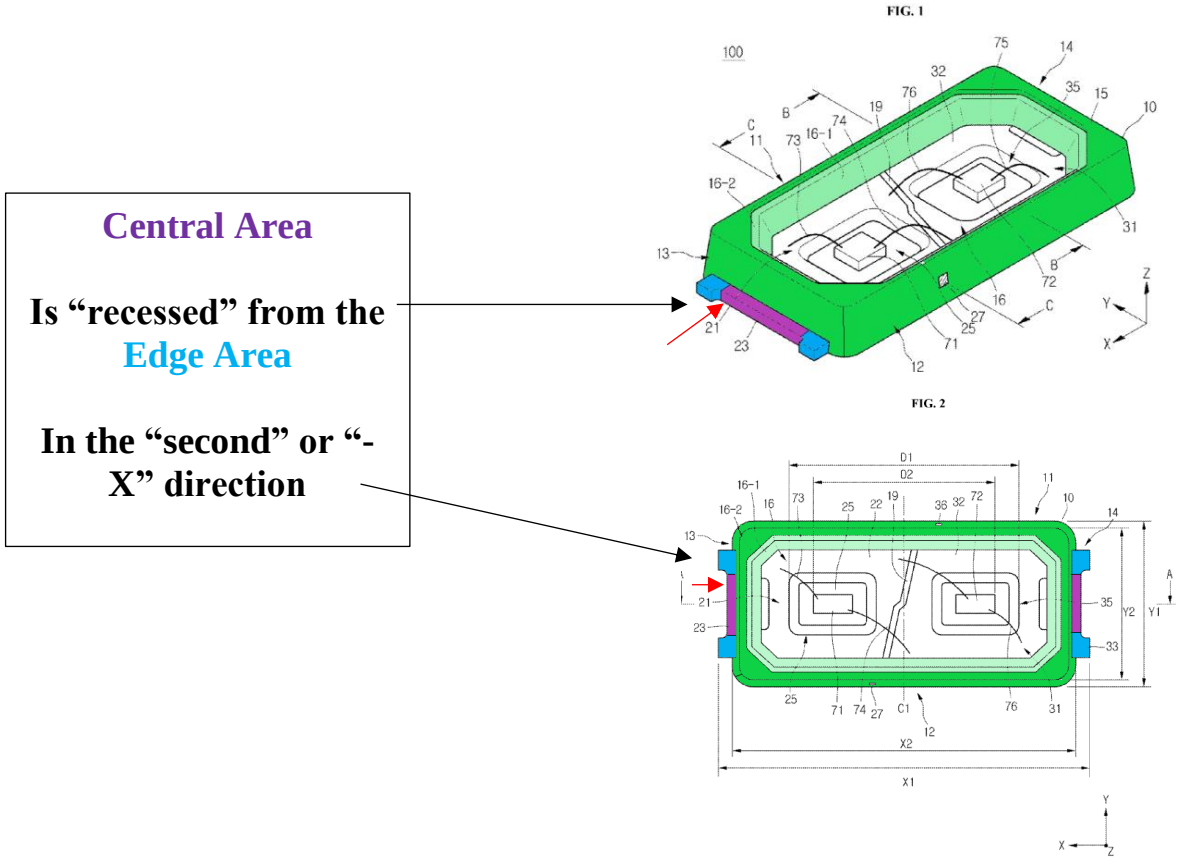
Kim FIGs. 1 and 2 (Annotated)



9.1.9.6. Claim 11: "wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing"

144. It is my opinion that Kim discloses the "wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing" limitation of claim 11. For example, as shown in the below annotated Kim FIGs. 1 and 2, the centra area (purple) "is recessed from the at least one edge area [blue] in a second ["-X"] direction [that is] opposite from the first direction toward the housing [green]":

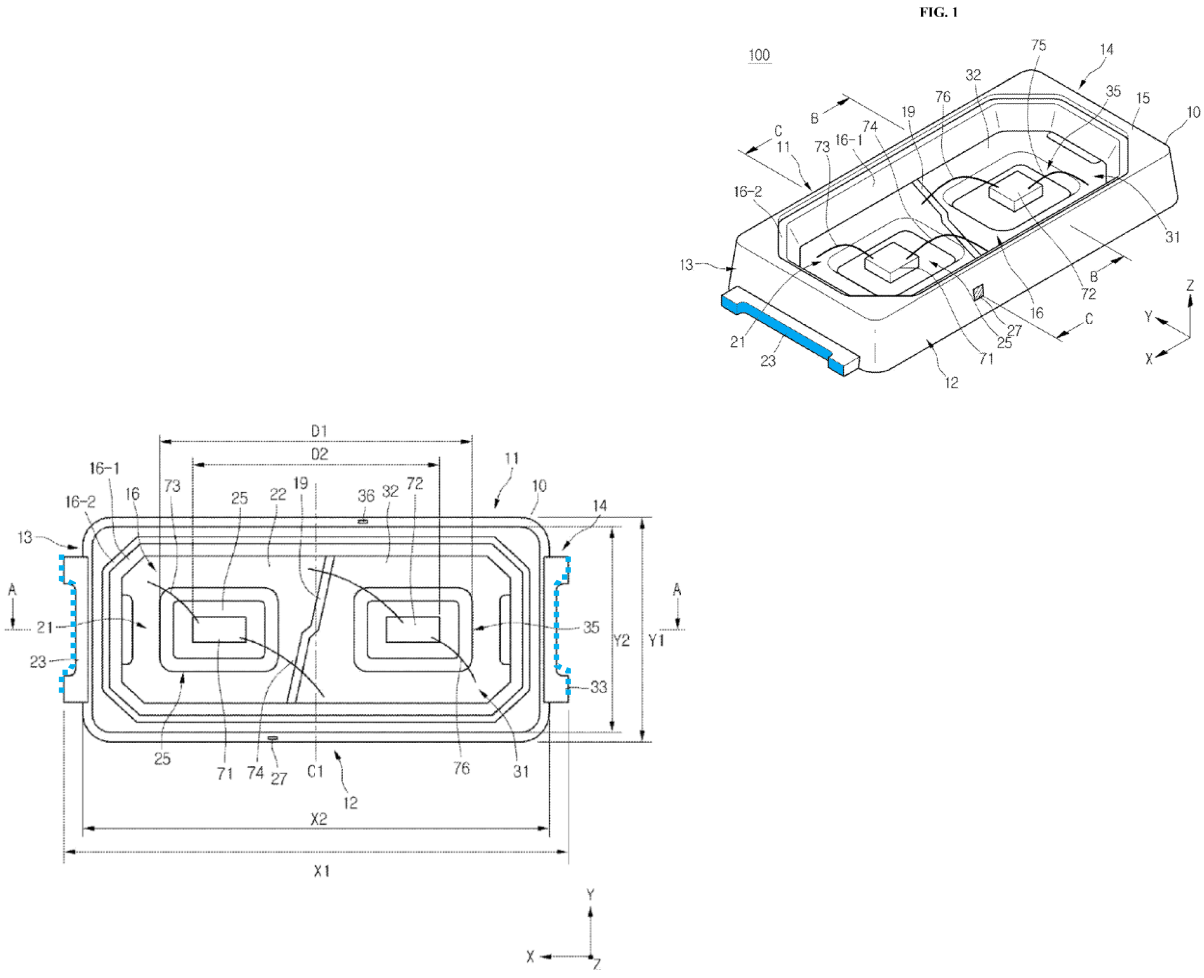
Kim FIGs. 1 and 2 (Annotated)



9.1.9.7. Claim 11: "wherein the at least one electrode portion further comprises an electrode portion cross section"

145. It is my opinion that Kim discloses the "wherein the at least one electrode portion further comprises an electrode portion cross section" limitation of claim 11. For example, as shown in the below annotated Kim FIGs. 1 and 2, Kim discloses an "electrode portion cross section," which is shown in blue and blue hashed lines, on the edges of both lead frame portions 23 and 33:

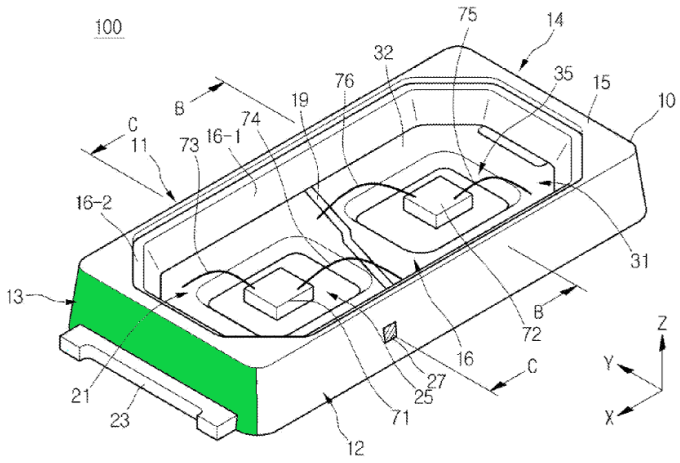
Kim FIGs. 1 and 2 (Annotated)

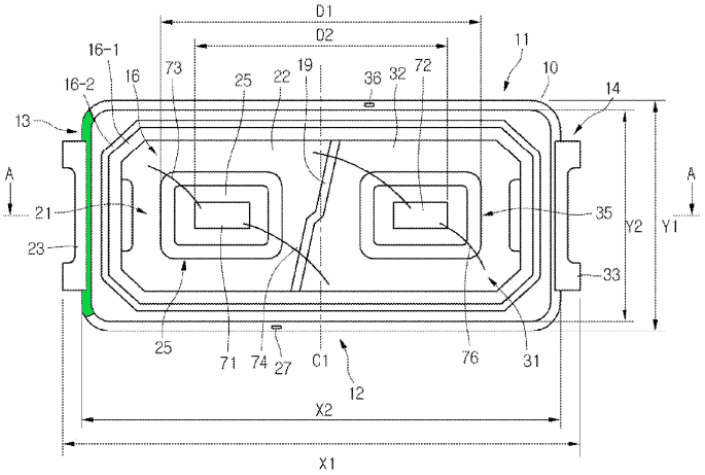


9.1.9.8. Claim 11: "wherein the resin housing comprises at least one housing cross section"

146. It is my opinion that Kim discloses the "wherein the resin housing comprises at least one housing cross section" limitation of claim 11. For example, Kim discloses at least one housing cross section (green) that is located on the edge of the resin housing body 10, as shown in the below annotated Kim FIGs. 1 and 2:

Kim FIGs. 1 and 2 (Annotated)

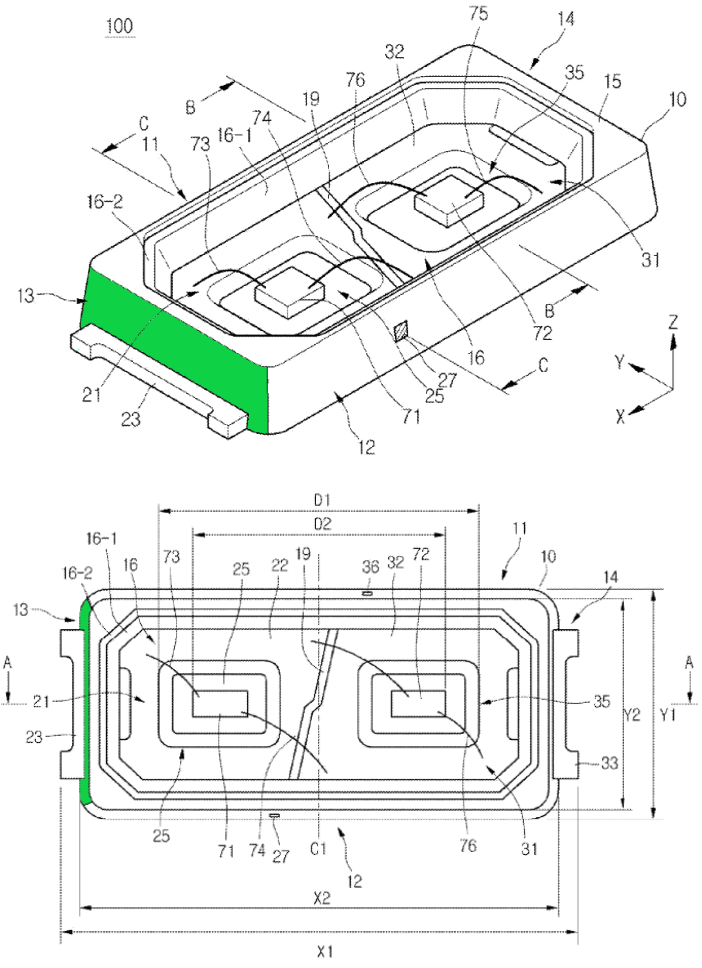


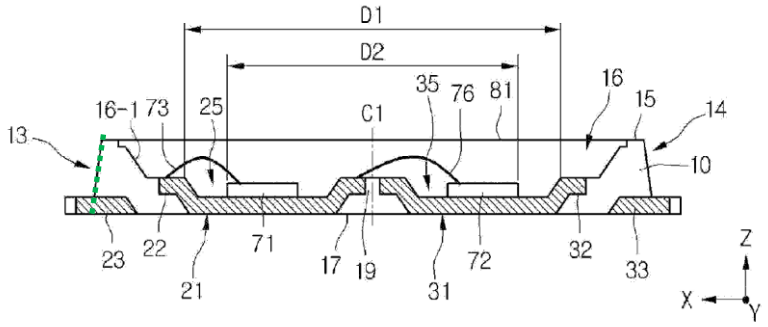


9.1.9.9. Claim 11: "wherein the at least one housing cross section is located in a vicinity of a comer of the resin housing"

147. It is my opinion that Kim discloses the "wherein the at least one housing cross section is located in a vicinity of a comer [sic] of the resin housing" limitation of claim 11. For example, this is shown in the below annotated Kim FIGs. 1-3:

Kim FIGs. 1 and 2 (Annotated)

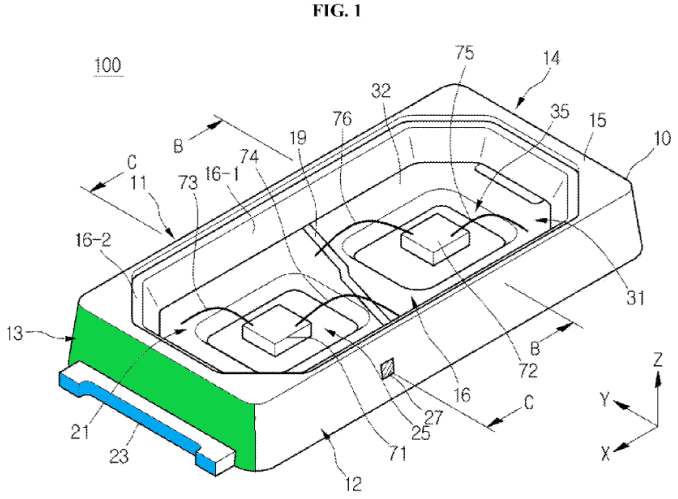


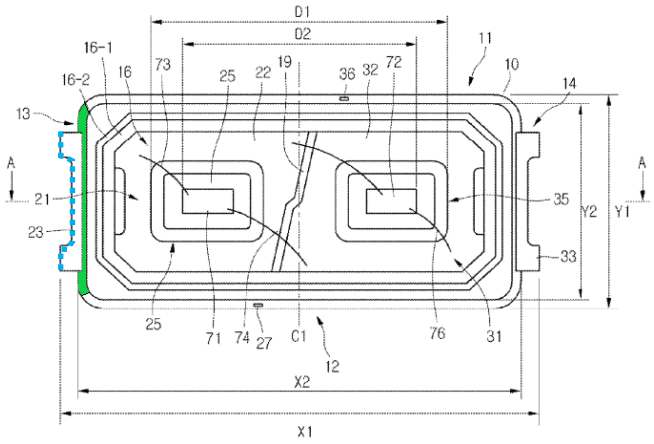


9.1.9.10. Claim 11: "wherein the at least one housing cross section is not level with the electrode portion cross section"

148. It is my opinion that Kim discloses the "wherein the at least one housing cross section is not level with the electrode portion cross section" limitation of claim 11. For example, as shown in the below annotated Kim FIGs. 1 and 2, the housing cross section (green) and electrode portion cross section are "not level":

Kim FIGs. 1 and 2 (Annotated)





9.1.9.11. Claim 11: "wherein the at least one edge area comprises two edge areas"

149. It is my opinion that Kim discloses the "wherein the at least one edge area comprises two edge areas" limitation of claim 11. For example, as shown below, each of lead frame portion 23, 33 comprise "two edge areas," which are shown in blue:

Kim FIGs. 1 and 2 (Annotated)

FIG. 1

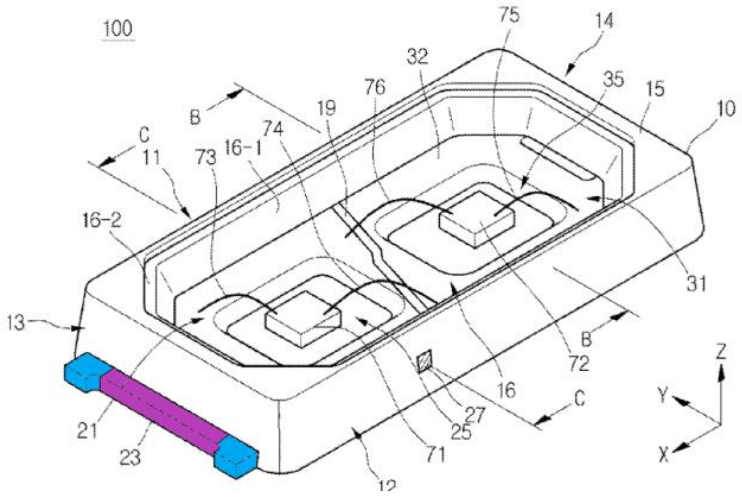
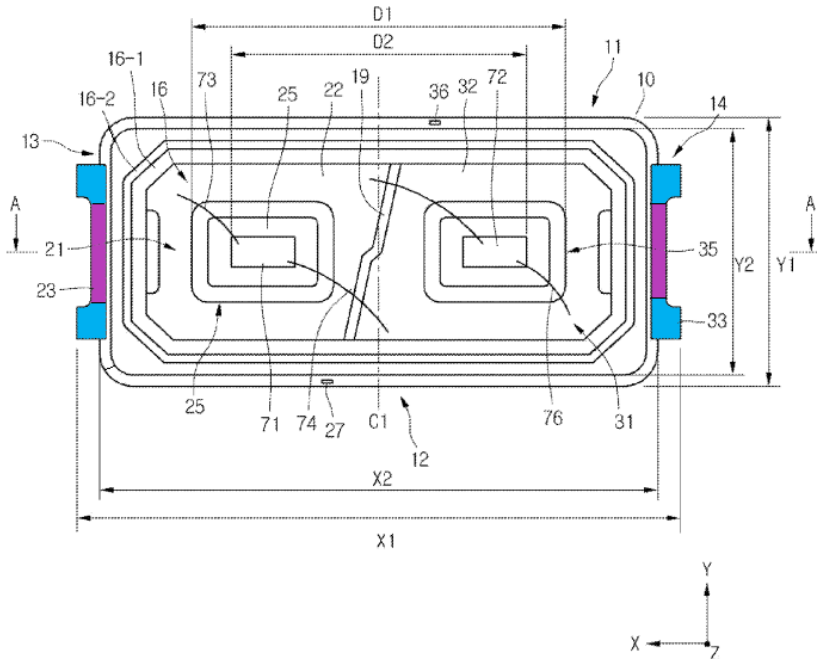


FIG. 2

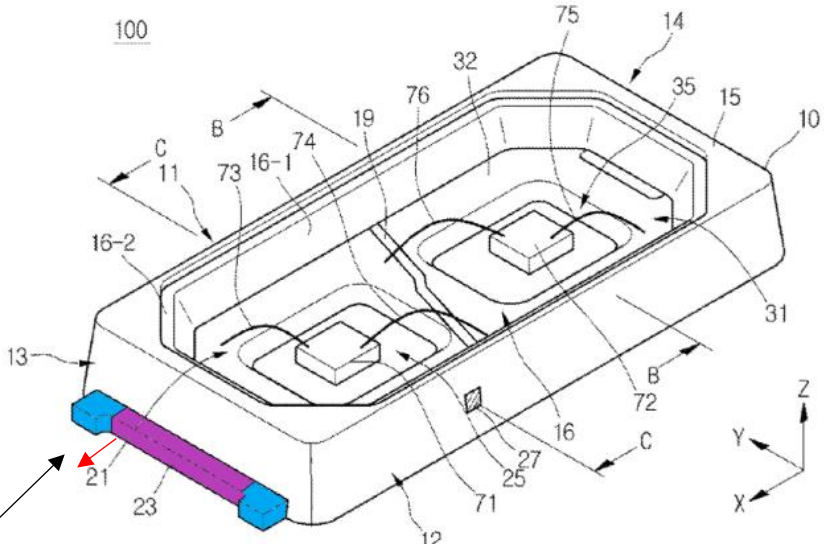


9.9.1.12. Claim 11: "wherein the two edge areas protrude from the central area in the first direction"

150. It is my opinion that that Kim discloses the "wherein the two edge areas protrude from the central area in the first direction" limitation of claim 11. For example, as shown in the below annotated Kim FIGs. 1 and 2, and as I discuss in Section 9.1.5 above, the two edge areas on wing portion 32 (blue) "protrude from the central area [purple] in the first ["X"] direction":

Kim FIGs. 1 and 2 (Annotated)

FIG. 1



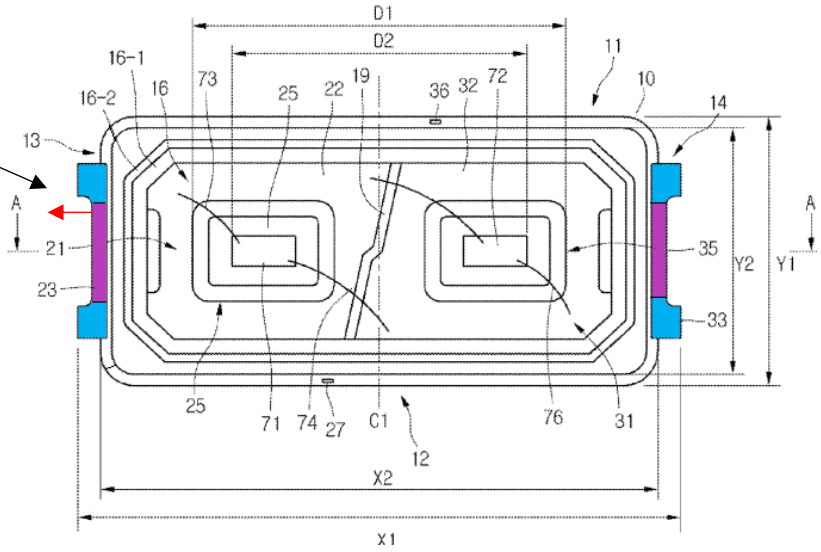
Two Edge Areas

"protruding from"

Central Area

In "first" or "X" direction

FIG. 2



9.1.10. Claim 12: "The light emitting device according to claim 11, wherein the wing portion is exposed outside the resin housing"

151. It is my opinion that Kim discloses that the "the wing portion is exposed outside the resin housing," as required by claim 12. For example, as shown in the

below annotated Kim FIGs. 1 and 2, that lead frame (or "wing") portions 23, 33, which are shown in red, are exposed outside of the resin housing body 10 (green):

Kim FIGs. 1 and 2 (Annotated)

FIG. 1

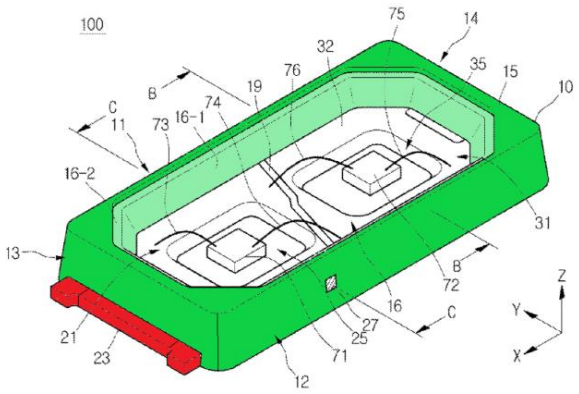
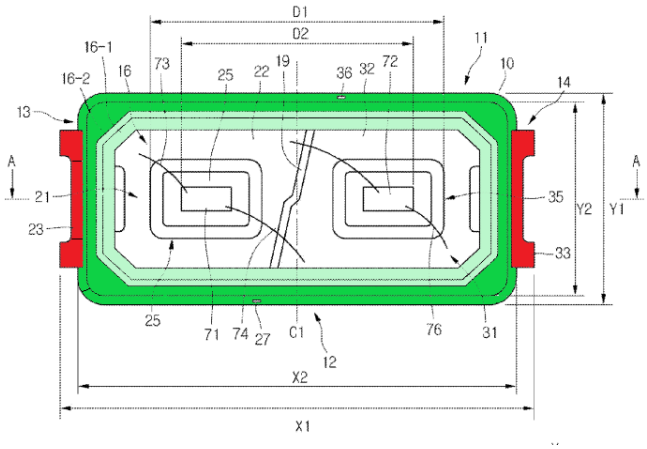


FIG. 2



9.1.11. Claim 13: "The light emitting device according to claim 12, wherein the wing portion comprises two edge areas"

152. It is my opinion that Kim discloses that "the wing portion comprises two edge areas," as required by claim 13. For example, as shown below, each of

lead frame portion 23, 33, which are each a "wing portion," comprise "two edge areas," which are shown in blue:

Kim FIGs. 1 and 2 (Annotated)

FIG. 1

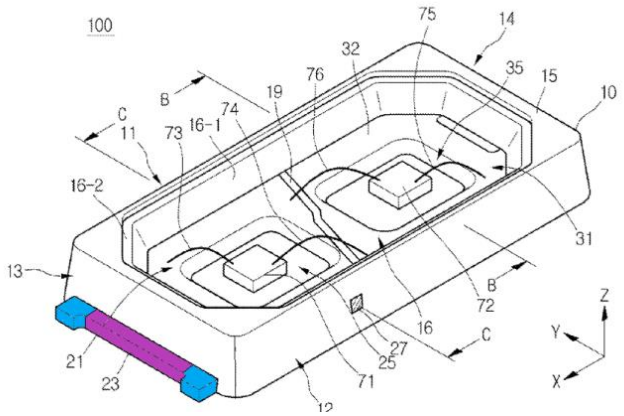
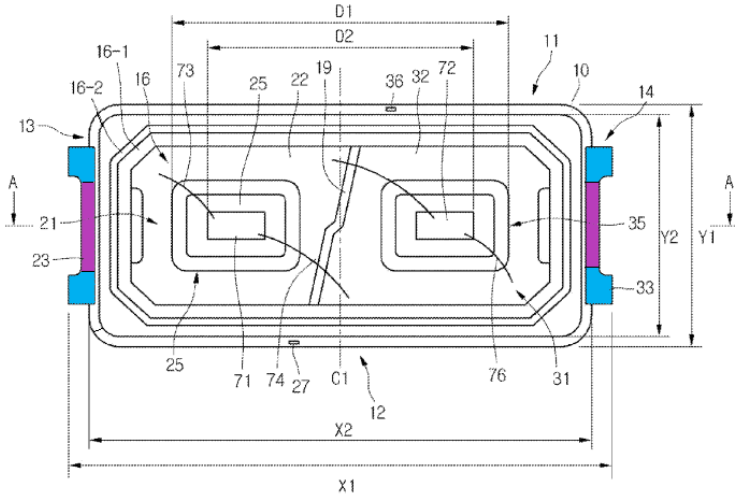


FIG. 2



9.1.12. Claim 14: "The light emitting device according to claim 13, wherein the two edge areas protrude from central area"

153. It is my opinion that Kim discloses that the "the two edge areas protrude from central area," as required by claim 14. For example, as shown in the below

annotated Kim FIGs. 1 and 2, the two edge areas (blue) "protrude from" the central area (purple) in the "X-direction":

Kim FIGs. 1 and 2 (Annotated)

FIG. 1

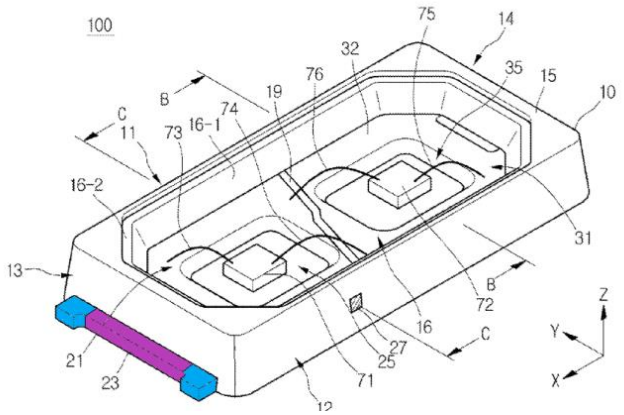
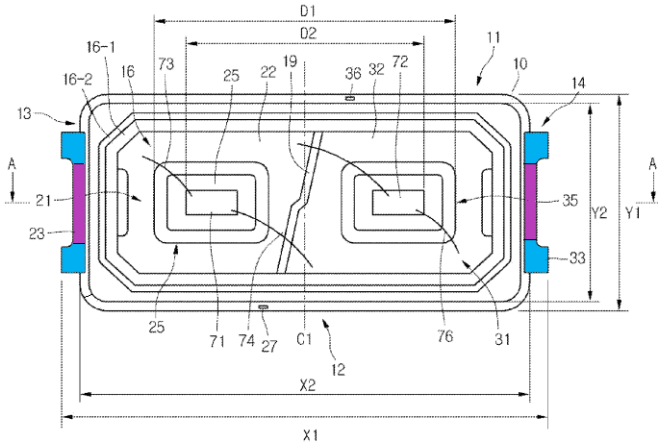


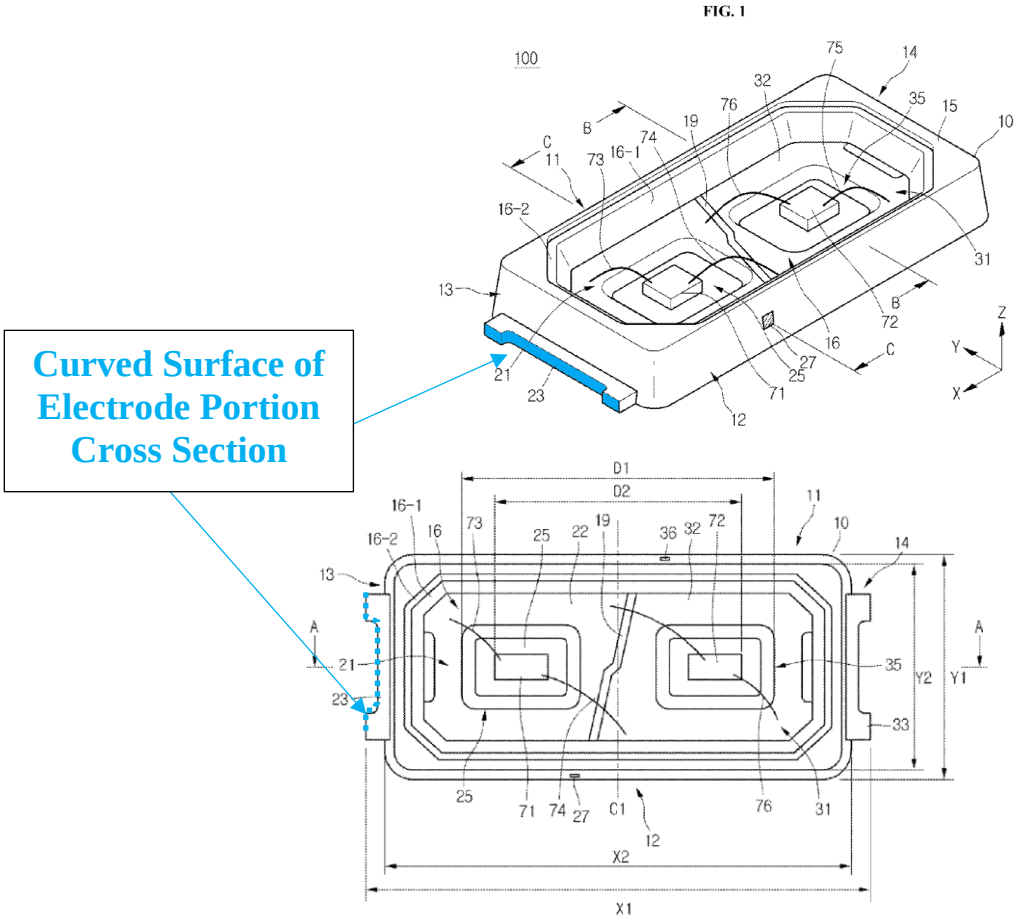
FIG. 2



9.1.13. Claim 15: "The light emitting device according to claim 11, wherein the at least one electrode portion cross section comprises a curved surface"

154. It is my opinion that Kim discloses that the "electrode portion cross section comprises a curved surface," as required by claim 15 of the '742 patent, as shown in the below annotated Kim FIGs. 1 and 2:

Kim FIGs. 1 and 2 (Annotated)



9.1.14. Claim 16: "The light emitting device according to claim 11, wherein the at least one electrode portion further comprises a conductive layer"

155. It is my opinion that Kim discloses that "the at least one electrode portion further comprises a conductive layer," as required by claim 16. For example, Kim describes that the lead frames 21, 31, which are each the claimed "at least one electrode portion," may be "metallic" (Ex-1004 at ¶ [0067]). And metals are well-known to be conductive.

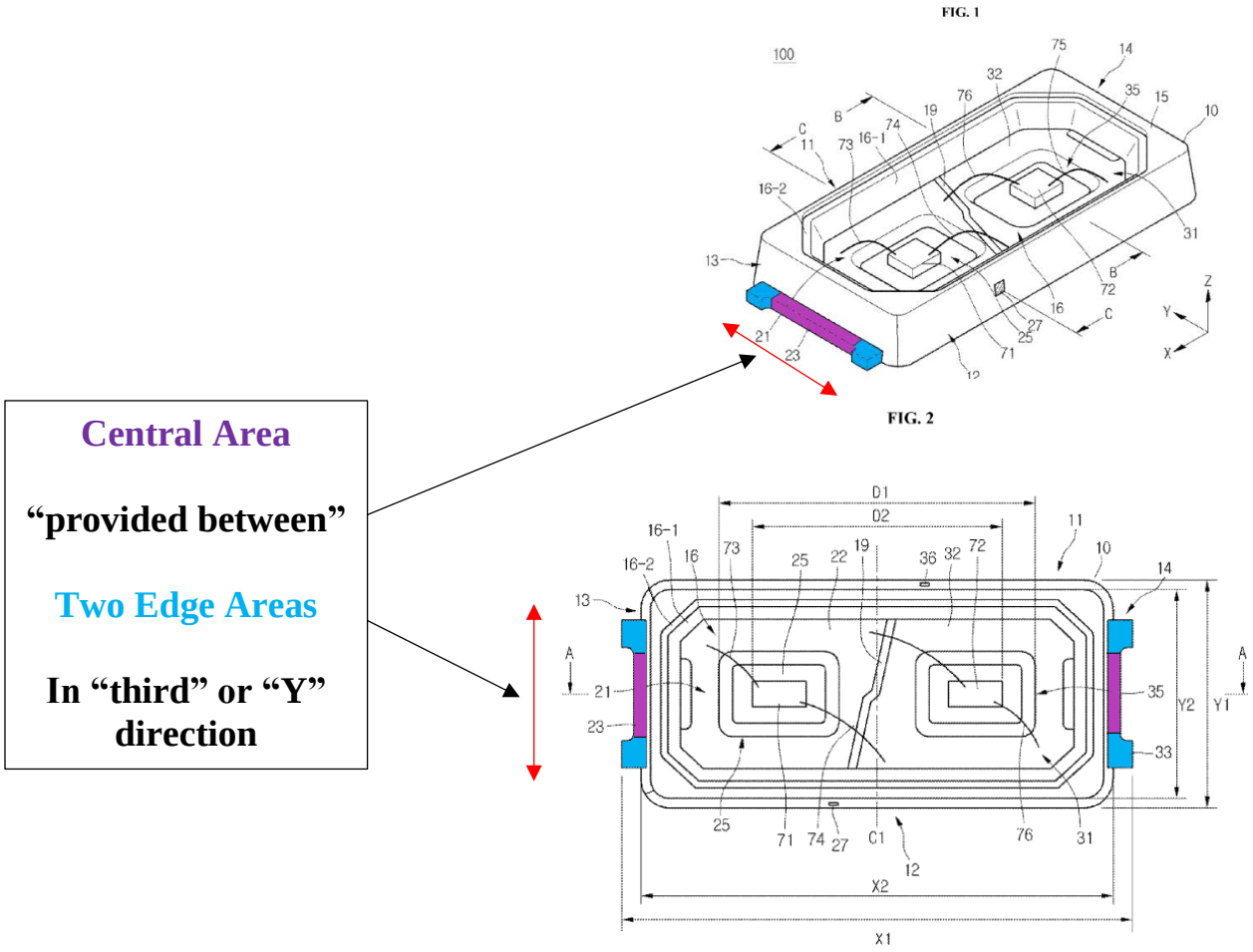
156. Kim further explains that the lead frames 21, 31 may "include a single metallic layer of a multi-layer metallic layer" (Ex-1004 at ¶ [0067]). Kim also provides that the lead frames 21, 31 may include a "plating layer" laminated in a copper material that may be "formed in at least one layer" (Ex-1004 at ¶ [0067]). These are conductive layers.

9.1.15. Claim 20: "The light emitting device according to claim 11, wherein the central area is provided between the two edge area along a third direction substantially perpendicular to the first and second direction"

157. It is my opinion that Kim discloses that "the central area is provided between the two edge area along a third direction substantially perpendicular to the first and second direction," as required by claim 20.

158. For example, as shown in the below annotated Kim FIGs. 1 and 2, the central area (purple) "is provided between" the two edge areas (blue) in a third "Y" direction. Further, the "Y" direction is "substantially perpendicular to the first and second ["X"] direction":

Kim FIGs. 1 and 2 (Annotated)

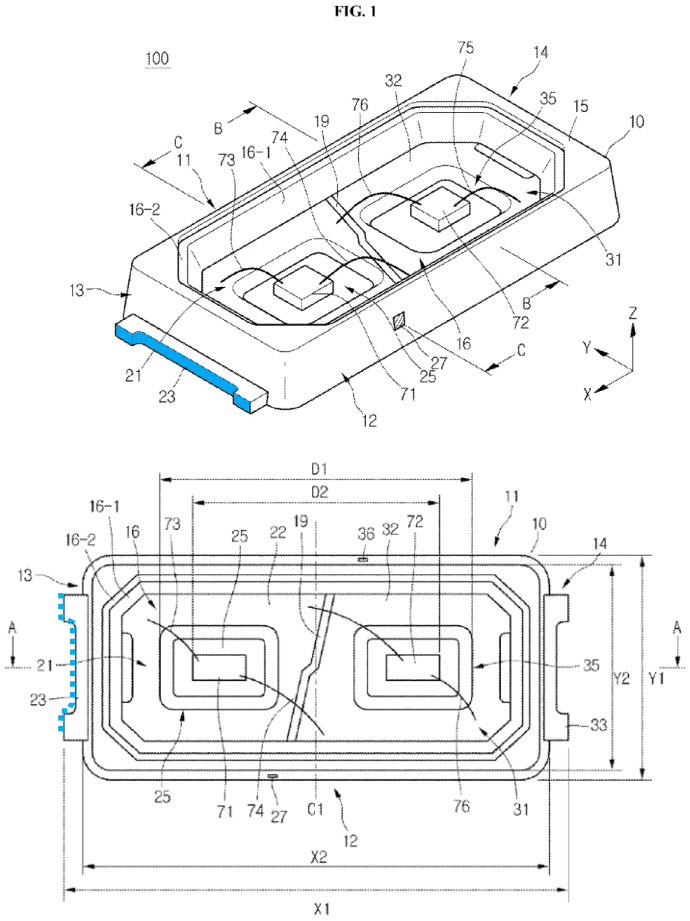


9.1.16. Claim 21: "The light emitting device according to claim 11, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion"

159. It is my opinion that Kim discloses that "the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion," as required by claim 21. For example, as shown in the below annotated Kim FIGs. 1 and 2, the electrode portion cross section (blue) "corresponds to at least a portion of an outer surface of the" lead frame portion 23, which is the claimed "wing portion."

Although not shown, the same is true of the electrode portion cross section for lead frame portion 33.

Kim FIGs. 1 and 2 (Annotated)

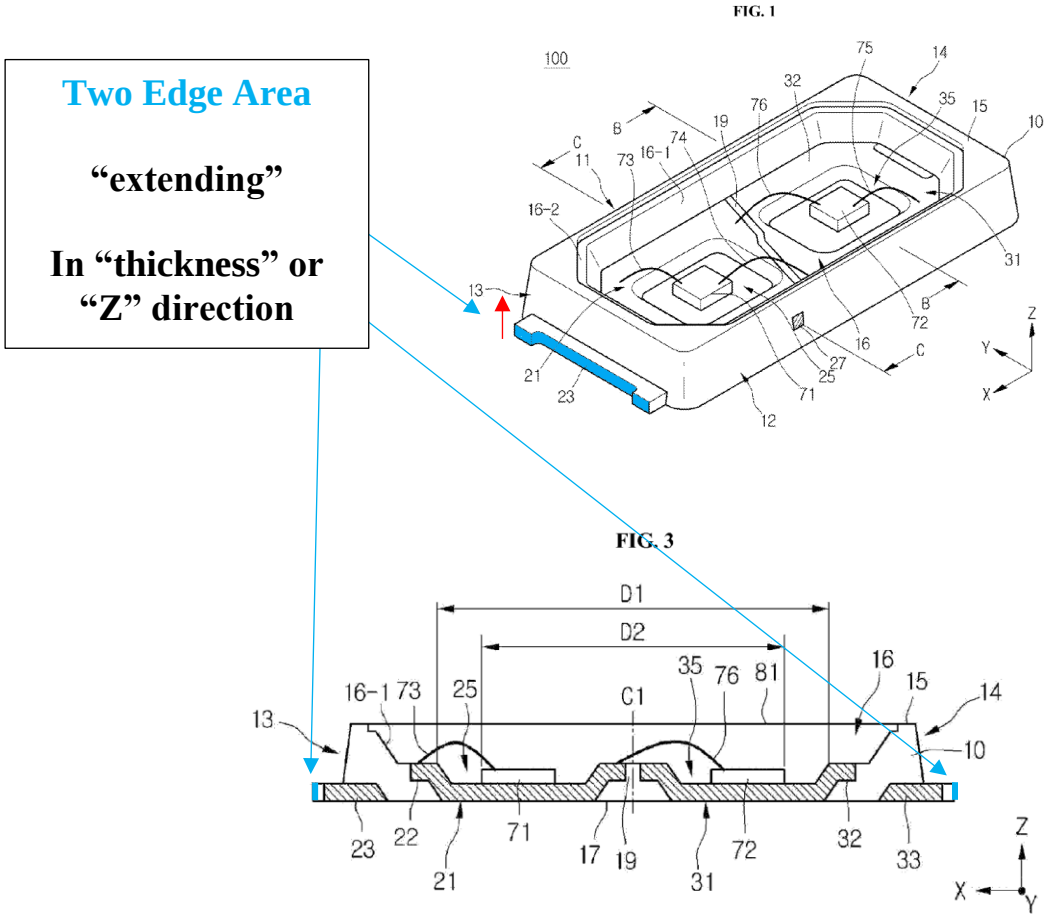


9.1.17. Claim 22: "The light emitting device according to claim 21, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion"

160. It is my opinion that Kim discloses that "the electrode portion cross section extends in a thickness direction of the at least one electrode portion," as required by claim 22. For example, as shown in the below annotated Kim FIG. 1,

"the electrode portion [blue] cross section extends in a thickness ["Z"] direction of the at least one electrode portion as shown in Kim FIGs. 1 and 3:

Kim FIGs. 1 and 3 (Annotated)



9.2. Claims 1, 5-14, and 20-22 are Anticipated by Kobayakawa

161. It is my opinion that Kobayakawa anticipates claims 1, 5-14 and 20-22 of the '742 patent.

9.2.1. Claim 1

162. For the reasons below, it is my opinion that Kobayakawa discloses each limitation of claim 1 of the '742 patent, and thus claim 1 is anticipated by Kobayakawa.

9.2.1.1 Claim 1: "A Light Emitting Device Comprising …"

163. It is my opinion that Kobayakawa discloses "[a] light emitting device comprising…" Kobayakawa is entitled "semiconductor light-emitting device" (Ex-1005 at Cover). Kobayakawa discloses a "semiconductor light-emitting device" in Figures 1-5 (Ex-1005 at 2:37-38; Figs. 1-5).

9.2.1.2. Claim 1: "at Least one Electrode Portion"

164. It is my opinion that Kobayakawa discloses the "at least one electrode portion" limitation of claim 1 through its lead frames 1, which are shown in orange in the below annotated Kobayakawa FIGs. 1-3:

Kobayakawa FIGs. 1-3 (Annotated)

Fig.1

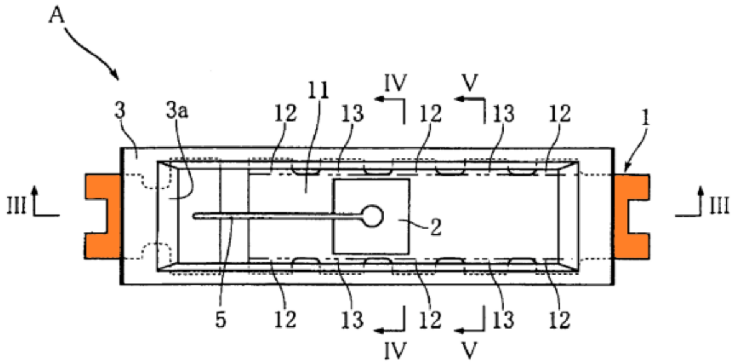


Fig.2

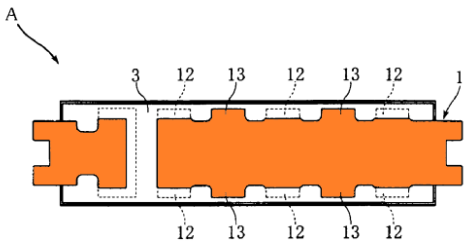
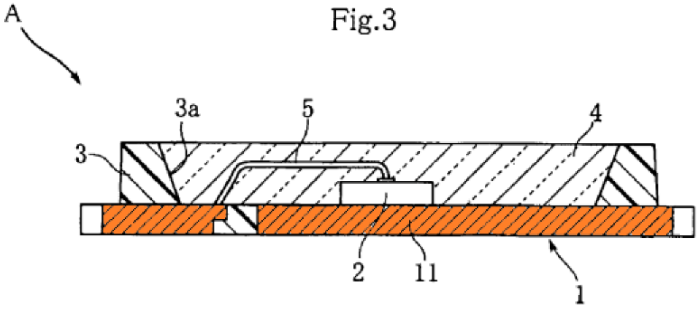


Fig.3



9.2.1.3. Claim 1: "a resin housing containing a reflecting material and covering a portion of said at least one electrode portion"

165. It is my opinion that Kobayakawa discloses the "resin housing containing a reflecting material and covering a portion of said at least one electrode portion" limitation of claim 1. Kobayakawa discloses a "case 3" (green) that is the claimed "resin housing containing a reflective material and covering a portion of said at least one electrode portion" (Ex-1005 at 2:40; 3:21-29). As an example, Kobayakawa discloses that its resin housing case 3 is "made of a white resin" (Ex- at 3:21). As shown in Kim's FIGs. 1-3, Kim's resin housing case 3 (green) covers a portion of lead frame 1 (orange) (e.g., "a portion of said at least one electrode portion").

Kobayakawa FIGs. 1-3 (Annotated)

Fig.1

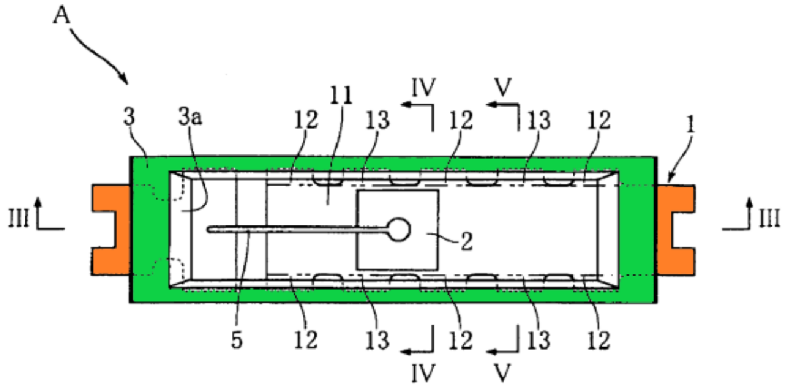


Fig.2

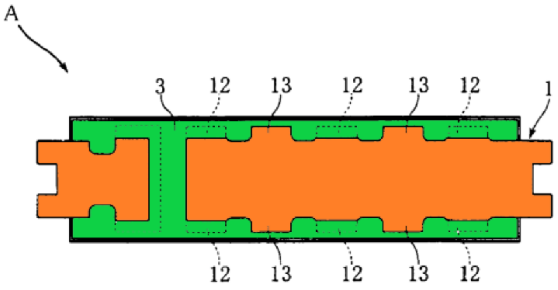
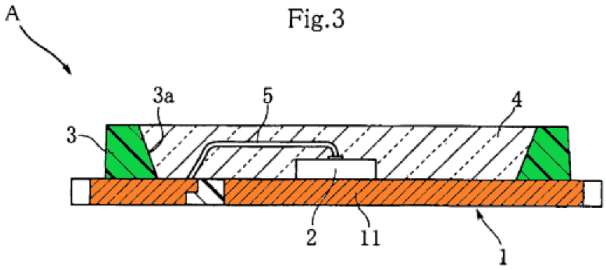


Fig.3



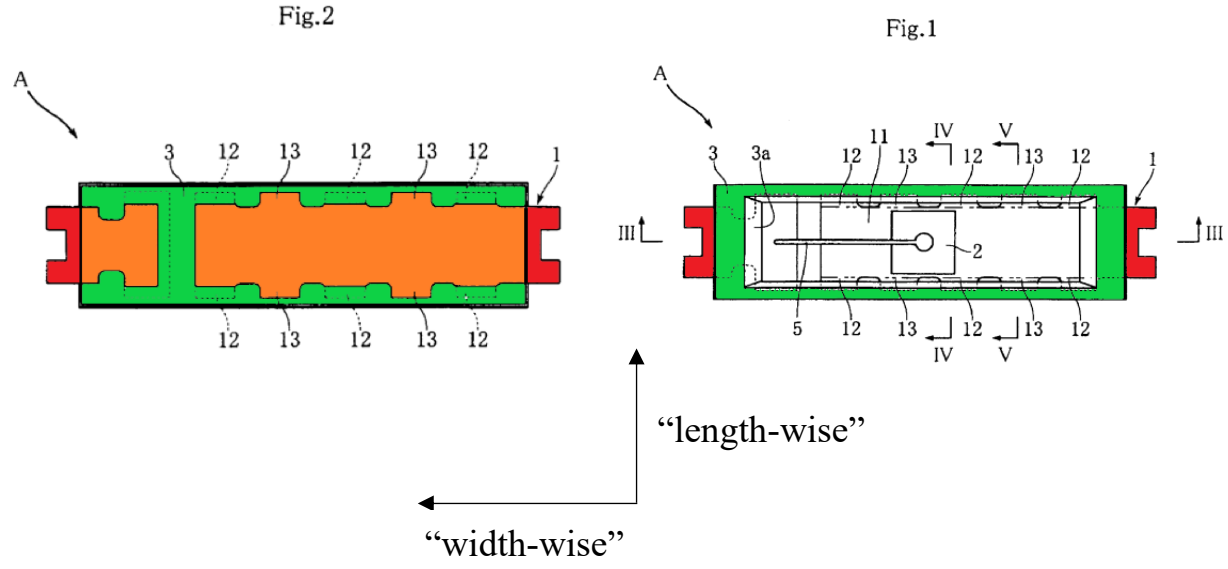
9.2.1.4. Claim 1: "wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction"

166. It is my opinion that Kobayakawa discloses the "wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise

direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction" limitation of claim 1.

167. As shown in the below annotated Kobayakawa FIGs. 1 and 2, Kobayakawa's lead frame 1 (e.g., "electrode portion") comprises "a wing portion [red] which is exposed outside of the" resin housing case 3 (green). Kobayakawa also discloses that its "wing portion" extends "in a length-wise direction of the wing portion along an edge of the housing" and "protrude[es] from the housing in a width-wise direction of the wing portion." Finally, the "length-wise direction of the wing portion" and the "width-wise direction of the wing portion" are "substantially perpendicular.

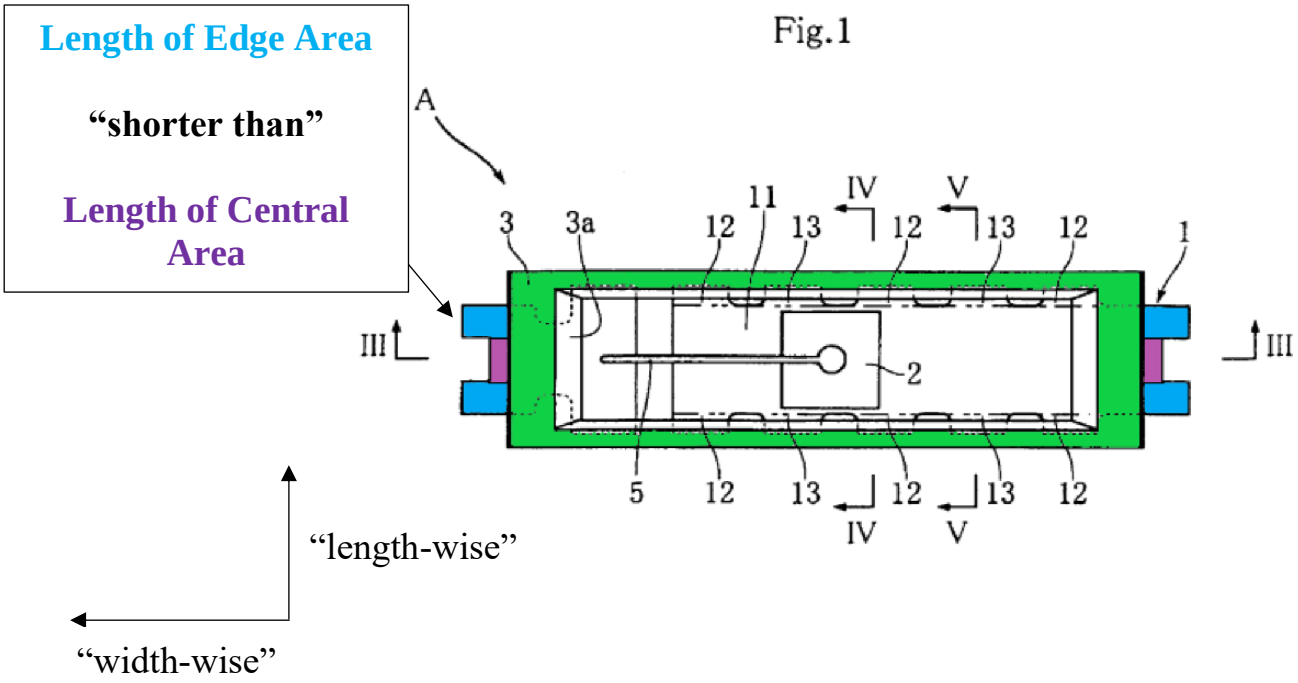
Kobayakawa FIGs. 1 and 2 (Annotated)



9.2.1.5. Claim 1: "wherein the wing portion comprises: a central area; and at least one edge area having a length in the length-wise direction shorter than that of the central area"

168. It is my opinion that Kobayakawa discloses the "wherein the wing portion comprises: a central area; and at least one edge area having a length in the length-wise direction shorter than that of the central area" limitation of claim 1. For example, Kobayakawa's central area (purple) and at least on edge area (blue) are shown in the below annotated Kobayakawa FIGs. 1 and 3. As can also be seen in the below annotated figures, Kobayakawa's edge area (blue) has "a length in the length-wise direction shorter than that of the central area.

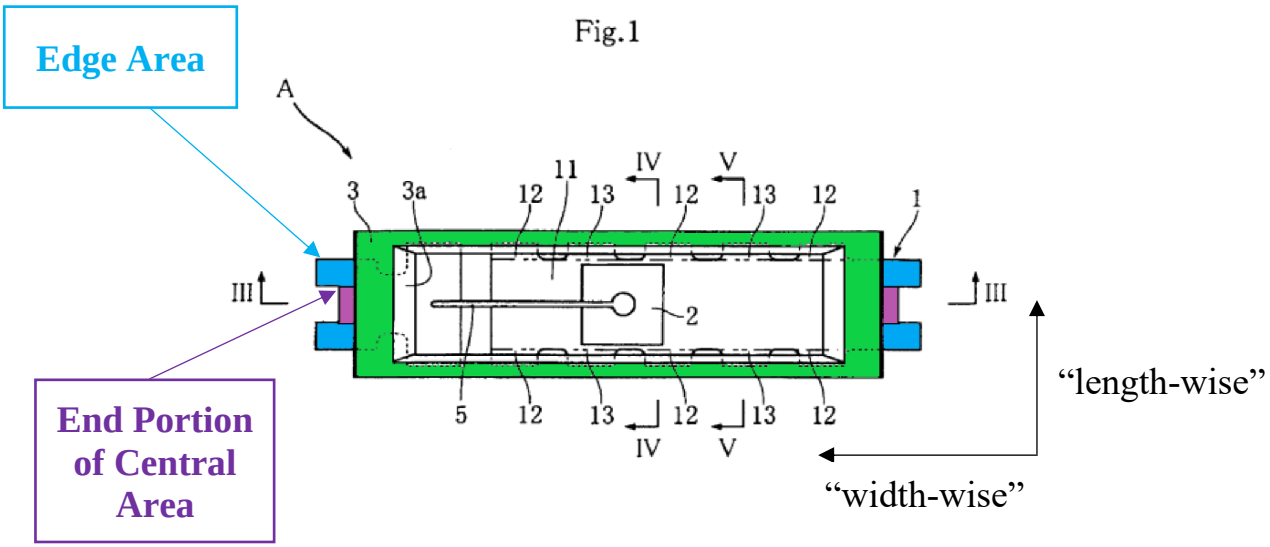
Kobayakawa FIG. 1 (Annotated)



9.2.1.6. Claim 1: "wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area"

169. It is my opinion that Kobayakawa discloses the "wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area" limitation of claim 1. For example, this is shown in the below annotated Kobayakawa FIG. 1:

Kobayakawa FIG. 1 (Annotated)



9.2.1.7. Claim 1: "wherein the at least one electrode portion further comprises an electrode portion cross section"

170. It is my opinion that Kobayakawa discloses the "wherein the at least one electrode portion further comprises an electrode portion cross section" limitation of claim 1.

171. Kobayakawa's "electrode portion cross section," which is located on the edge of electrode portion, is shown via a blue hashed line in the below annotated Kobayakawa FIGs. 1 and 3.

Kobayakawa FIGs. 1 and 3 (Annotated)

Fig.1

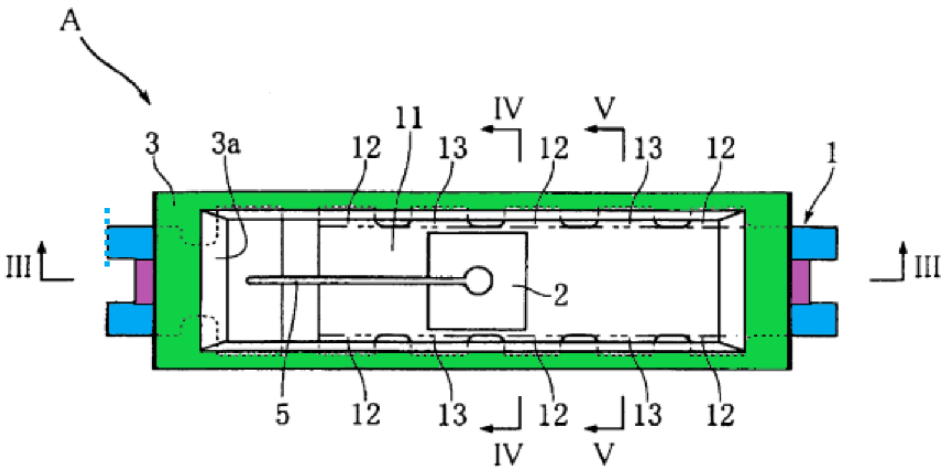
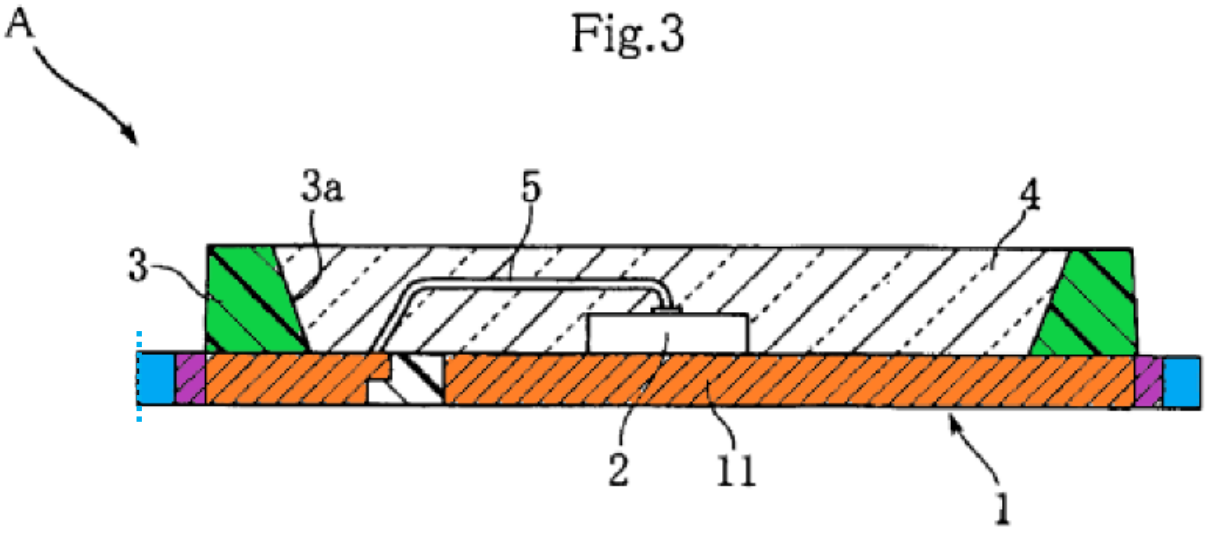


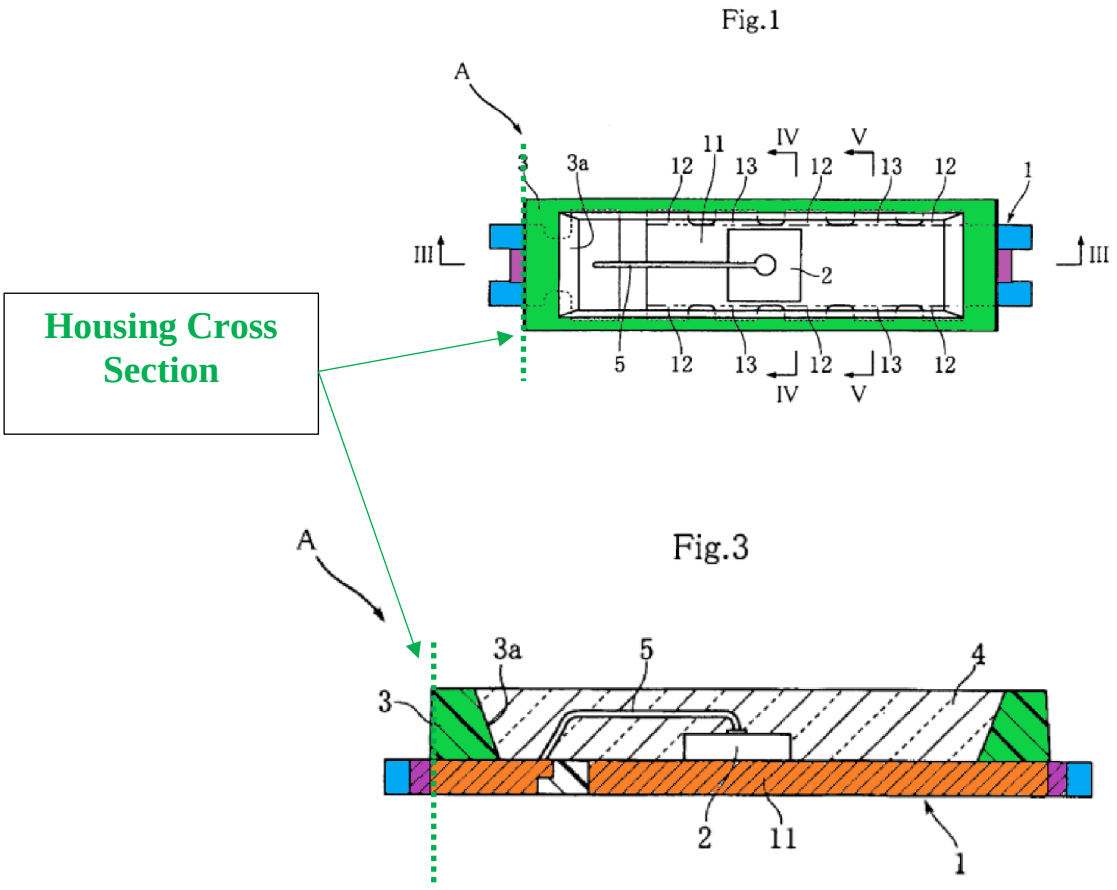
Fig.3



9.2.1.8. Claim 1: "wherein the resin housing comprises at least one housing cross section"

172. It is my opinion that Kobayakawa discloses the "wherein the resin housing comprises at least one housing cross section" limitation of claim 1. For example, a housing cross section is shown via a green hashed line in the below annotated Kobayakawa FIGs. 1 and 3. Although I only identify one housing cross-section in the below annotated figures, it will be appreciated that several different cross sections can be drawn on Kobayakawa's resin housing case 3.

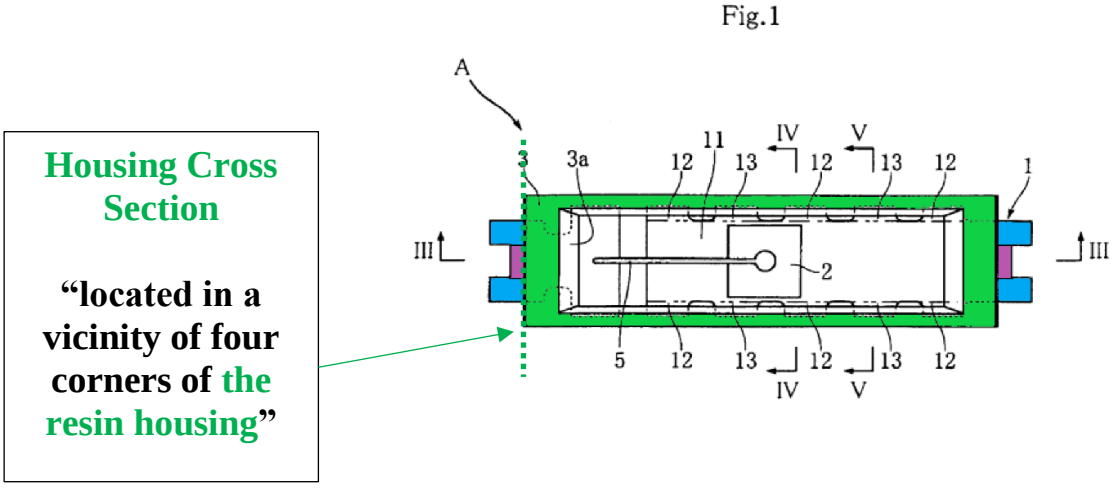
Kobayakawa FIGs. 1 and 3 (Annotated)



9.2.1.9. Claim 1: "wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing"

173. It is my opinion that Kobayakawa discloses the "wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing" limitation of claim 1, as shown in the below annotated Kobayakawa FIG. 1. As can be seen the housing cross section identified below is on an edge of the resin housing case 3, and this is in a "vicinity of four corners." And while only one cross section is shown below, multiple cross sections can be drawn.

Kobayakawa FIG. 1 (Annotated)

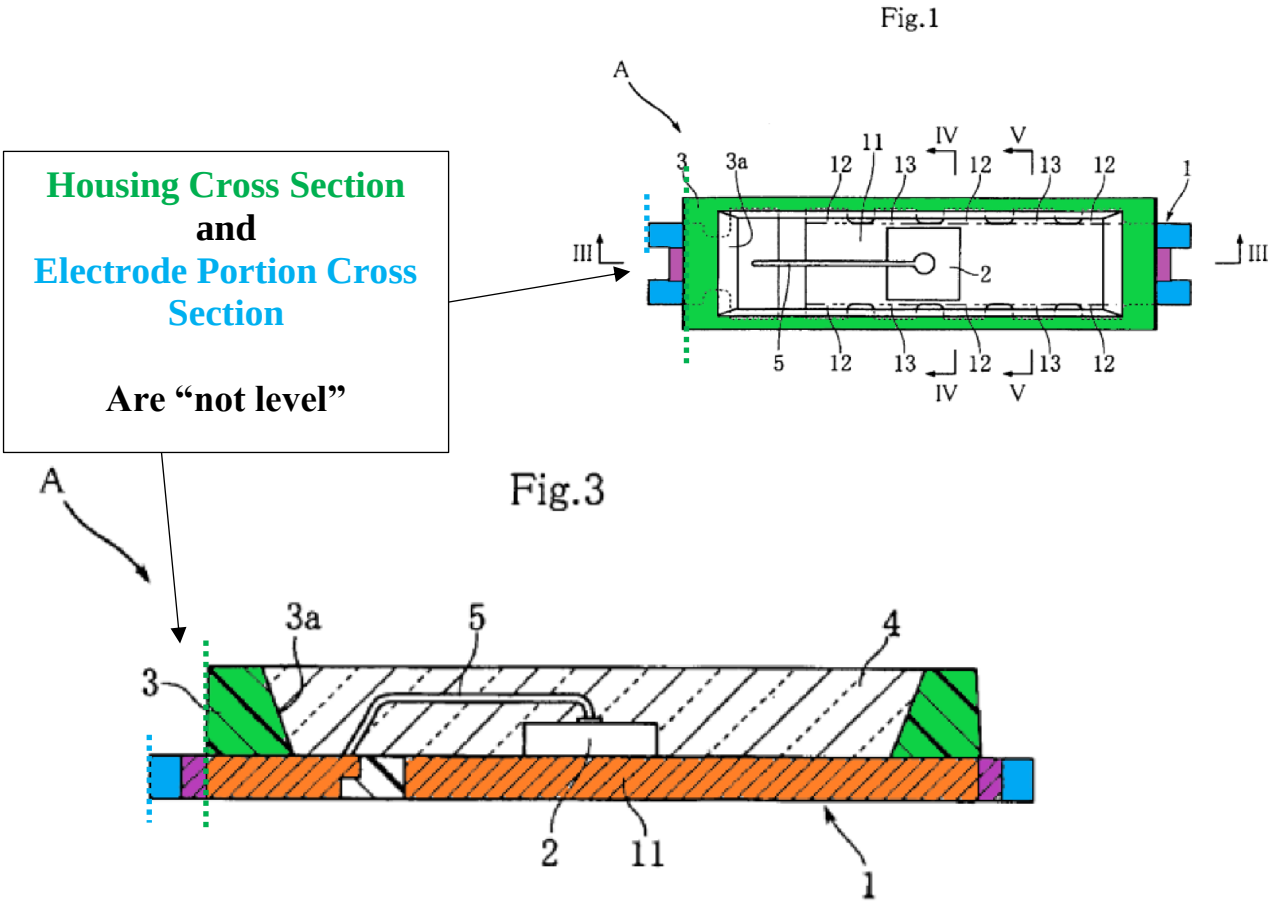


9.2.1.10. Claim 1: "wherein the at least one housing cross section is not level with the electrode portion cross section"

174. It is my opinion that Kobayakawa discloses the "wherein the at least one housing cross section is not level with the electrode portion cross section" limitation of claim 1. For example, as shown in the below annotated Kobayakawa

FIGs. 1 and 3, the electrode portion cross section (blue hashed line) and the housing cross section (green hashed line) are "not level":

Kobayakawa FIGs. 1 and 3 (Annotated)

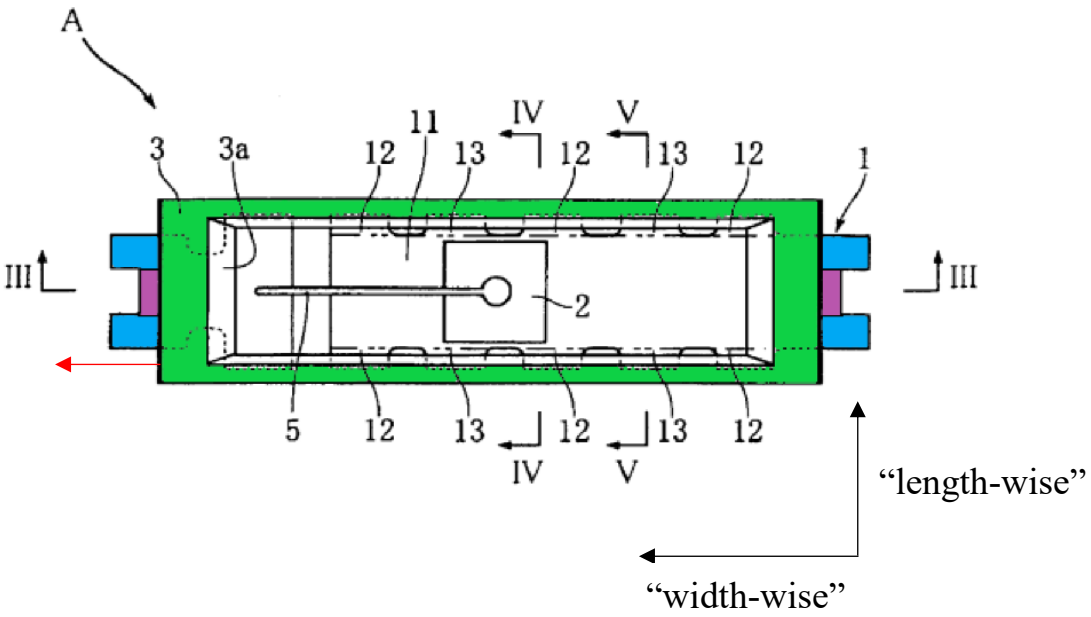


9.2.2. Claim 5: The light emitting device according to claim 1, wherein the central area and the at least one edge area protrude from the housing in the width-wise direction

175. It is my opinion that Kobayakawa discloses that the "central area [purple] and the at least one edge area [blue] protrude from the housing [green] in the width-wise direction," as shown in the below annotated Kobayakawa FIG. 1.

Kobayakawa FIG. 1 (Annotated)

Fig.1

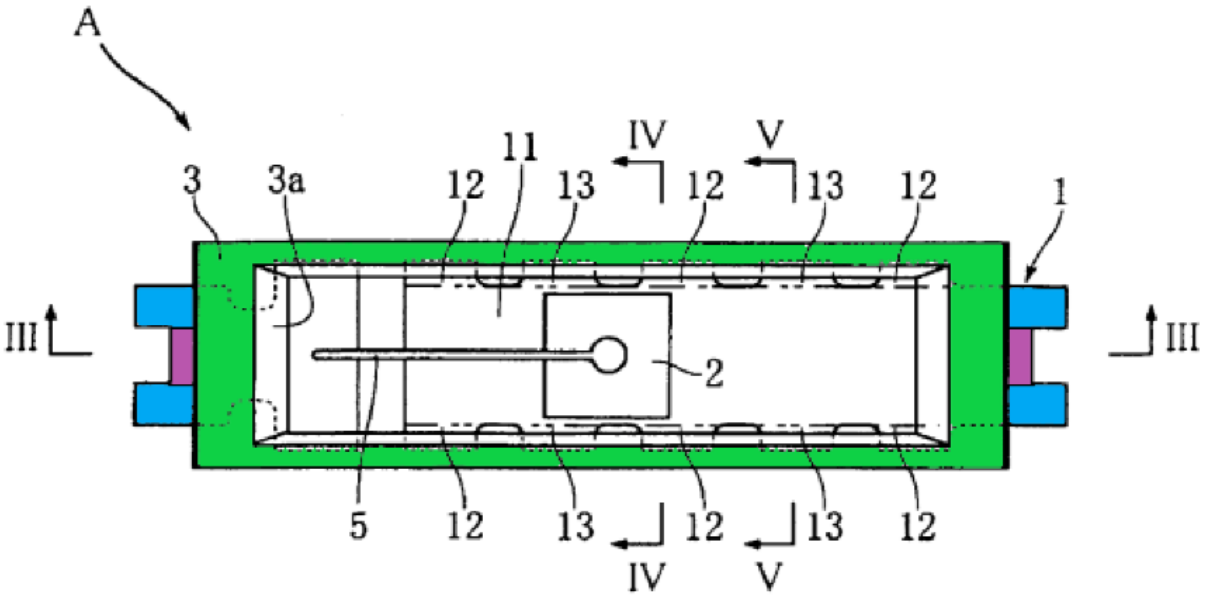


9.2.3. Claim 6: The light emitting device according to claim 1, wherein the at least one edge area comprises two edge areas

176. It is my opinion that Kobayakawa discloses that the "wherein the at least one edge area comprises two edge areas," as required by claim 6. As shown in the below annotated Kobayakawa FIG. 1, the protruding ends of the lead frame 1 each comprise two edge areas (blue):

Kobayakawa FIG. 1 (Annotated)

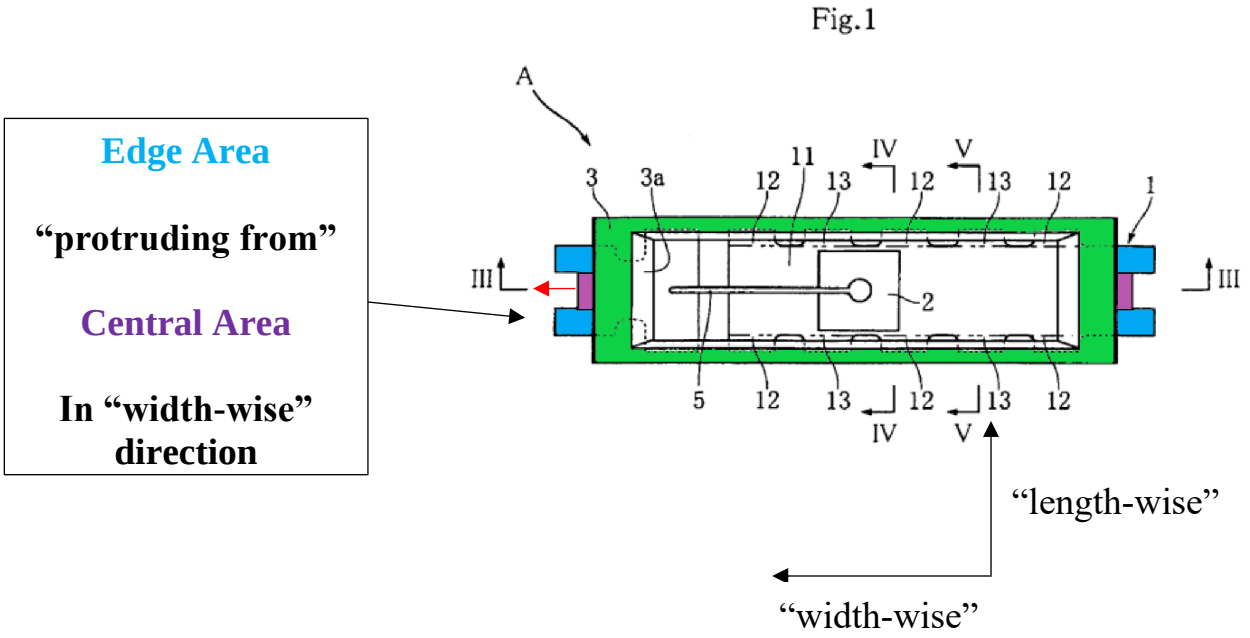
Fig.1



9.2.4. Claim 7: The light emitting device according to claim 6, wherein the two edge areas protrude from central area in the width-wise direction

177. It is my opinion that Kobayakawa discloses that the "the two edge areas protrude from central area in the width-wise direction," as required by claim 7. This is shown in the below annotated Kobayakawa FIGs 1:

Kobayakawa FIG. 1 (Annotated)

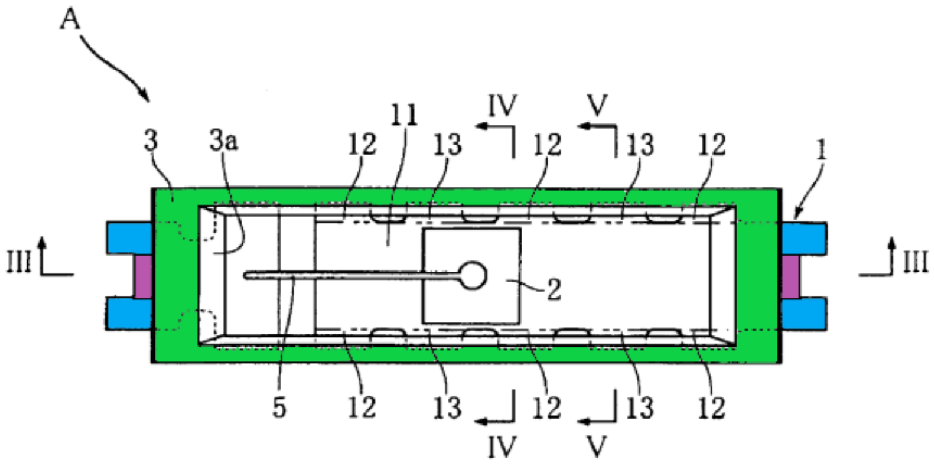


9.2.5. Claim 8: The light emitting device according to claim 6, wherein the central area is provided between the two edge areas along the length-wise direction

178. It is my opinion that Kobayakawa discloses that "wherein the central area is provided between the two edge areas along the length-wise direction," as required by claim 8. That Kobayakawa's central area (purple) "is provided between the two edge areas [blue] along the length-wise direction" is shown in the below annotated FIG. 1:

Kobayakawa FIG. 1 (Annotated)

Fig.1

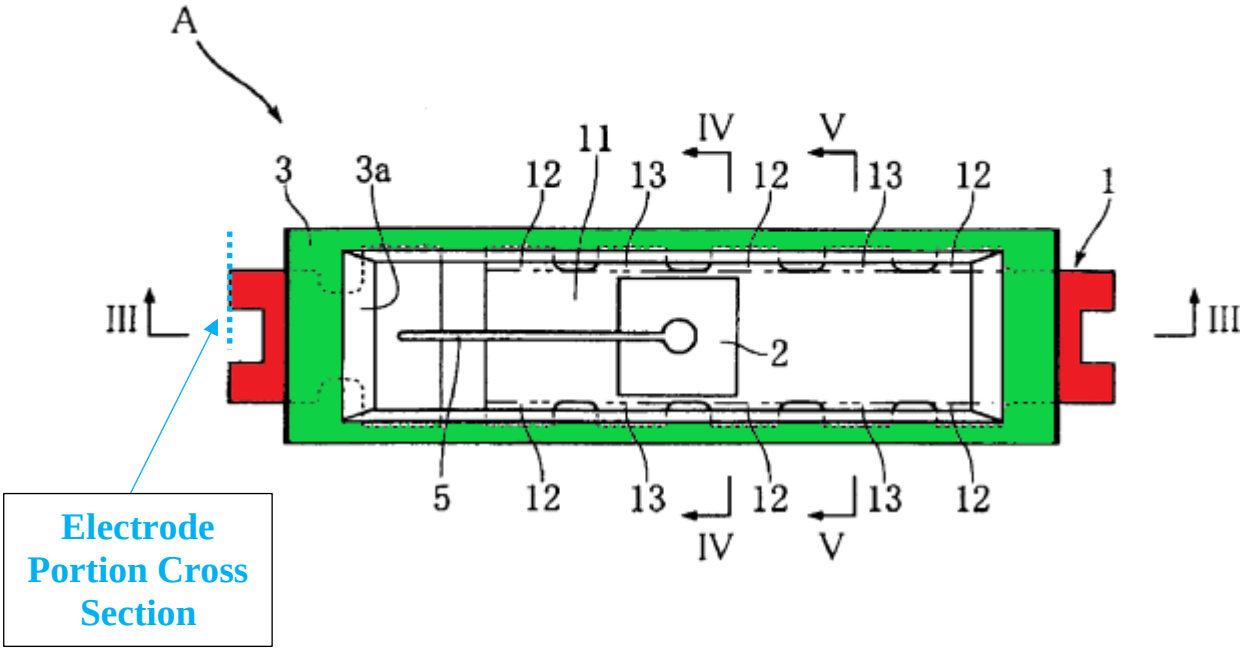


9.2.6. Claim 9: The light emitting device according to claim 1, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion

179. It is my opinion that Kobayakawa discloses that "the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion," as required by claim 9. This is shown in the below annotated Kobayakawa FIG. 1:

Kobayakawa FIG. 1 (Annotated)

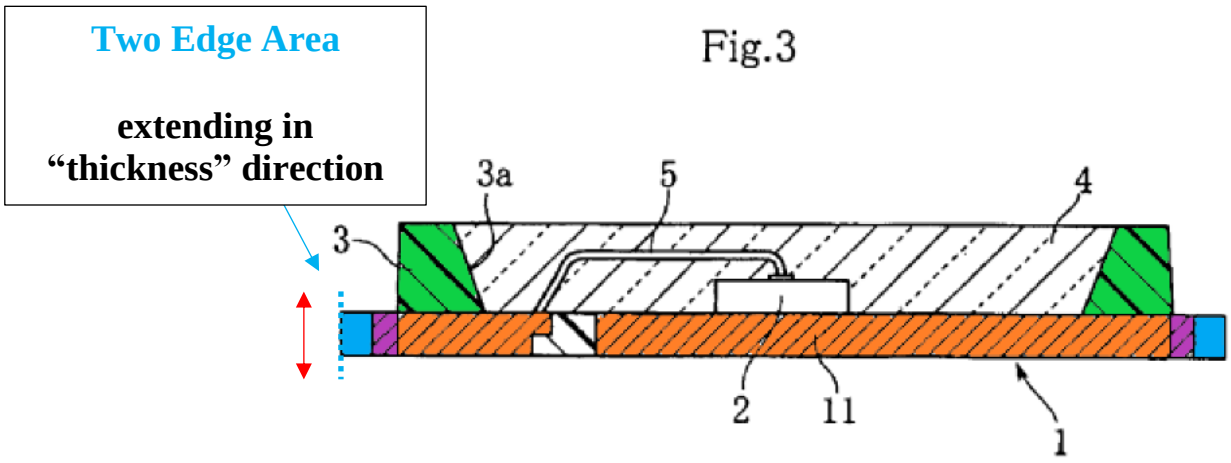
Fig.1



9.2.7. Claim 10: The light emitting device according to claim 9, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion

180. It is my opinion that Kobayakawa discloses that the "electrode portion cross section extends in a thickness direction of the at least one electrode portion," as required by claim 10. That the electrode portion cross section (blue hashed lines) "extends in a thickness direction of the at least one electrode portion" is shown in the below annotated Kobayakawa FIG. 1:

Kobayakawa FIG. 3 (Annotated)



9.2.8. Claim 11

181. It is my opinion that Kobayakawa discloses each limitation of claim 11.

9.2.8.1. Claim 11: "A light emitting device comprising"

182. It is my opinion that Kobayakawa discloses a "[a] light emitting device" for the reasons I provide in Section 9.2.1.1 above.

9.2.8.2. Claim 11: "at least one electrode portion having a wing portion"

183. It is my opinion that Kobayakawa discloses "at least one electrode portion having a wing portion" for the reasons I provide in Section 9.2.1.2 above.

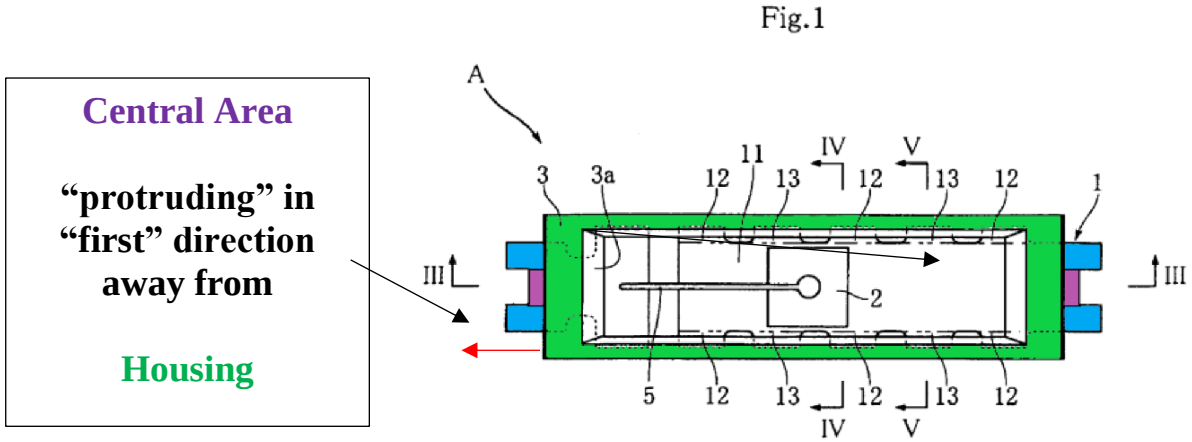
9.2.8.3. Claim 11: "resin housing containing a reflecting material"

184. It is my opinion that Kobayakawa discloses "resin housing containing a reflecting material" for the reasons I provide in Section 9.2.1.6 above.

9.2.8.4. Claim 11: "wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing"

185. It is my opinion that Kobayakawa discloses the "wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing," limitation of claim 11. For example, as shown in the below annotated Kobayakawa FIG. 1, Kobayakawa's central area [purple] "protrude[es] from the housing [green] in a first direction [red arrow] away from the housing:

Kobayakawa FIG. 1 (Annotated)

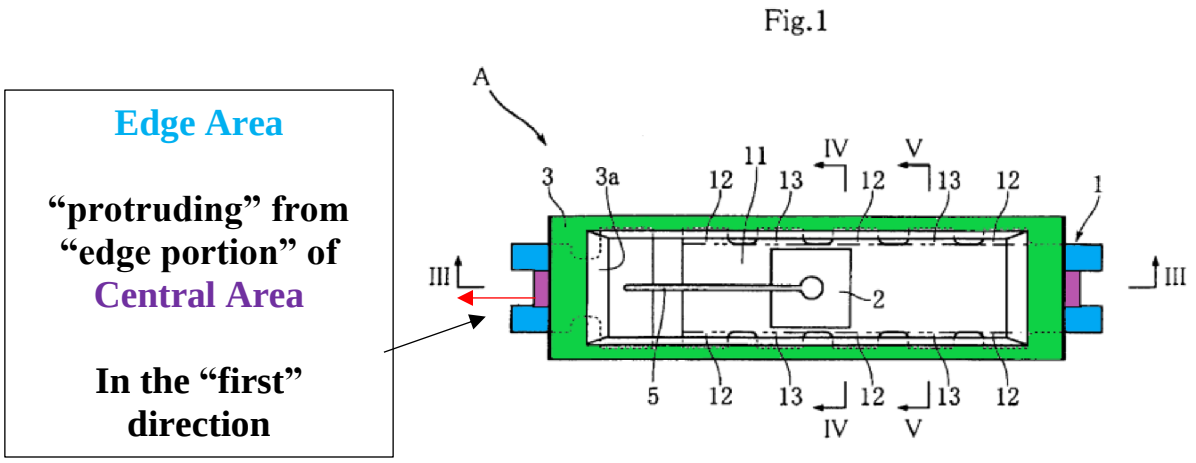


9.2.8.5. Claim 11: "at least one edge area protruding from an edge portion of the central area, in the first direction"

186. It is my opinion that Kobayakawa discloses the "at least one edge area protruding from an edge portion of the central area, in the first direction" limitation of claim 11. For example, as shown in the below annotated Kobayakawa FIG. 1, the

"edge area" (blue) protrudes "from an edge portion of the central area [purple], in the first direction [red arrow]."

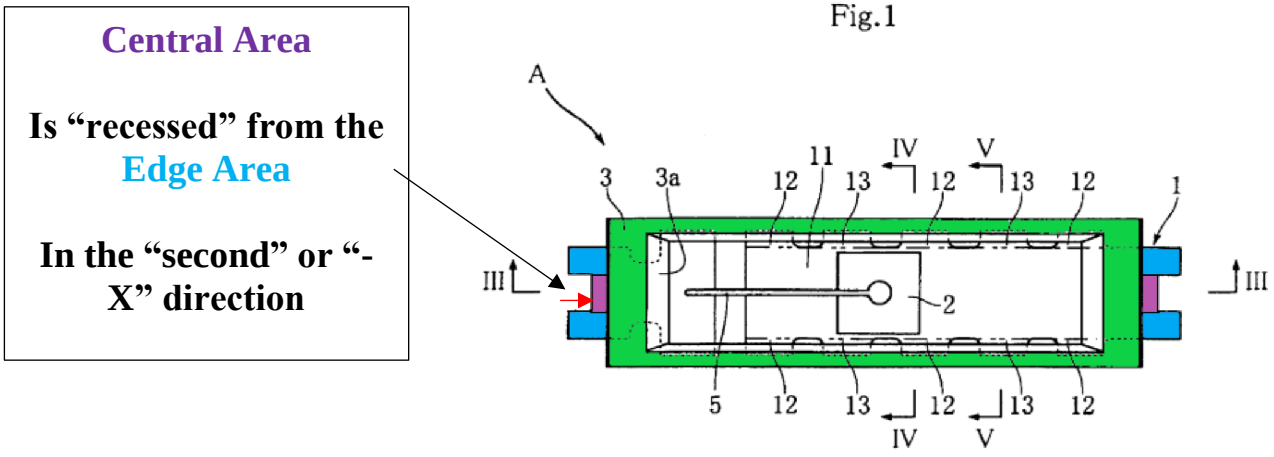
Kobayakawa FIG. 1 (Annotated)



9.2.8.6. Claim 11: "wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing"

187. It is my opinion that Kobayakawa discloses the "wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing" limitation of claim 11. For example, as shown in the below annotated Kobayakawa FIG. 1, the central area (purple) is "recessed from the at least one edge area [blue] in a second direction [red arrow] opposite from the first direction toward the housing [green]":

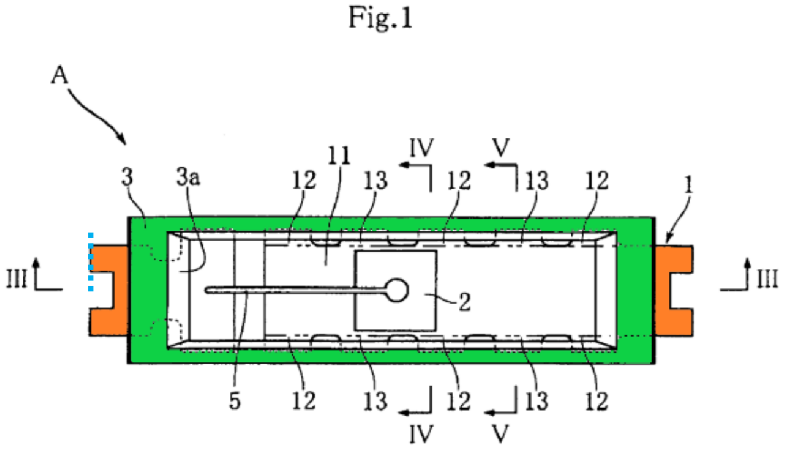
Kobayakawa FIG. 1 (Annotated)



9.2.8.7. Claim 11: "wherein the at least one electrode portion further comprises an electrode portion cross section"

188. It is my opinion that Kobayakawa discloses the "wherein the at least one electrode portion further comprises an electrode portion cross section" limitation of claim 11. For example, Kobayakawa's electrode portion cross section is shown via a blue hashed line in the below annotated FIG. 1:

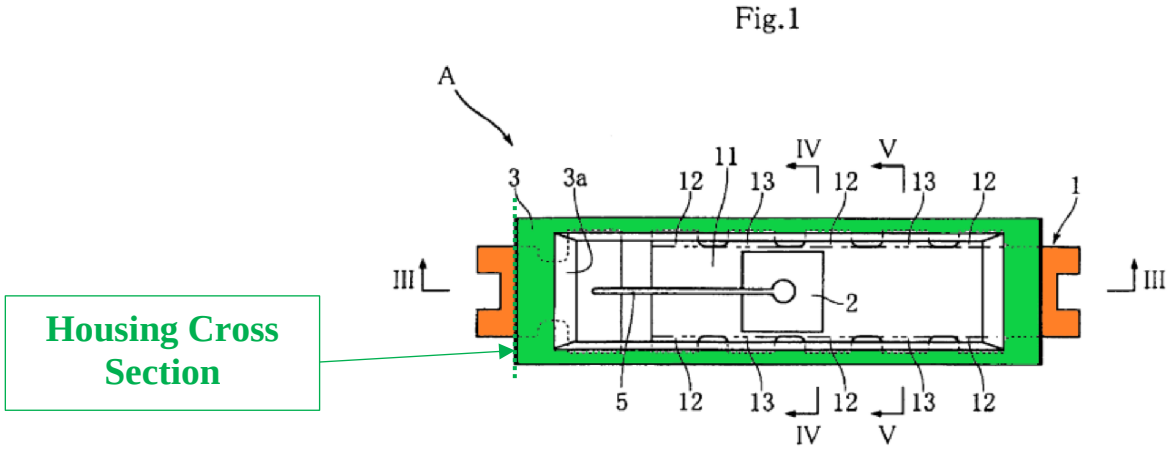
Kobayakawa FIG. 1 (Annotated)



9.2.8.8. Claim 11: "wherein the resin housing comprises at least one housing cross section"

189. It is my opinion that Kobayakawa discloses the "wherein the resin housing comprises at least one housing cross section" limitation of claim 11. Kobayakawa's "housing cross section" is shown by a green hashed line on the below annotated Kobayakawa FIG. 1.

Kobayakawa FIG. 1 (Annotated)



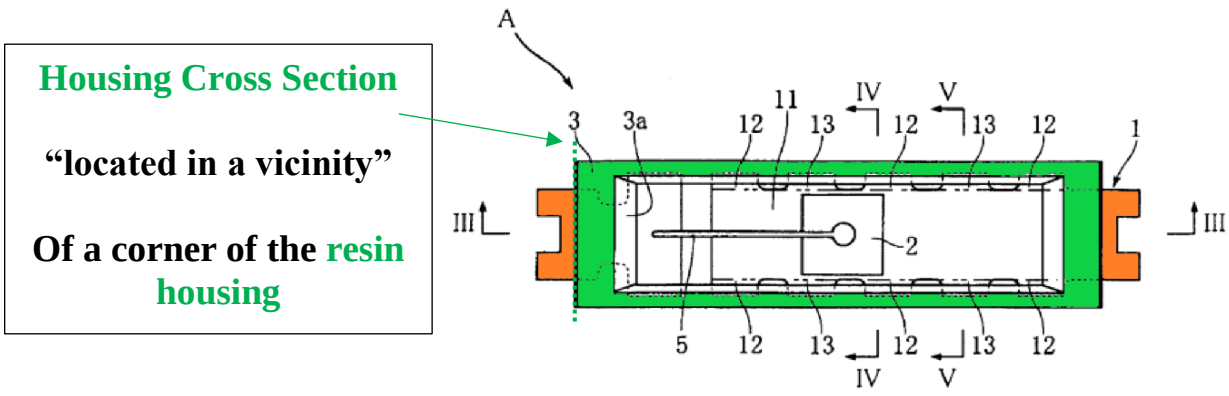
9.2.8.9. Claim 11: "wherein the at least one housing cross section is located in a vicinity of a comer of the resin housing"

190. It is my opinion that Kobayakawa discloses the "wherein the at least one housing cross section is located in a vicinity of a comer [sic] of the resin housing" limitation of claim 11, as shown in the below annotated Kobayakawa FIG. 1. For example, a housing cross section is shown via a green hashed line in the below annotated Kobayakawa FIG. 1. Although I only identify one housing cross-

section in the below annotated figures, it will be appreciated that several different cross sections can be drawn on Kobayakawa's resin housing case 3.

Kobayakawa FIGs. 1 and 3 (Annotated)

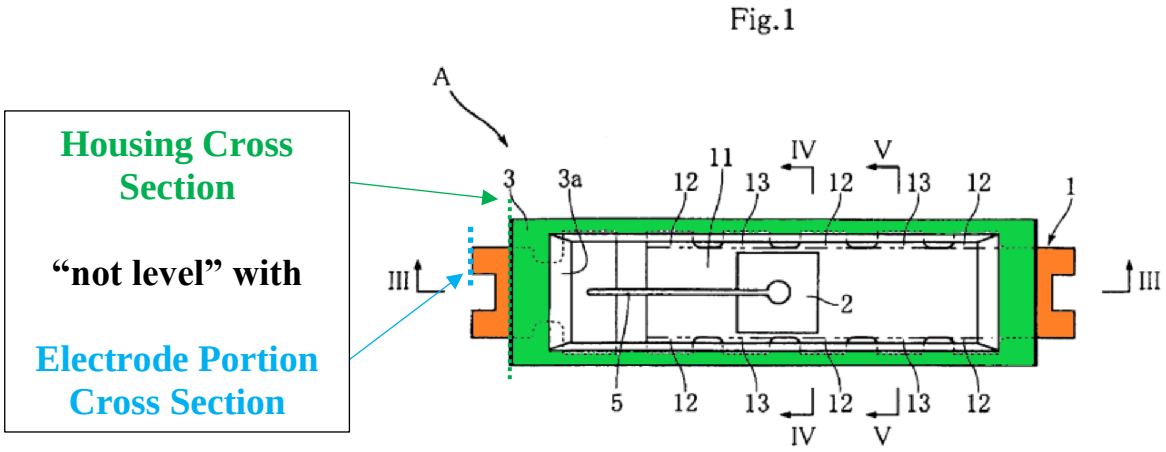
Fig.1



9.2.8.10. Claim 11: "wherein the at least one housing cross section is not level with the electrode portion cross section"

191. It is my opinion that Kobayakawa discloses the "wherein the at least one housing cross section is not level with the electrode portion cross section" limitation of claim 11. For example, as shown in the below annotated Kobayakawa FIG. 1, the housing cross section (green hashed line) and electrode portion cross section (blue hashed line) are "not level":

Kobayakawa FIG. 1 (Annotated)

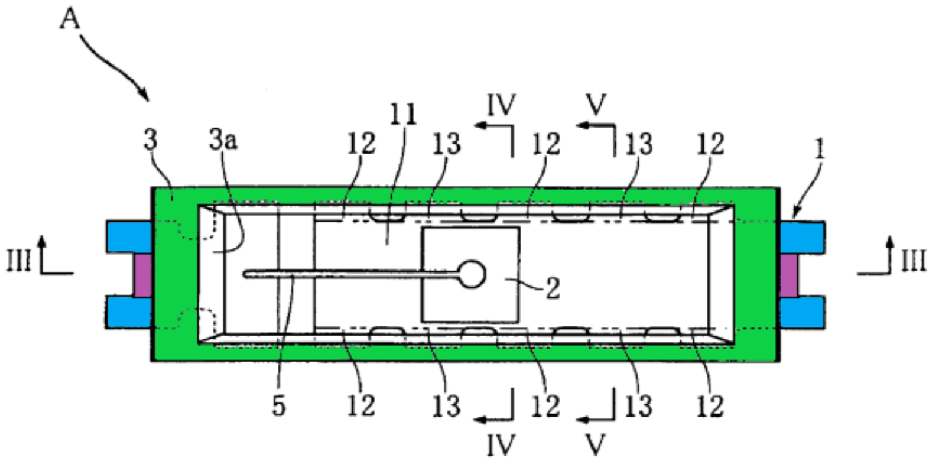


9.2.8.11. Claim 11: "wherein the at least one edge area comprises two edge areas"

192. It is my opinion that Kobayakawa discloses the "wherein the at least one edge area comprises two edge areas" limitation of claim 11 As shown in the below annotated Kobayakawa FIG. 1, the protruding ends of the lead frame 1 each comprise two edge areas (blue):

Kobayakawa FIG. 1 (Annotated)

Fig.1

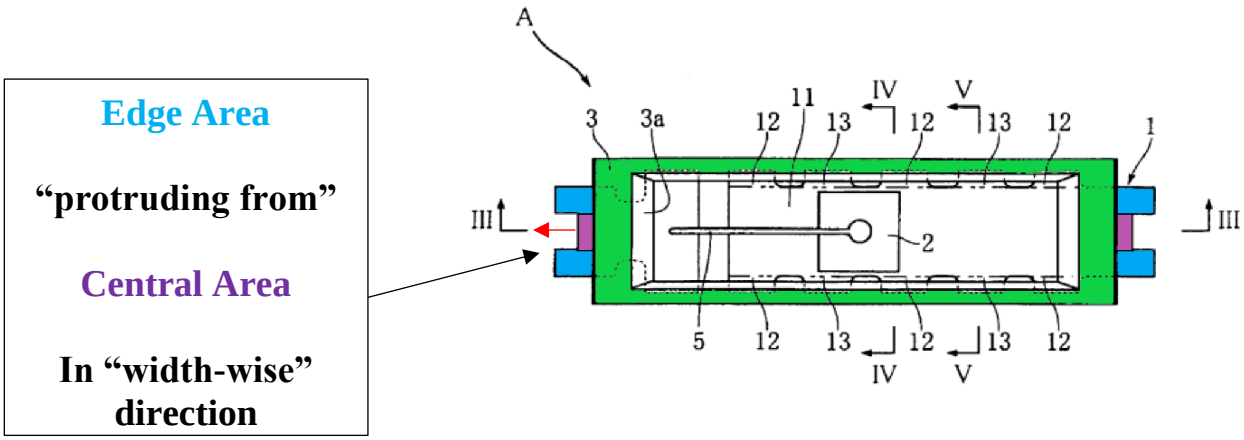


9.2.8.12. Claim 11: "wherein the two edge areas protrude from the central area in the first direction"

193. It is my opinion that that Kobayakawa discloses the "wherein the two edge areas protrude from the central area in the first direction" limitation of claim 11, as shown in the below annotated Kobayakawa FIGs. 1:

Kobayakawa FIG. 1 (Annotated)

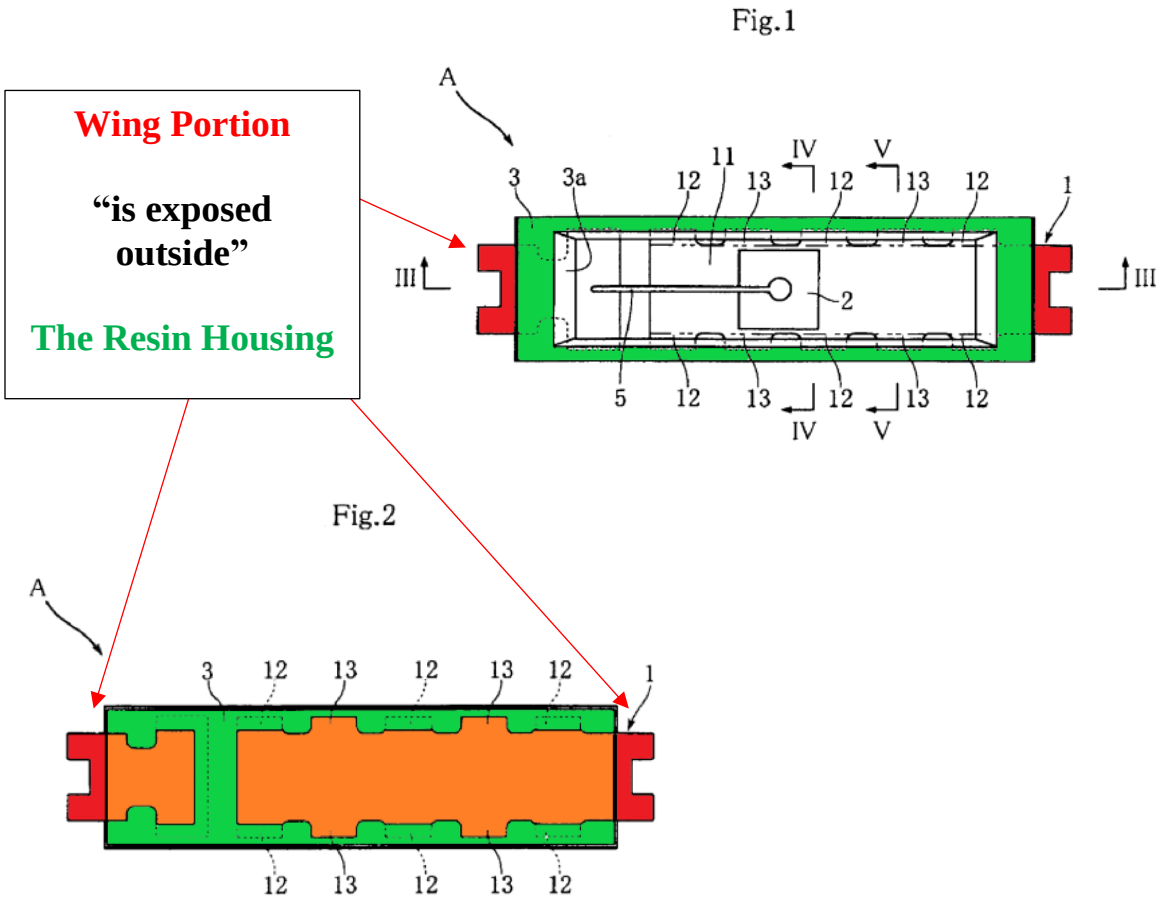
Fig.1



9.2.9. Claim 12: "The light emitting device according to claim 11, wherein the wing portion is exposed outside the resin housing"

194. It is my opinion that Kobayakawa discloses that the "the wing portion is exposed outside the resin housing," as required by claim 12. For example, as shown in the below annotated FIGs. 1 and 2, Kobayakawa's wing portion (red) is exposed outside of the resin housing (green):

Kobayakawa FIGs. 1 and 3 (Annotated)

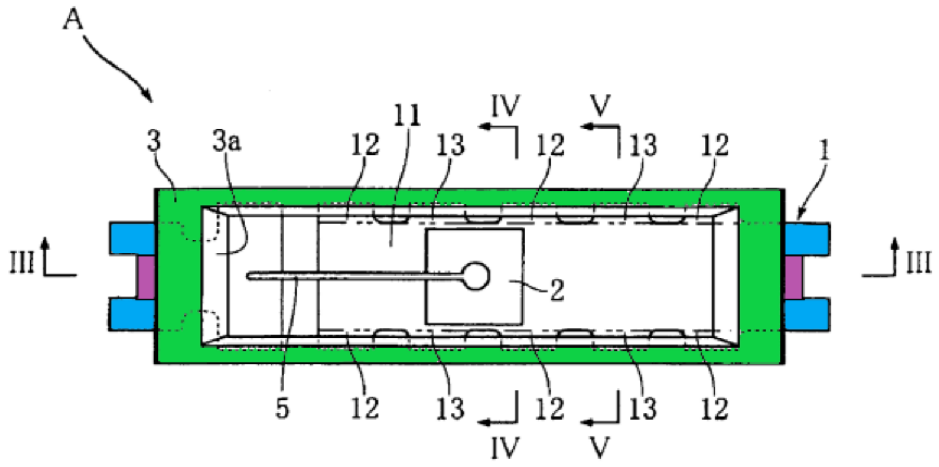


9.2.10. Claim 13: "The light emitting device according to claim 12, wherein the wing portion comprises two edge areas"

195. It is my opinion that Kobayakawa discloses that "the wing portion comprises two edge areas," as required by claim 13. For example, each of the two protruding wing portions comprise two edge areas (blue), as shown in the below annotated Kobayakawa FIG. 1:

Kobayakawa FIG. 1 (Annotated)

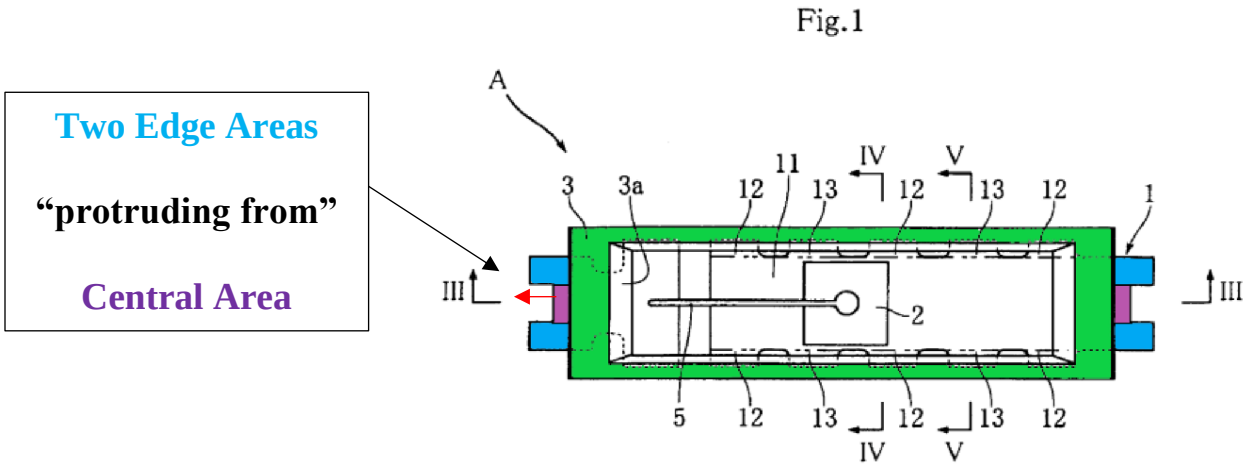
Fig.1



9.2.12. Claim 14: "The light emitting device according to claim 13, wherein the two edge areas protrude from central area"

196. It is my opinion that Kobayakawa discloses that the "the two edge areas protrude from central area," as required by claim 14. That Kobayakawa's "the two edge areas [blue] protrude from central area [purple]" is illustrated in the below annotated FIG. 1:

Kobayakawa FIG. 1 (Annotated)



9.2.11. Claim 16: "The light emitting device according to claim 11, wherein the at least one electrode portion further comprises a conductive layer"

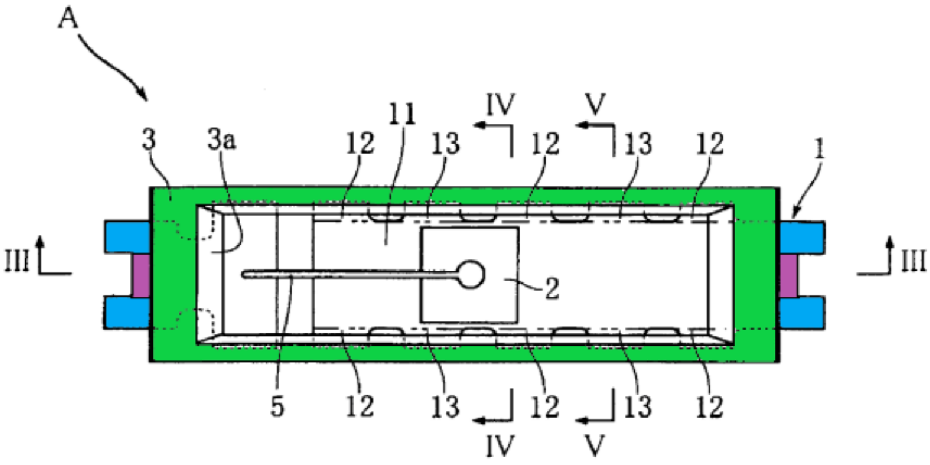
197. It is my opinion that Kobayakawa discloses that "the at least one electrode portion further comprises a conductive layer," as required by claim 16. For example, Kobayakawa describes that the lead frame 1 or "at least one electrode portion" is "made of Cu, Ni, or an alloy containing Cu and/or Ni" (Ex-1005 at 2:39-41). Copper (Cu), Nickel (Ni), and alloy containing Copper or Nickel are widely understood to be conductive materials, and thus are a "conductive layer." Therefore, Kobayakawa discloses that the lead frame 1, which is the claimed "at least one electrode portion," comprises a "conductive layer" as required by claim 16 of the '742 patent.

9.2.12. Claim 20: "The light emitting device according to claim 11, wherein the central area is provided between the two edge area along a third direction substantially perpendicular to the first and second direction"

198. It is my opinion that Kobayakawa discloses that "the central area is provided between the two edge area[s] along a third direction substantially perpendicular to the first and second direction," as required by claim 20. For example, as shown in the below annotated Kobayakawa FIG. 1, the central area [purple] is provided between the two edge area [blue] along a third direction, and the third direction is "substantially perpendicular to the first and second direction":

Kobayakawa FIG. 1 (Annotated)

Fig.1

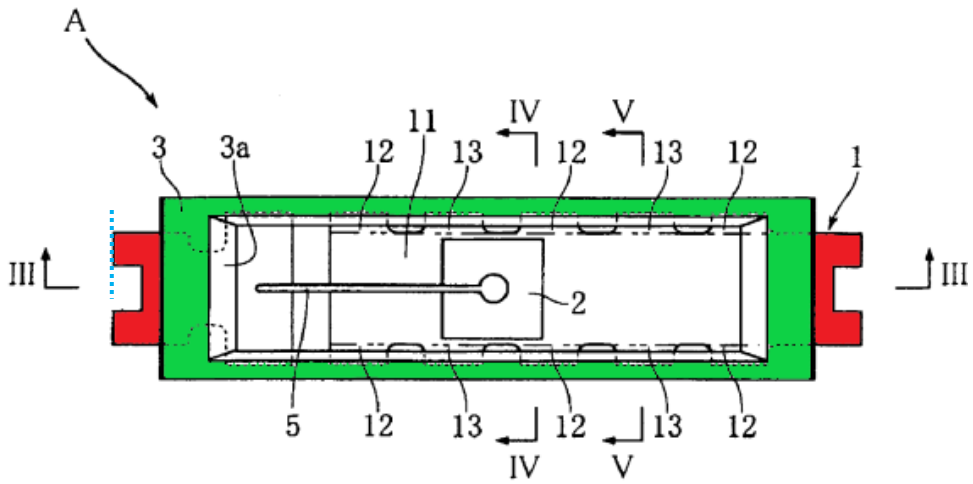


9.2.13. Claim 21: "The light emitting device according to claim 11, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion"

199. It is my opinion that Kobayakawa discloses that "the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion," as required by claim 21. For example, as shown in the below annotated Kobayakawa FIG. 1, the electrode portion cross section (blue hashed line) "corresponds to at least a portion of an outer surface" of the wing portion (red):

Kobayakawa FIG. 1 (Annotated)

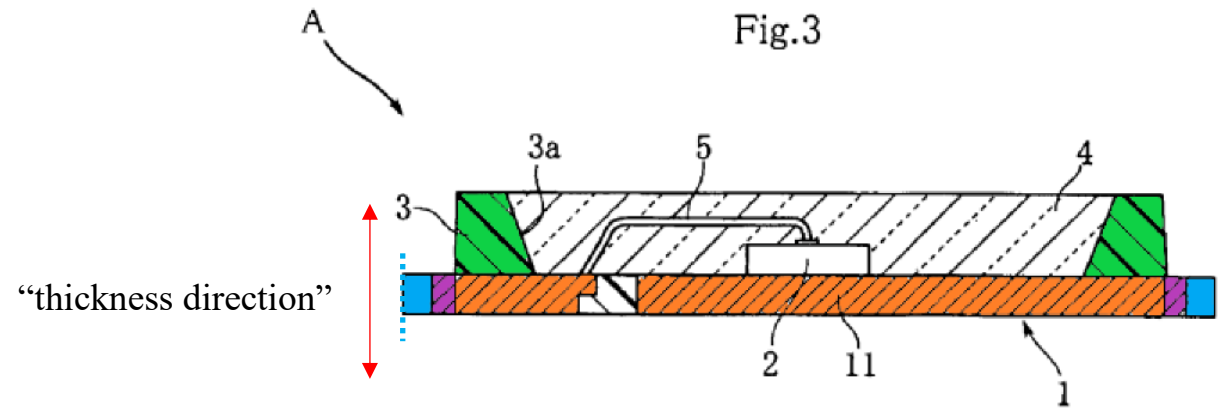
Fig.1



9.2.14. Claim 22: "The light emitting device according to claim 21, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion"

200. It is my opinion that Kobayakawa discloses that "the electrode portion cross section extends in a thickness direction of the at least one electrode portion," as required by claim 22. For example, as shown in the below annotated Kobayakawa FIG. 3, "the electrode portion [blue hashed line] cross section extends in a thickness direction [red arrows] of the at least one electrode portion":

Kobayakawa FIG. (Annotated)



9.3. Claims 1, 2, 5-16, and 20-22 are Anticipated by Hayashi

201. It is my opinion that Hayashi anticipates claims 1, 5-16 and 20-22 of the '742 patent.

9.3.1. Claim 1

202. For the reasons below, it is my opinion that Hayashi discloses each limitation of claim 1 of the ’742 patent, and thus claim 1 is anticipated by Hayashi.

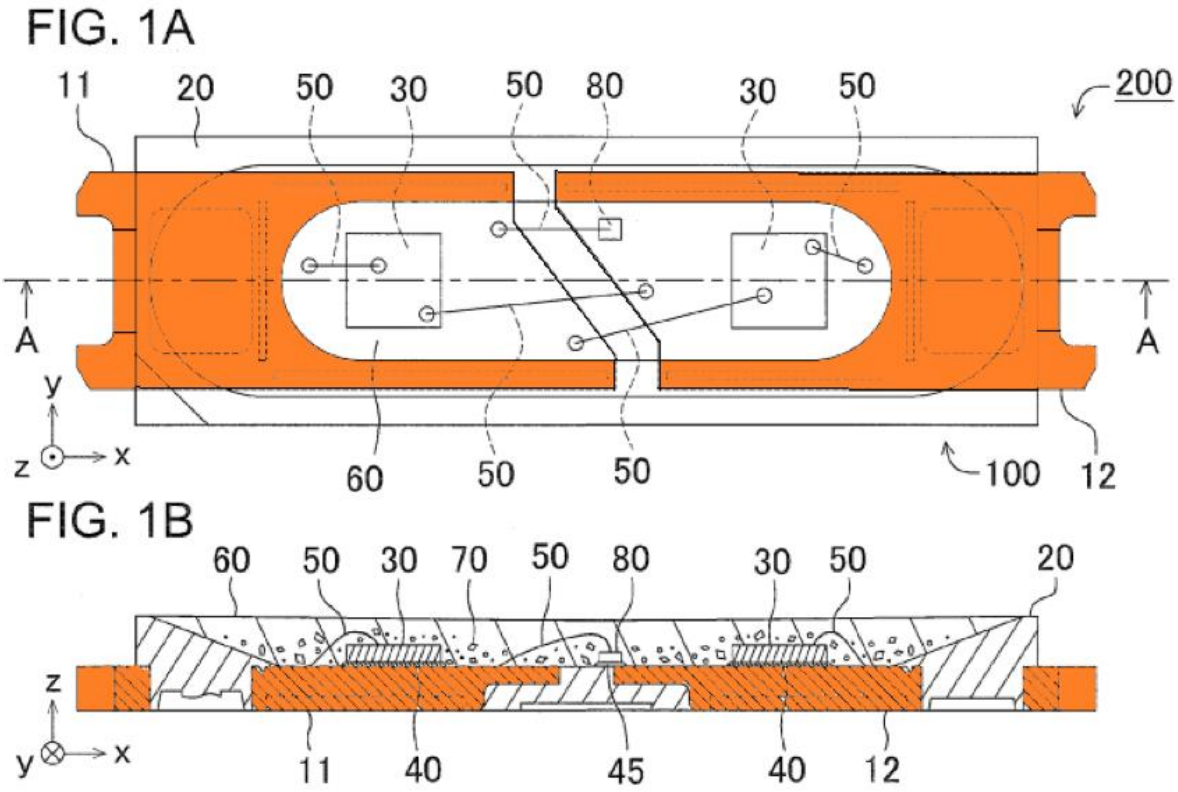
9.3.1.1 Claim 1: “A Light Emitting Device Comprising …”

203. It is my opinion that Hayashi discloses “[a] light emitting device comprising…” (Ex-1006 at [0006], [0008]-[0014]; FIGs. 1A-B, 2A-D).

9.3.1.2. Claim 1: “at Least one Electrode Portion”

204. It is my opinion that Hayashi discloses the “at least one electrode portion limitation of claim 1 through its “lead-frames 11, 12” that each “conduct electricity and can be connected with the light emitting elements,” which are shown in orange in the below annotated Hayashi FIGs. 1A and 1B (Ex-1006 at [0047]-[0048]):

Hayashi FIGs. 1A and 1B (Annotated)

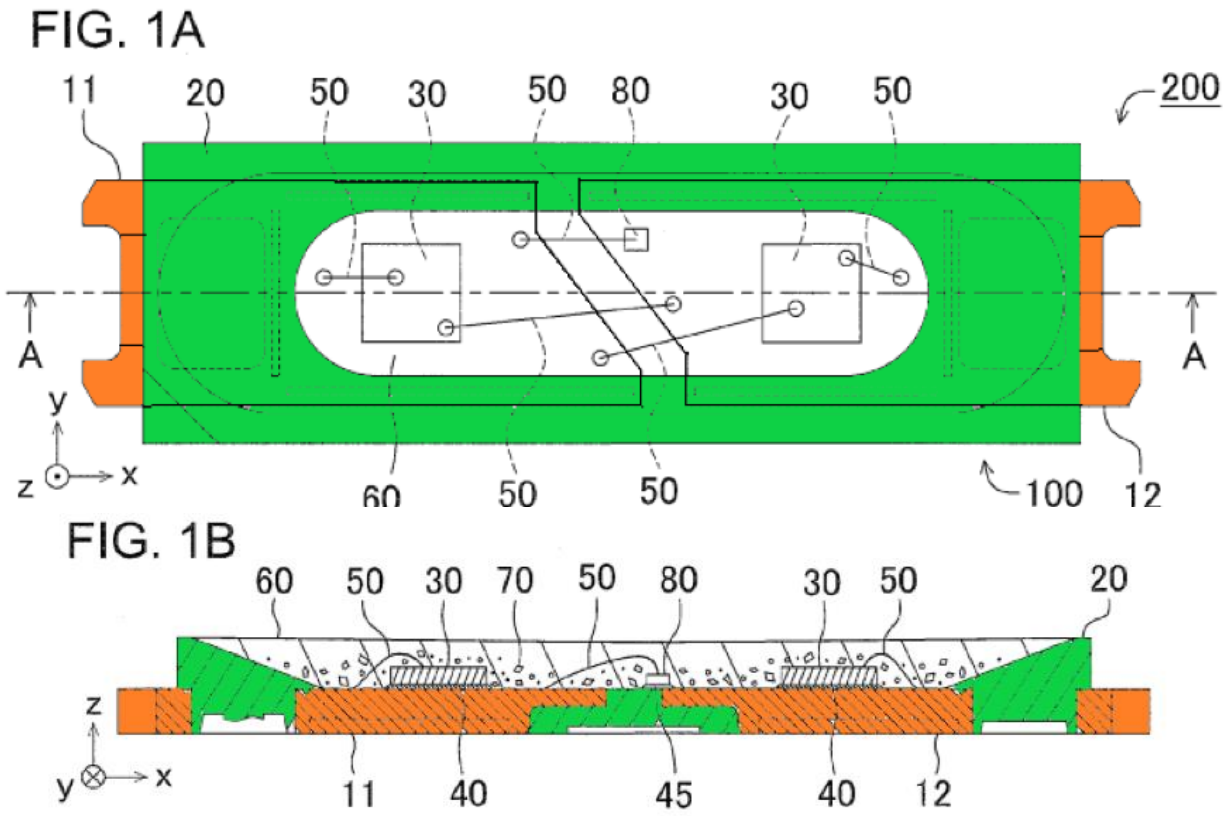


9.3.1.3. Claim 1: "a resin housing containing a reflecting material and covering a portion of said at least one electrode portion"

205. It is my opinion that Hayashi discloses the "resin housing containing a reflecting material and covering a portion of said at least one electrode portion" limitation of claim 1. For example, Hayashi's "molded resin 20," which is shown in green below, is the claimed "resin housing containing a reflective material and covering a portion of said at least one electrode portion." Hayashi describes that "molded resin 20 [green] covers part (or all) of both sides (lateral surfaces) of the

lead-frames 11, 12 [orange]" (Ex-1006 at [0025]). This is shown in the below annotated Hayashi FIGs. 1A-1B:

Hayashi FIGs. 1A and 1B (Annotated)



206. Hayashi further explains that molded resin housing 20 (green) can be made of any of a "base material (matrix)" (Ex-1006 at [0050]) and that molded resin 20 is shaped to reflect light emitted by the LED outward (e.g., up) from the LED package (Ex-1006 at [0045]). Hayashi also states that "particulate or fiber fillers and pigments such as glass, silica, titanium oxide, magnesium oxide, magnesium carbonate, magnesium hydroxide, calcium carbonate, calcium hydroxide, calcium silicate, magnesium silicate, wollastonite, mica, zinc oxide, barium titanate, calcium

titanate, aluminum borate, aluminum oxide, silicon carbide, antimony oxide, zinc stannate, zinc borate, iron oxide, chrome oxide, manganese oxide, and carbon black can be mixed into the base material" (Ex-1006 at [0050]). Each of these materials that the Hayashi describes are used to create the resin housing 20 are known to include reflective materials. For example, this is evidenced by the '742 patent itself, which describes zinc oxide as an example of a reflecting material (Ex-1001 at 4:65-5:4).

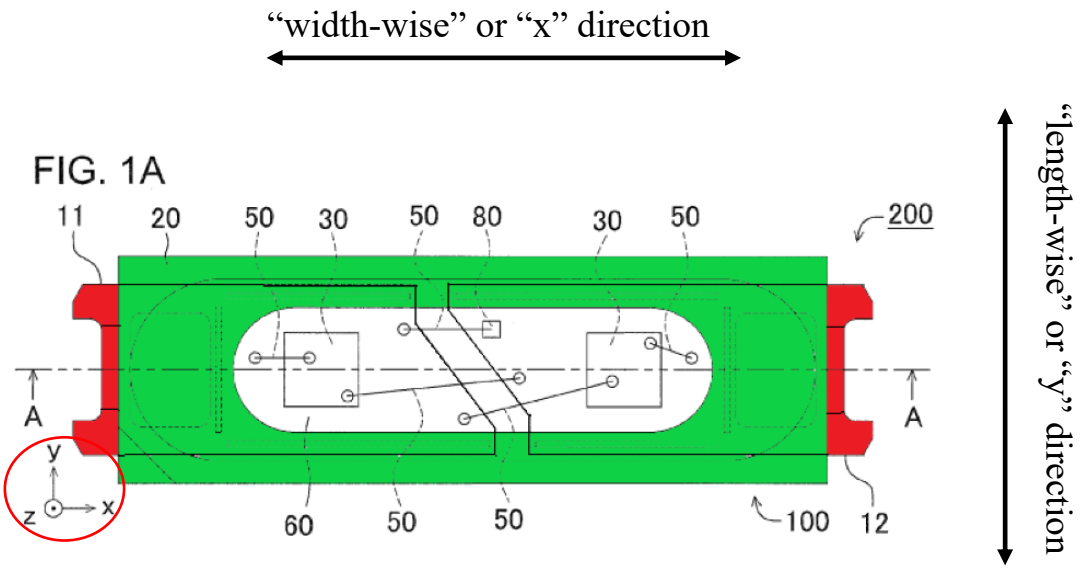
9.3.1.4. Claim 1: "wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction"

207. It is my opinion that Hayashi discloses the "wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction" limitation of claim 1.

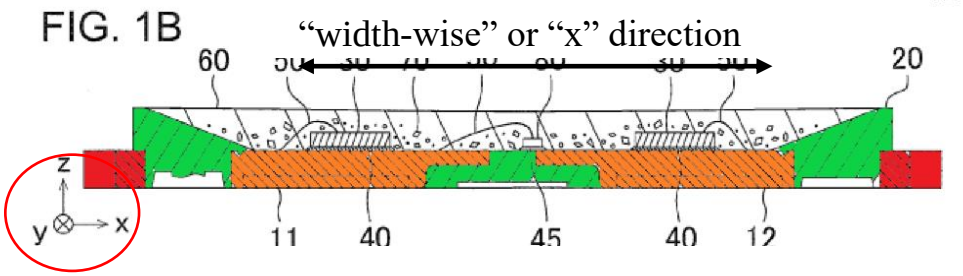
208. As shown in the below FIGs. 1A-B, Hayashi's the portions of lead frame portions 11, 12 that are exposed outside molded resin 20 (green) are the

claimed "wing portion" (red). Further, as shown below, the wing portion (red) extend along the edge of the edge of molded resin 20 in the "y," or "length-wise" direction, and protrude from molded resin 20 (green) in a direction substantially perpendicular "x" or "width-wise" direction.

Hayashi FIGs. 1A (Annotated)



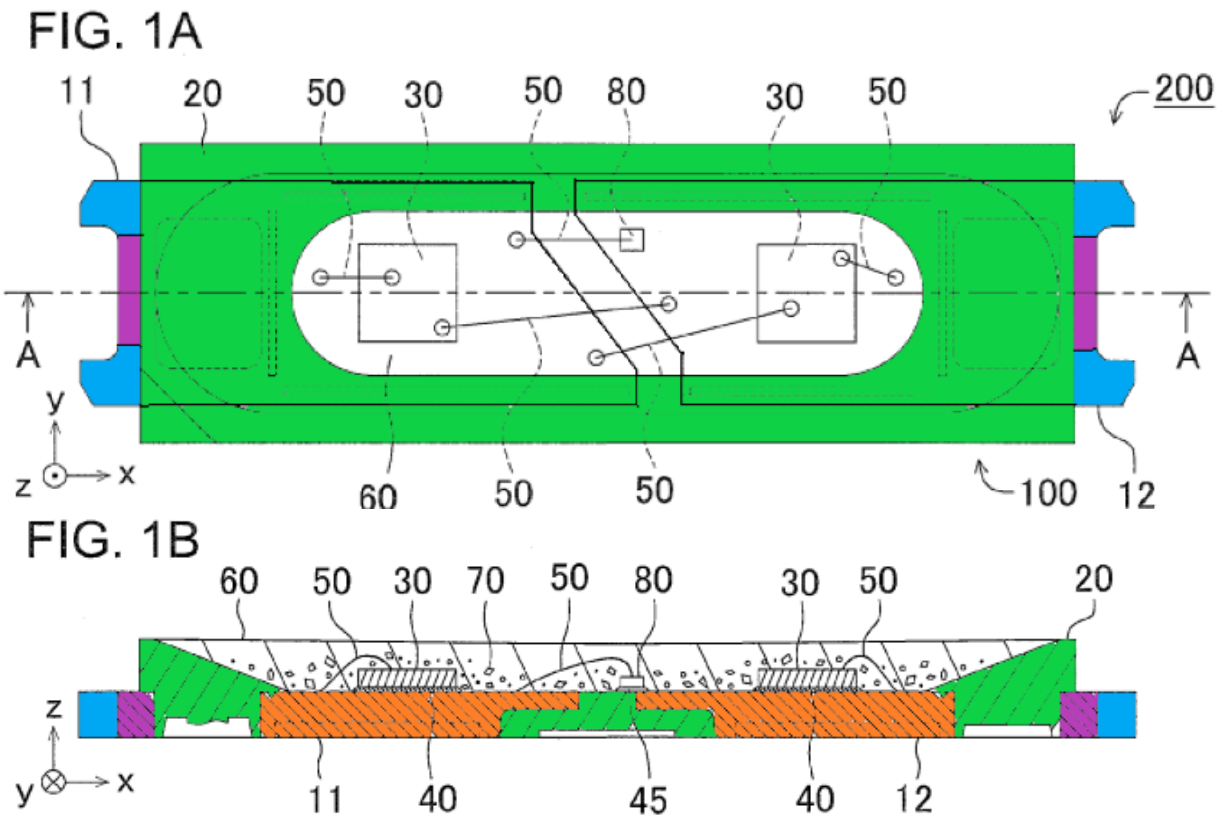
Hayashi FIGs. 1B (Annotated)



9.3.1.5. Claim 1: "wherein the wing portion comprises: a central area; and at least one edge area having a length in the length-wise direction shorter than that of the central area"

209. It is my opinion that Hayashi discloses the "wherein the wing portion comprises: a central area; and at least one edge area having a length in the length-wise direction shorter than that of the central area" limitation of claim 1. Hayashi's central area (purple) and at least one edge are (blue) are shown in the below annotated Hayashi FIGs. 1A and 1B:

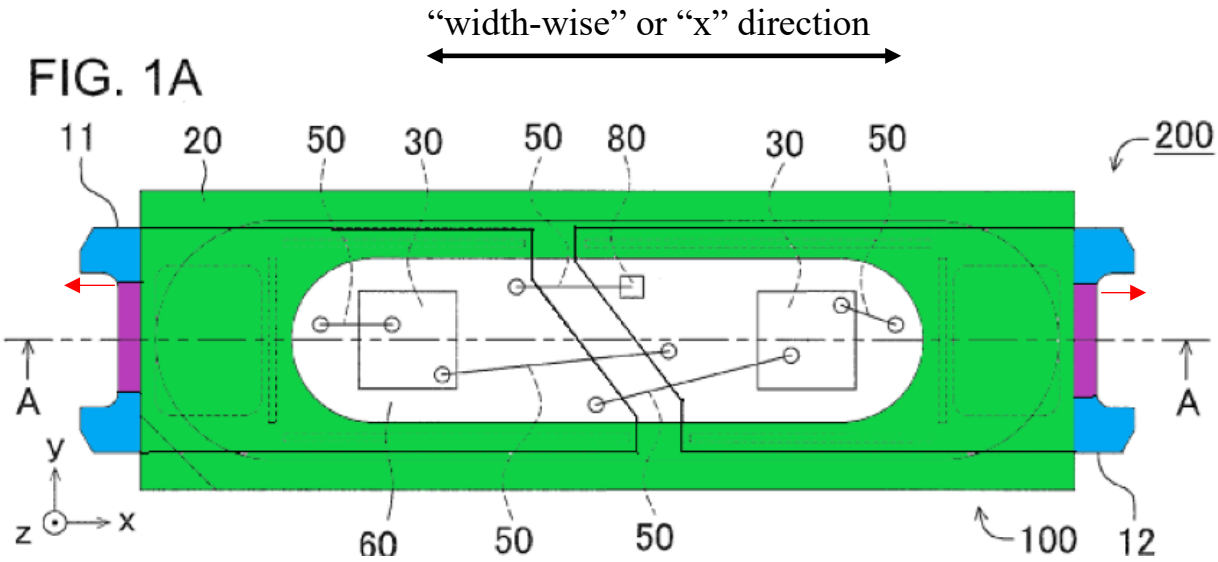
Hayashi FIGs. 1A and 1B (Annotated)



9.3.1.6. Claim 1: "wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area"

210. It is my opinion that Hayashi discloses the "wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area" limitation of claim 1. For example, that "the at least one edge area [blue] protrudes in the width-wise ["x"] direction from an end portion of the central area [purple]" is shown in the below annotated Hayashi FIG. 1A:

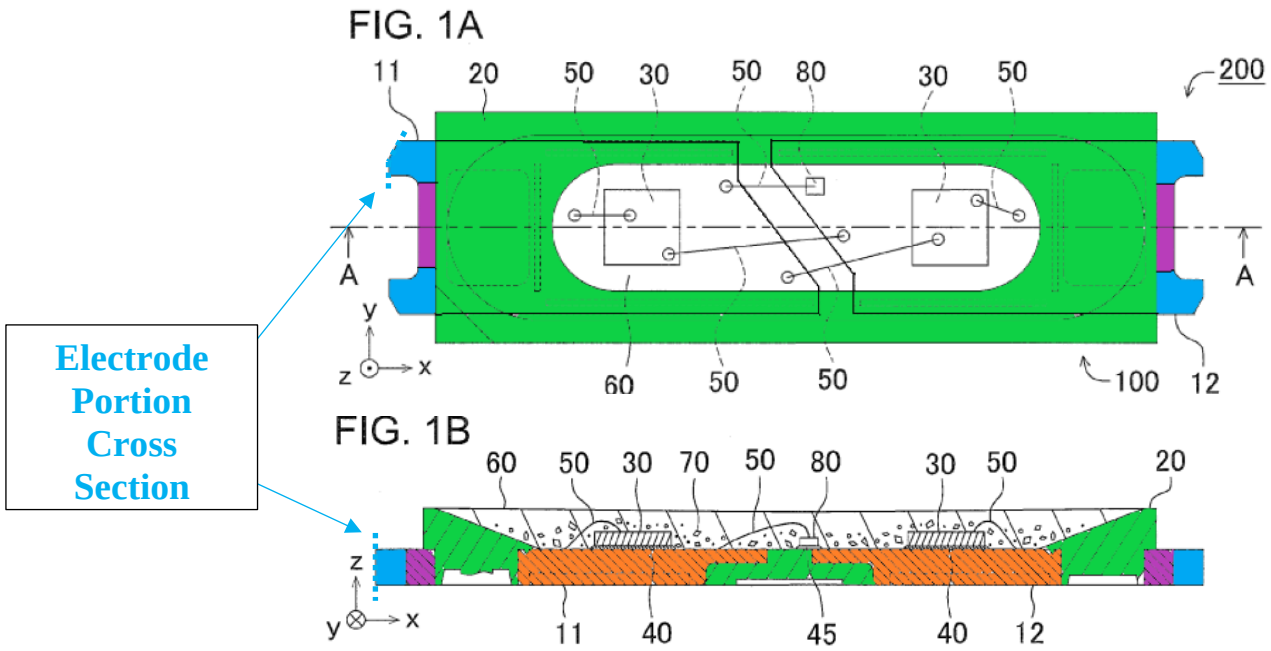
Hayashi FIG. 1A (Annotated)



9.3.1.7. Claim 1: "wherein the at least one electrode portion further comprises an electrode portion cross section"

211. It is my opinion that Hayashi discloses the "wherein the at least one electrode portion further comprises an electrode portion cross section" limitation of claim 1. For example, Hayashi's electrode portion cross section is shown via a blue hashed line in the below annotated Hayashi FIGs. 1A and 1B:

Hayashi FIGs. 1A and 1B (Annotated)

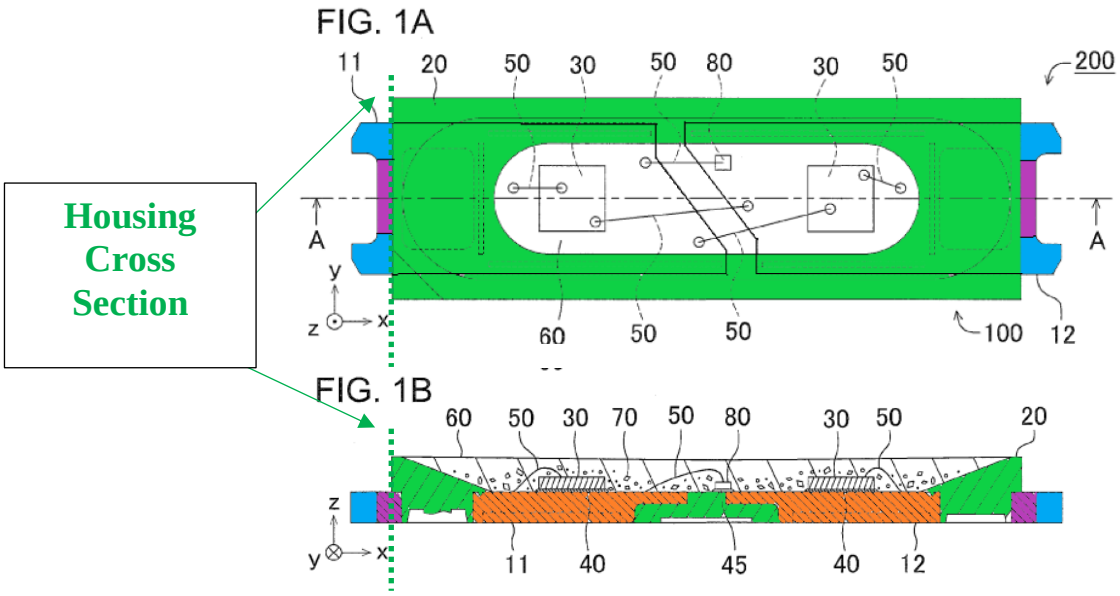


9.3.1.8. Claim 1: "wherein the resin housing comprises at least one housing cross section"

212. It is my opinion that Hayashi discloses the "wherein the resin housing comprises at least one housing cross section" limitation of claim 1. For example,

Hayashi's housing cross section is shown via green hashed lines in the below annotated FIGs. 1A and 1B:

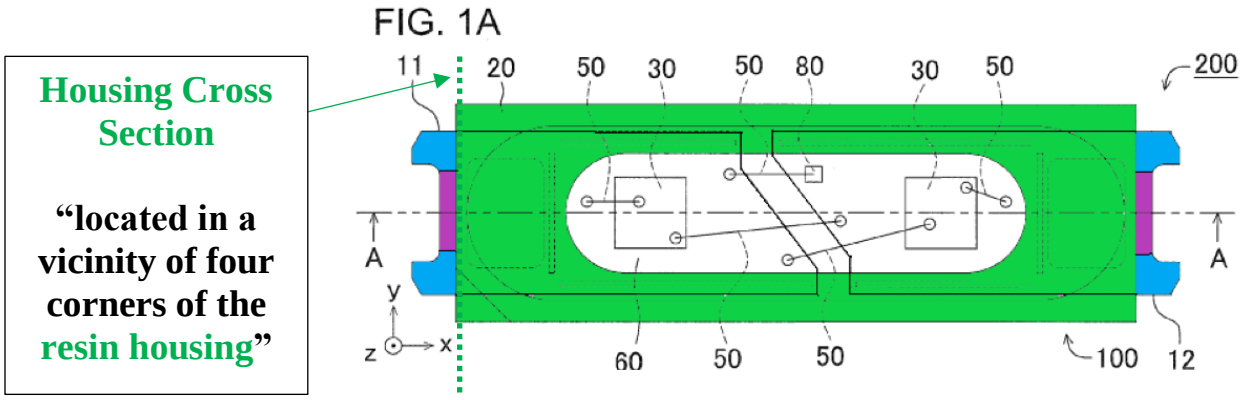
Hayashi FIGs. 1A and 1B (Annotated)



9.3.1.9. Claim 1: "wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing"

213. It is my opinion that Hayashi discloses the "wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing" limitation of claim 1. For example, the below annotated Hayashi FIG 1A shows that the housing cross section (green hashed line) is located in a vicinity of four corners of the resin housing":

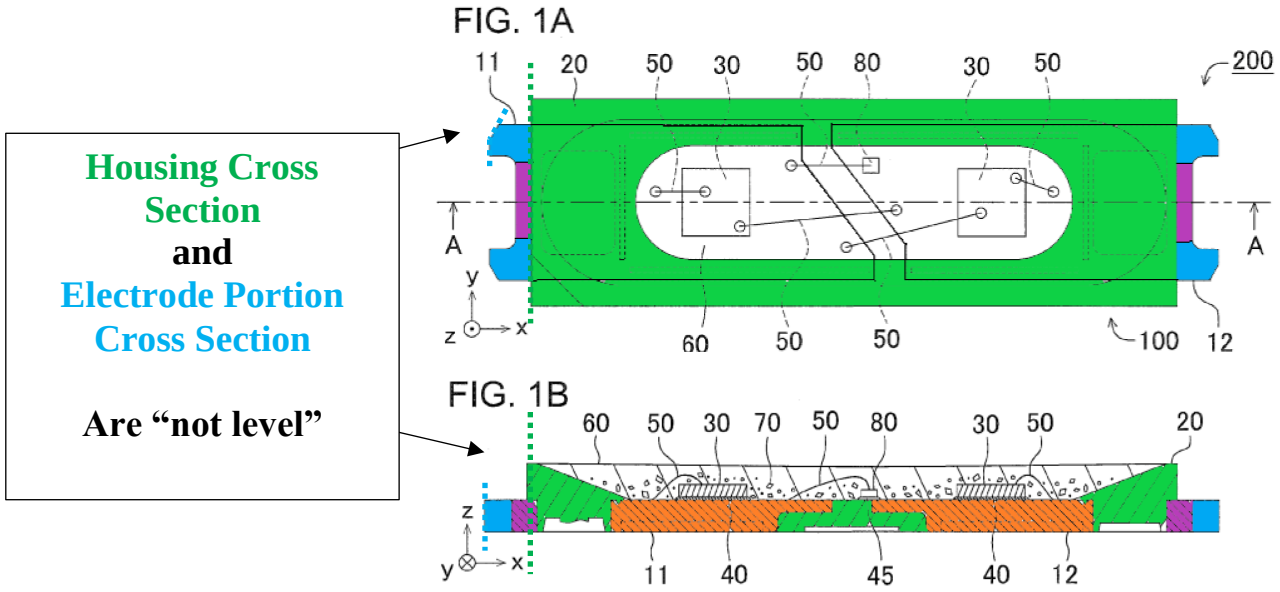
Hayashi FIG. 1A (Annotated)



9.3.1.10. Claim 1: "wherein the at least one housing cross section is not level with the electrode portion cross section"

214. It is my opinion that Hayashi discloses the "wherein the at least one housing cross section is not level with the electrode portion cross section" limitation of claim 1, as shown in the below annotated FIGs. 1A and 1B:

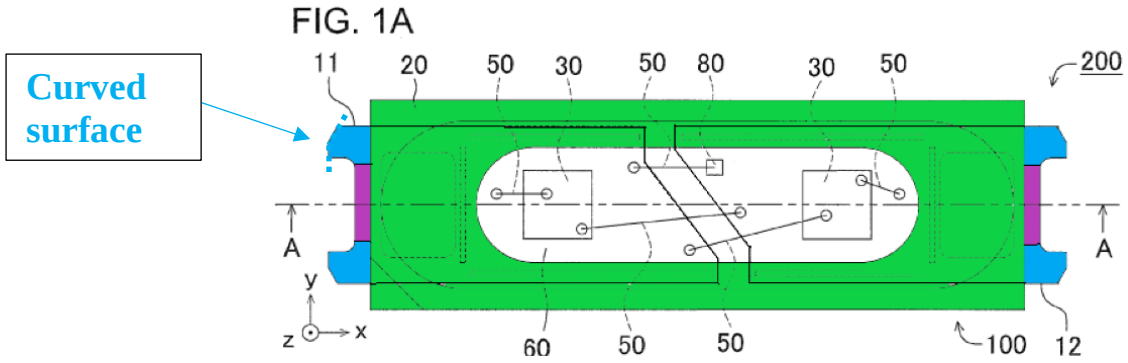
Hayashi FIGs. 1A and 1B (Annotated)



9.3.2. Claim 2: The light emitting device according to claim 1, wherein the electrode portion cross section comprises at least one curved surface.

215. It is my opinion that Hayashi discloses that the "electrode portion cross section comprises at least one curved surface," as required by claim 2 of the '742 patent, as shown in the below annotated Hayashi FIG. 1A:

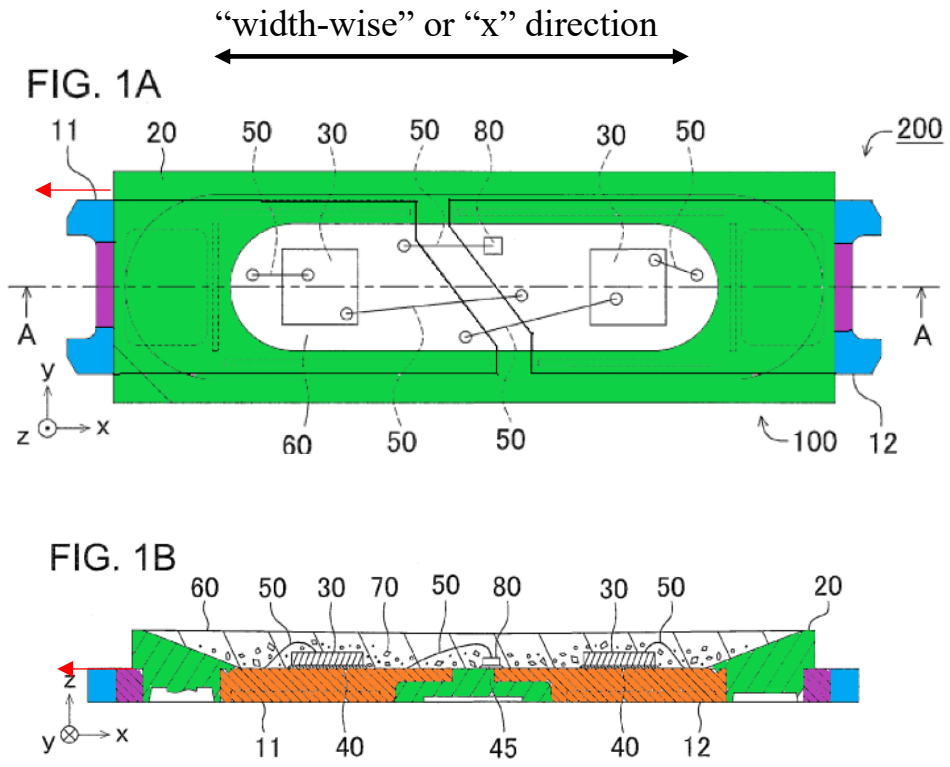
Hayashi FIG. 1A (Annotated)



9.3.3. Claim 5: The light emitting device according to claim 1, wherein the central area and the at least one edge area protrude from the housing in the width-wise direction

216. It is my opinion that Hayashi discloses that the "central area and the at least one edge area protrude from the housing in the width-wise direction." For example, as shown in the below annotated Hayashi FIGs. 1A and 1B, the central area (purple) and the edge area (blue) "protrude from the housing [green] in the width-wise ["x"] direction ":

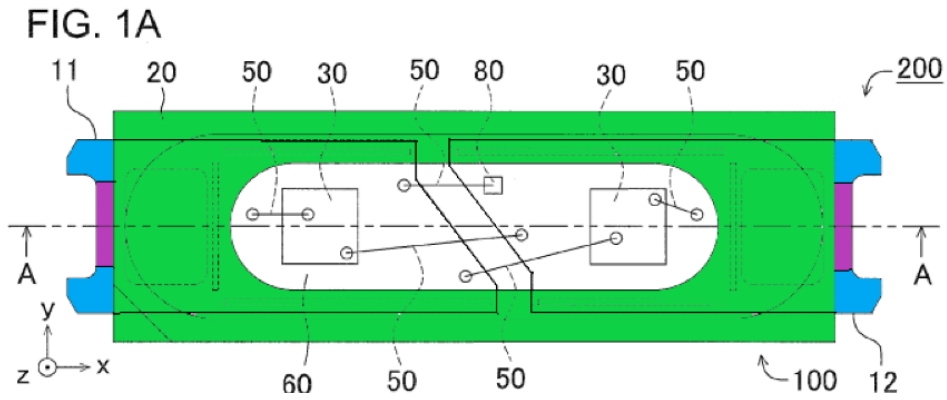
Hayashi FIGs. 1A and 1B (Annotated)



9.3.4. Claim 6: The light emitting device according to claim 1, wherein the at least one edge area comprises two edge areas

217. It is my opinion that Hayashi discloses that the at least one edge area comprises two edge areas," as required by claim 6. As shown below, each of Hayashi's two exposed "wing portions" comprise two edge areas (blue):

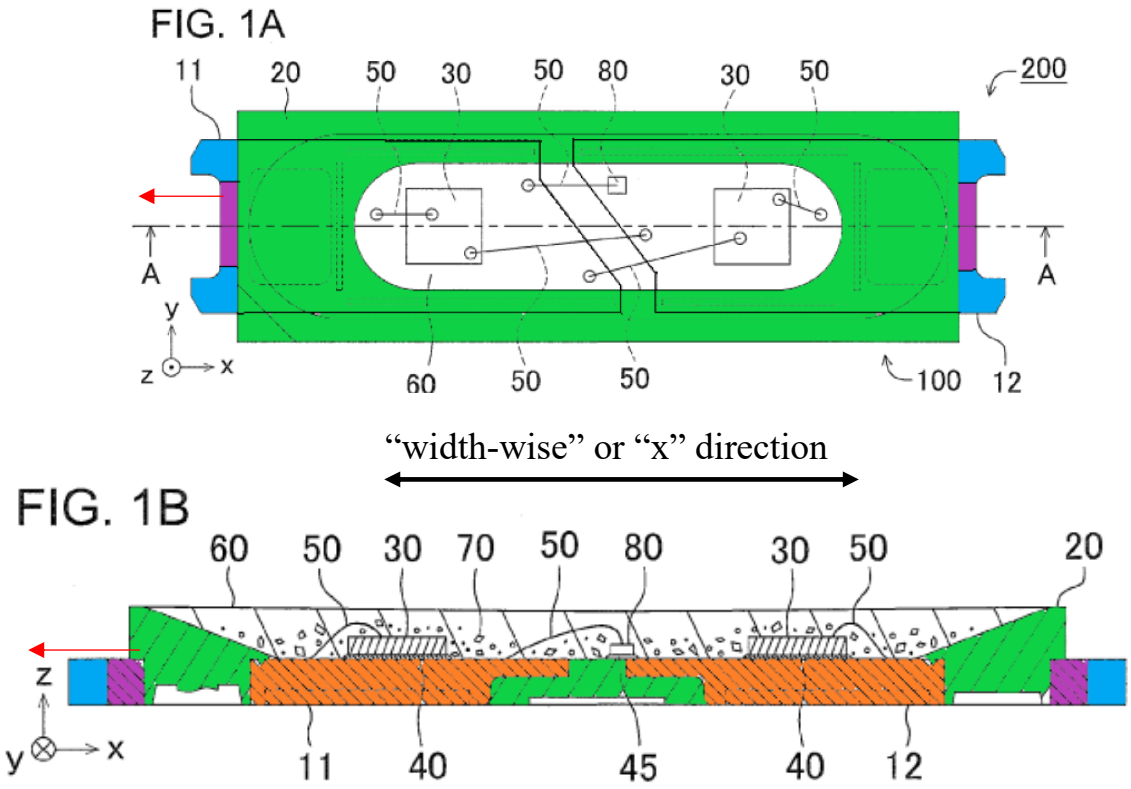
Hayashi FIG. 1A(Annotated)



9.3.5. Claim 7: The light emitting device according to claim 6, wherein the two edge areas protrude from central area in the width-wise direction

218. It is my opinion that Hayashi discloses that the "the two edge areas protrude from central area in the width-wise direction," as required by claim 7. For example, this is shown in the below annotated Hayashi FIGs. 1A and 1B:

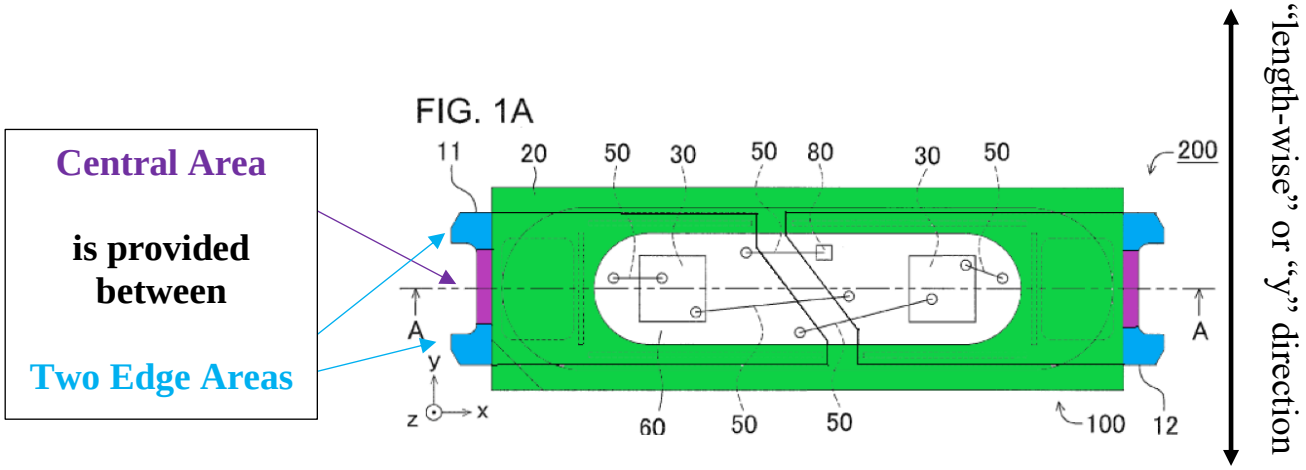
Hayashi FIGs. 1A and 1B (Annotated)



9.3.6. Claim 8: The light emitting device according to claim 6, wherein the central area is provided between the two edge areas along the length-wise direction

219. It is my opinion that Hayashi discloses that "wherein the central area is provided between the two edge areas along the length-wise direction," as required by claim 8. For example, this is shown in the below annotated FIG. 1A:

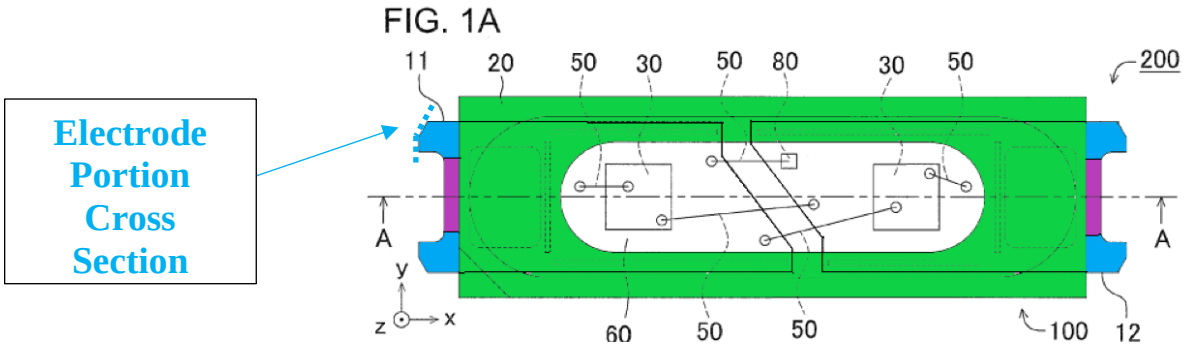
Hayashi FIG. 1A (Annotated)



9.3.7. Claim 9: The light emitting device according to claim 1, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion

220. It is my opinion that Hayashi discloses that "the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion," as required by claim 9. For example, the electrode portion cross section (blue hashed line) is located on an "an outer surface of the wing portion" (red):

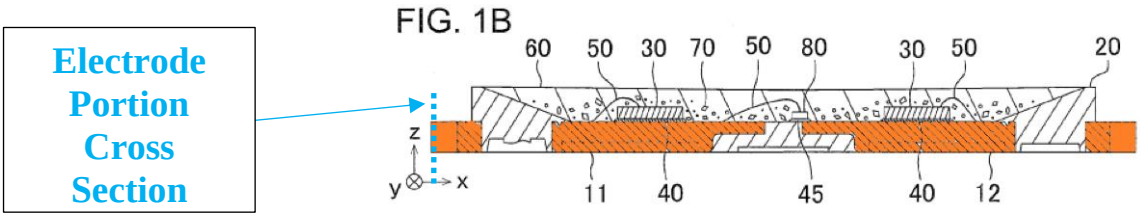
Hayashi FIG. 1A (Annotated)



9.3.8. Claim 10: The light emitting device according to claim 9, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion

221. It is my opinion that Hayashi discloses that the "electrode portion cross section extends in a thickness direction of the at least one electrode portion," as required by claim 10. For example, as shown below, the electrode portion cross section (blue hashed line) extends in a thickness (or "z") direction of the at least one electrode portion:

Hayashi FIG. 1B (Annotated)



9.3.9. Claim 11

222. It is my opinion that Hayashi discloses each limitation of claim 11.

9.3.9.1. Claim 11: "A light emitting device comprising"

223. It is my opinion that Hayashi discloses a "[a] light emitting device" for the reasons I provide in Section 9.3.1.1 above.

9.3.9.2. Claim 11: "at least one electrode portion having a wing portion"

224. It is my opinion that Hayashi discloses "at least one electrode portion having a wing portion" for the reasons I provide in Section 9.3.1.2 above.

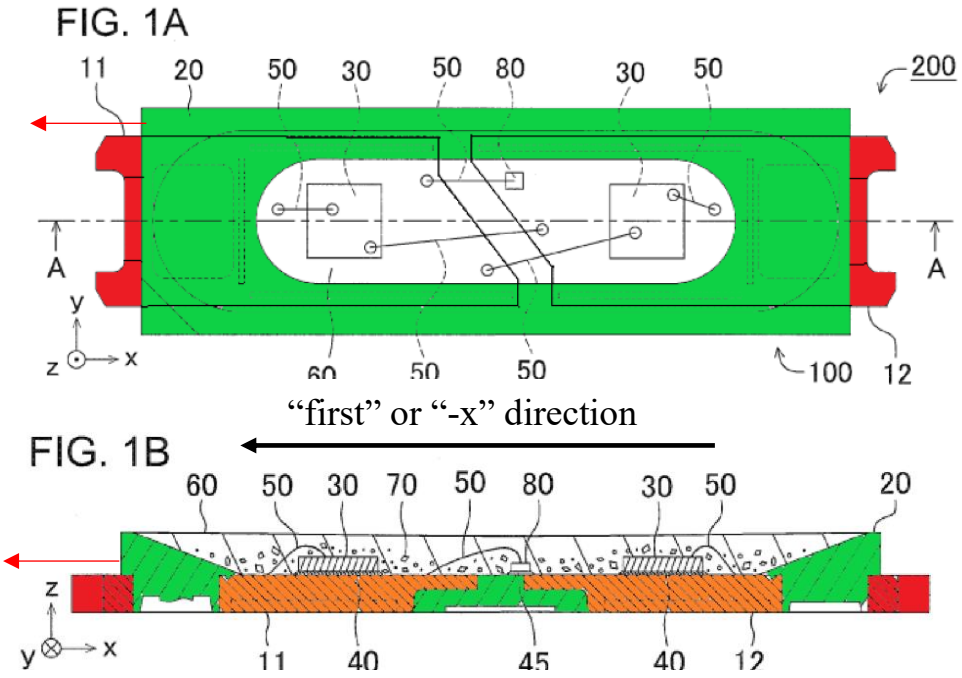
9.3.9.3. Claim 11: "resin housing containing a reflecting material"

225. It is my opinion that Hayashi discloses "resin housing containing a reflecting material" for the reasons I provide in Section 9.3.1.6 above.

9.3.9.4. Claim 11: "wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing"

226. It is my opinion that Hayashi discloses the "wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing," limitation of claim 11. For example, as shown in the below annotated Hayashi FIG. 1A, the wing portion (red) "protrud[es] from the housing [green] in a first ["x"] direction away from the housing:

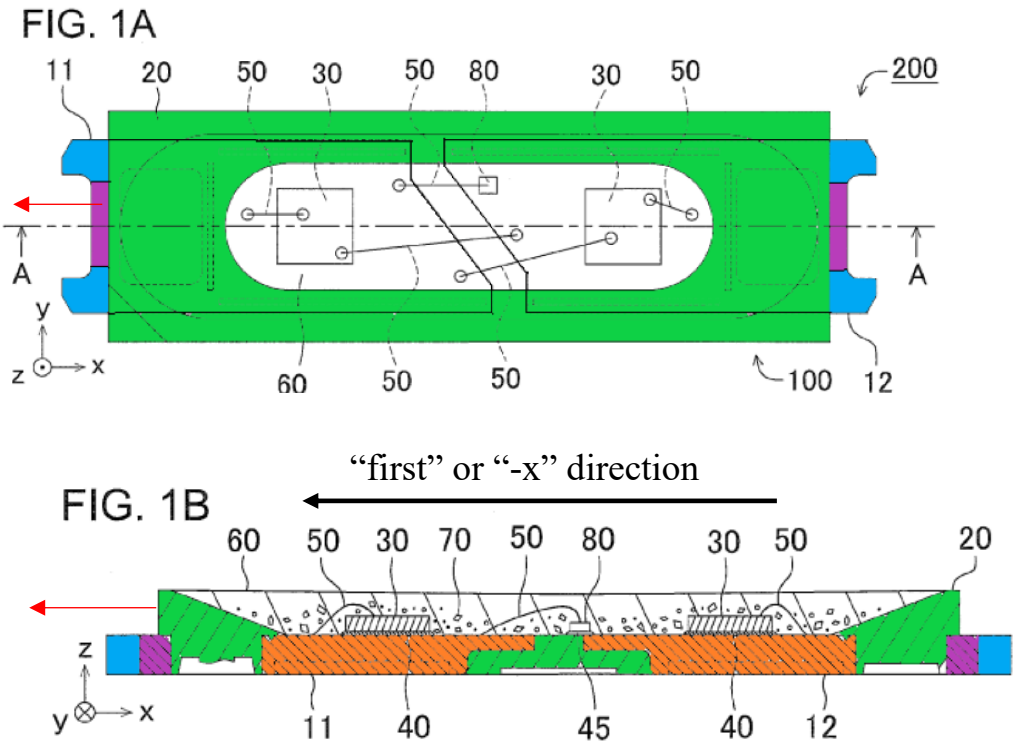
Hayashi FIGs. 1A and 1B (Annotated)



9.3.9.5. Claim 11: "at least one edge area protruding from an edge portion of the central area, in the first direction"

227. It is my opinion that Hayashi discloses the "at least one edge area protruding from an edge portion of the central area, in the first direction" limitation of claim 11. As shown in the below annotated Hayashi FIG. 1A, the "at least one edge area [blue] protrud[es] from an edge portion of the central area [purple], in the first ["x"] direction":

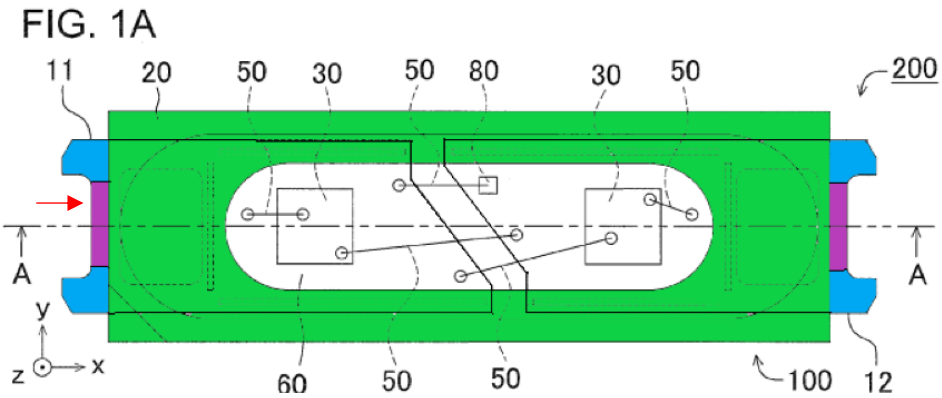
Hayashi FIGs. 1A and 1B (Annotated)

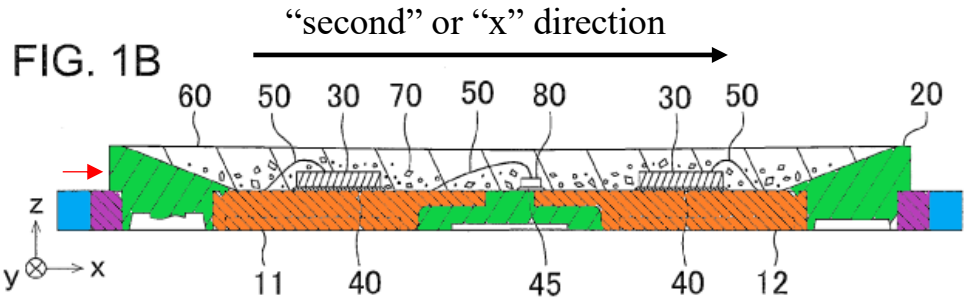


9.3.9.6. Claim 11: "wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing"

228. It is my opinion that Hayashi discloses the "wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing" limitation of claim 11. This is shown in the below annotated Hayashi FIG. 1A:

Hayashi FIGs. 1A and 1B (Annotated)

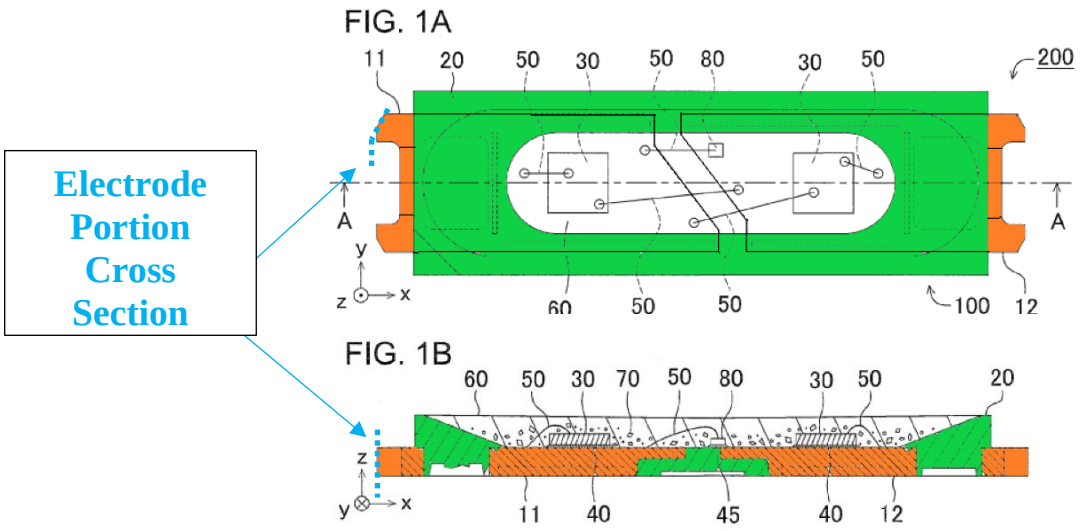




9.3.9.7. Claim 11: "wherein the at least one electrode portion further comprises an electrode portion cross section"

229. It is my opinion that Hayashi discloses the "wherein the at least one electrode portion further comprises an electrode portion cross section" limitation of claim 11. For example, Hayashi's electrode portion cross section is shown via a blue hashed line in the below annotated FIGs. 1A and 1B:

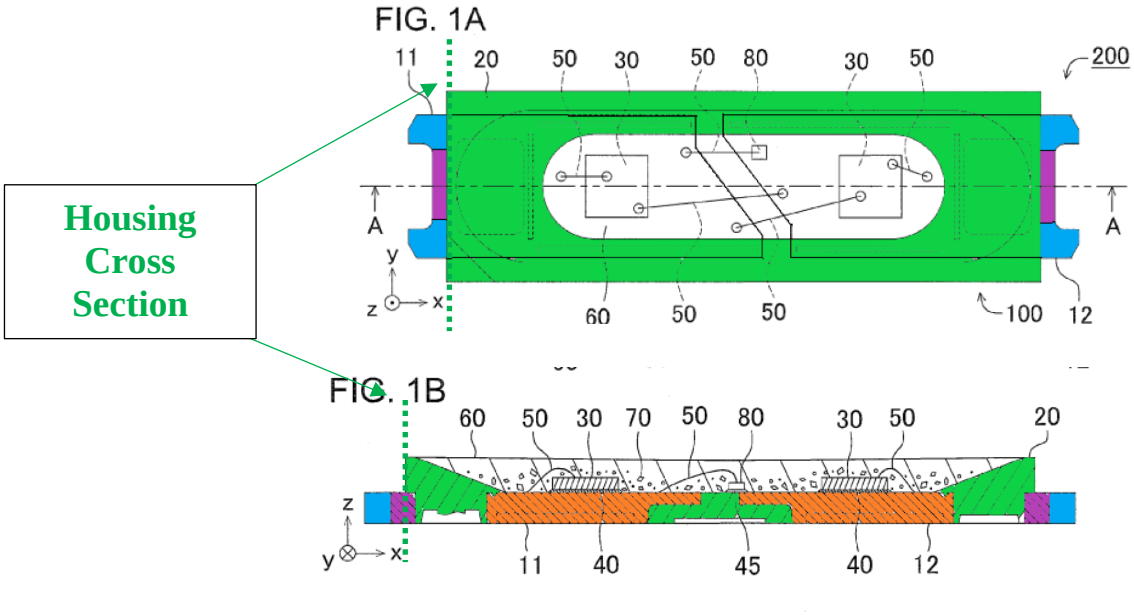
Hayashi FIGs. 1A and 1B (Annotated)



9.3.9.8. Claim 11: "wherein the resin housing comprises at least one housing cross section"

230. It is my opinion that Hayashi discloses the "wherein the resin housing comprises at least one housing cross section" limitation of claim 11. For example, the housing cross section is shown via green hashed lines in the below annotated Hayashi FIGs. 1A and 1B:

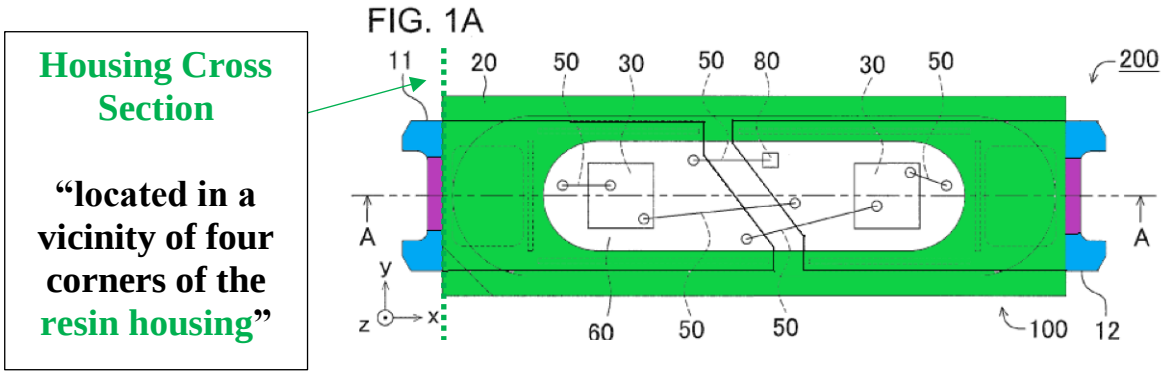
Hayashi FIGs. 1A and 1B (Annotated)



9.3.9.9. Claim 11: "wherein the at least one housing cross section is located in a vicinity of a comer of the resin housing"

231. It is my opinion that Hayashi discloses the "wherein the at least one housing cross section is located in a vicinity of a comer [sic] of the resin housing" limitation of claim 11, as shown in the below annotated Hayashi FIGs. 1A and 1B:

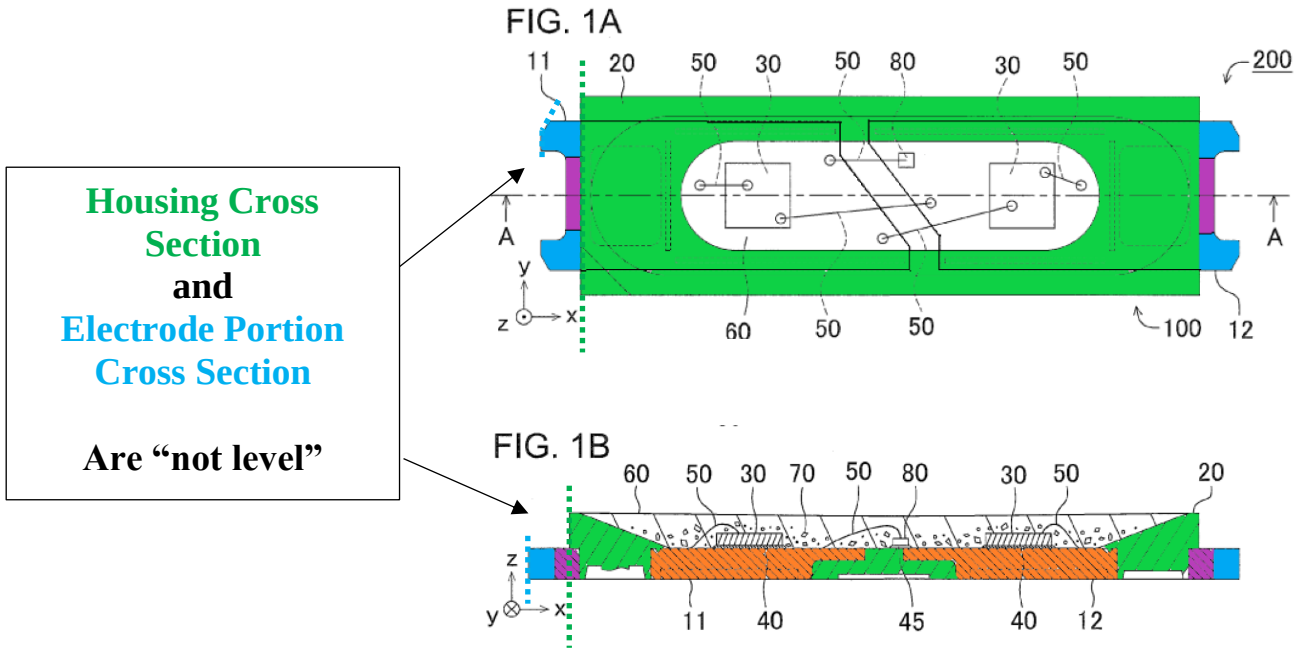
Hayashi FIGs. 1A and 1B (Annotated)



9.3.9.10. Claim 11: "wherein the at least one housing cross section is not level with the electrode portion cross section"

232. It is my opinion that Hayashi discloses the "wherein the at least one housing cross section is not level with the electrode portion cross section" limitation of claim 11. For example, as shown in the below annotated Hayashi FIGs. 1A and 1B, the housing cross section (green hashed line) and the electrode portion cross section are "not level":

Hayashi FIGs. 1A and 1B (Annotated)

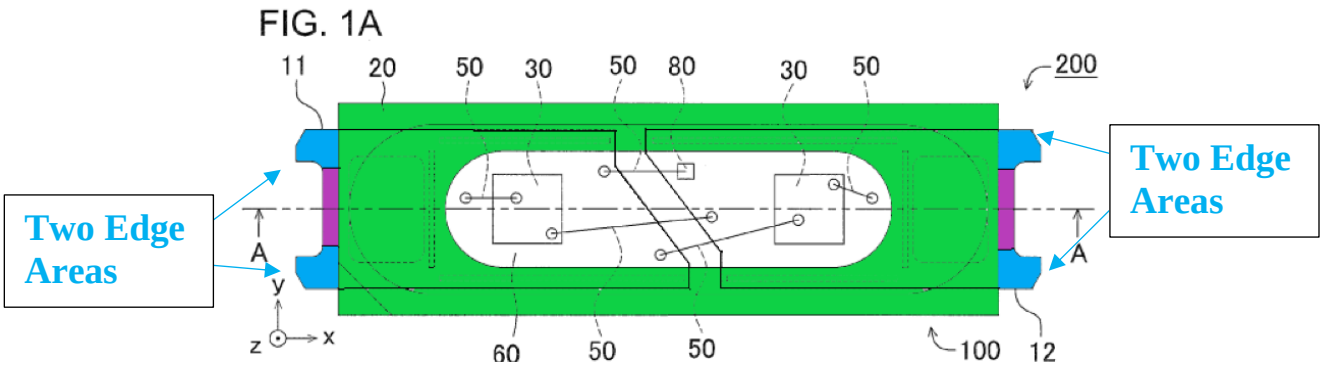


9.3.9.11. Claim 11: "wherein the at least one edge area comprises two edge areas"

233. It is my opinion that Hayashi discloses the "wherein the at least one edge area comprises two edge areas" limitation of claim 11. As shown below, for

example, Hayashi's discloses two edge areas (blue) on each of the exposed wing potions:

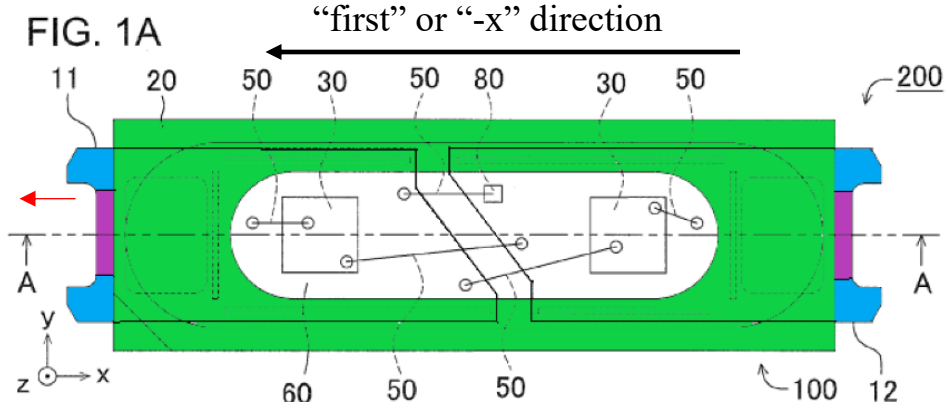
Hayashi FIG. 1A (Annotated)



9.3.9.12. Claim 11: "wherein the two edge areas protrude from the central area in the first direction"

234. It is my opinion that Hayashi discloses the "wherein the two edge areas protrude from the central area in the first direction" limitation of claim 11. For example, this is shown in the below annotated Hayashi FIG. 1A:

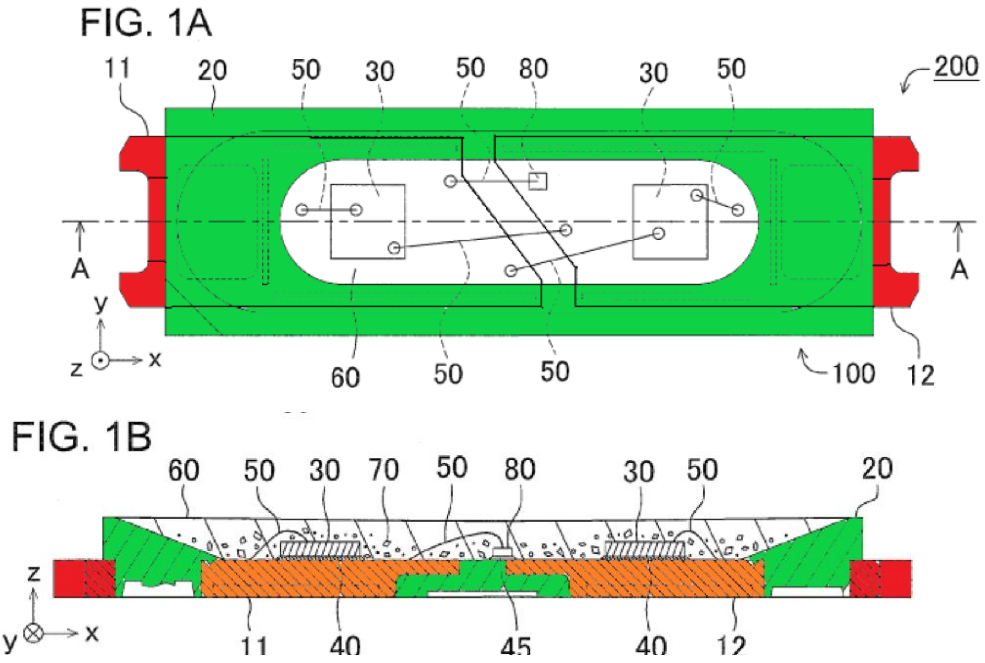
Hayashi FIG. 1A (Annotated)



9.3.10. Claim 12: "The light emitting device according to claim 11, wherein the wing portion is exposed outside the resin housing"

235. It is my opinion that Hayashi discloses that the "the wing portion is exposed outside the resin housing," as required by claim 12. For example, as shown in the below annotated Hayashi FIG. 1A, the wing portion (red) "is exposed outside the resin housing [green]":

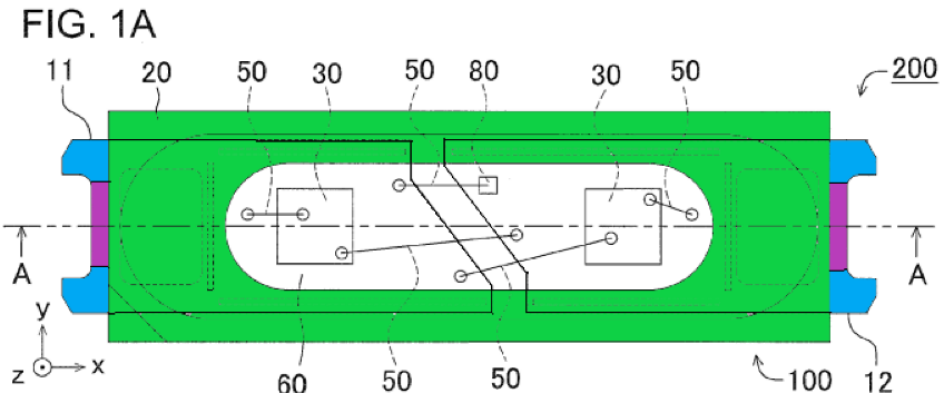
Hayashi FIGs. 1A and 1B (Annotated)



9.3.11. Claim 13: "The light emitting device according to claim 12, wherein the wing portion comprises two edge areas"

236. It is my opinion that Hayashi discloses that "the wing portion comprises two edge areas," as required by claim 13. For example, both of the Hayashi's wing portions comprise two edge areas (blue), as shown below:

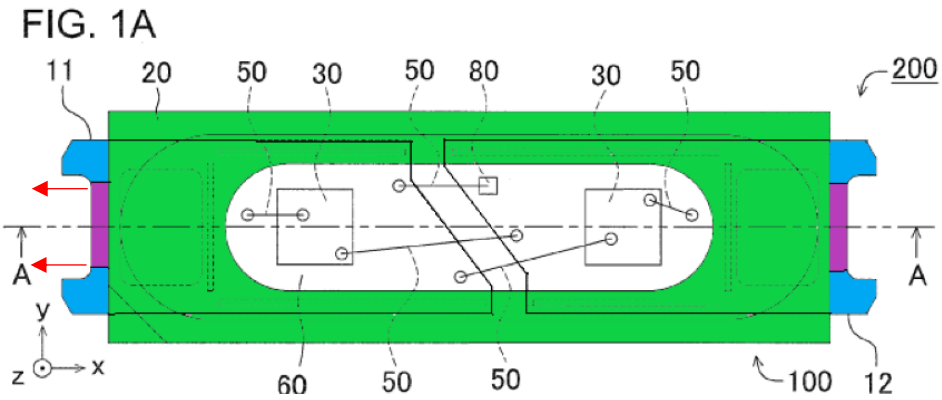
Hayashi FIG. 1A (Annotated)



9.3.12. Claim 14: "The light emitting device according to claim 13, wherein the two edge areas protrude from central area"

237. It is my opinion that Hayashi discloses that the "the two edge areas protrude from central area," as required by claim 14. For example, this is shown in the below annotated Hayashi FIG. 1A:

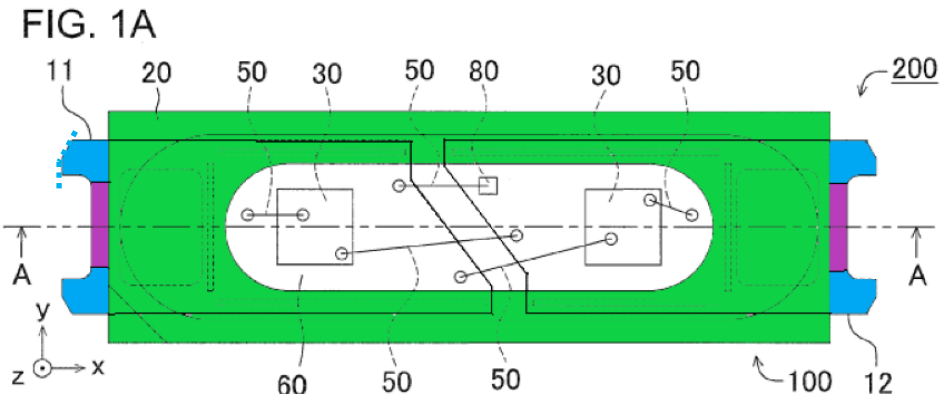
Hayashi FIG. 1A (Annotated)



9.3.13. Claim 15: "The light emitting device according to claim 11, wherein the at least one electrode portion cross section comprises a curved surface"

238. It is my opinion that Hayashi discloses that the "electrode portion cross section comprises a curved surface," as required by claim 15 of the '742 patent, as shown in the below annotated Hayashi FIG. 1A:

Hayashi FIG. 1A (Annotated)



9.3.14. Claim 16: "The light emitting device according to claim 11, wherein the at least one electrode portion further comprises a conductive layer"

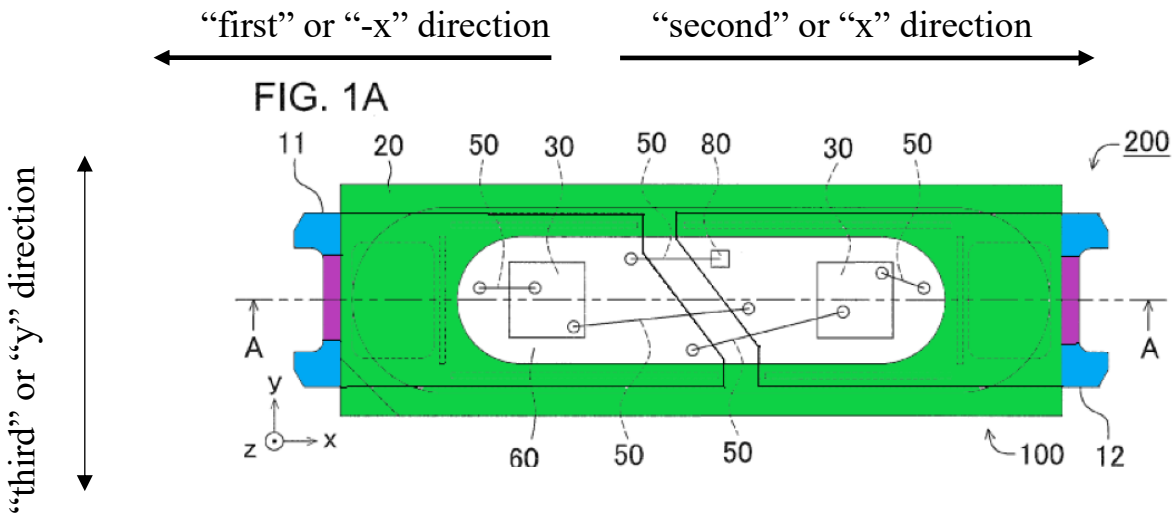
239. It is my opinion that Hayashi discloses that "the at least one electrode portion further comprises a conductive layer," as required by claim 16. For example, Hayashi describes that the lead frames 11, 12 (i.e., the claimed "electrode portion") may be "metals" that "conduct electricity" (Ex-1006 [0048]). Hayashi further provides that the lead frames 21, 31 may be "metals such as copper, aluminum, gold, silver, tungsten, iron (steel), nickel, cobalt, molybdenum, alloys of those metals

including copper-iron alloy, and phosphor bronze can be used when processed in sheet metal form by various methods. In addition, metal plating or light reflecting thin-film can be established on the lead-frame surface with materials such as silver, aluminum, rhodium, gold, copper, and alloys of those metals" (Ex-1006 [0048]). It is well known that "metals such as copper, aluminum, gold, silver, tungsten, iron (steel), nickel, cobalt, molybdenum, alloys of those metals including copper-iron alloy, and phosphor bronze" are conductive. It is therefore my opinion that the lead frames 11, 12 (i.e., the claimed "electrode portion") comprise "conductive layers," as claimed.

9.3.15. Claim 20: "The light emitting device according to claim 11, wherein the central area is provided between the two edge area along a third direction substantially perpendicular to the first and second direction"

240. It is my opinion that Hayashi discloses that "the central area is provided between the two edge area along a third direction substantially perpendicular to the first and second direction," as required by claim 20. For example, as shown in the below annotated Hayashi FIG. 1A, the "central area [purple] is provided between the two edge area [blue] along a third ["y"] direction. Further, the "y" or "third" direction is "substantially perpendicular to the first and second direction."

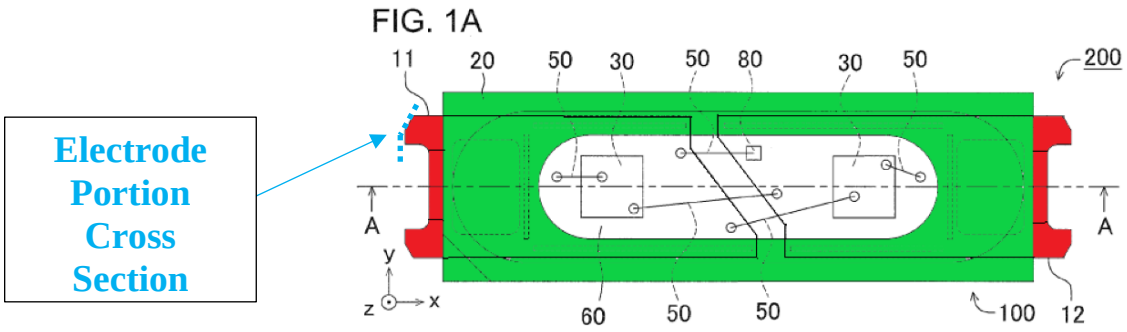
Hayashi FIG. 1A (Annotated)



9.3.16. Claim 21: "The light emitting device according to claim 11, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion"

241. It is my opinion that Hayashi discloses that "the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion," as required by claim 21. For example, this is shown in the below annotated Hayashi FIG. 1A:

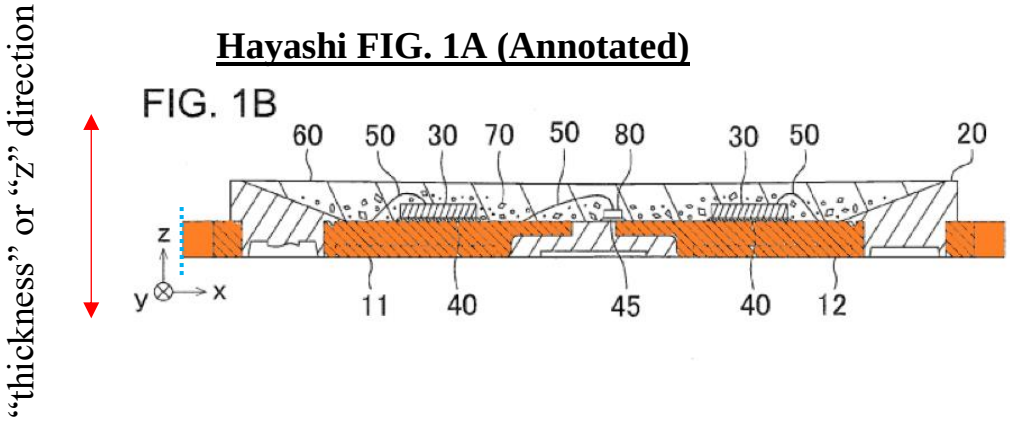
Hayashi FIG. 1A (Annotated)



9.3.17. Claim 22: "The light emitting device according to claim 21, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion"

242. It is my opinion that Hayashi discloses that "the electrode portion cross section extends in a thickness direction of the at least one electrode portion," as required by claim 22. For example, as shown in the below annotated Hayashi FIG. 1B, "the electrode portion cross section [blue hashed line] extends in a thickness ["z"] direction of the at least one electrode portion [orange]":

Hayashi FIG. 1A (Annotated)



9.4. Claims 2 and 15 are Rendered Obvious by Kobayakawa in view of Kim or Hayashi

243. Claim 2 requires that "the electrode portion cross section comprises at least one curved surface." Claim 15 requires the same.

244. As I describe in Sections 9.1.1 and 9.1.9, Kobayakawa discloses each limitation of claims 1 and 11. While Kobayakawa discloses the "U-Shaped" electrode recited in claims 1 and 11, it does not disclose that the electrode portion cross section "comprises at least one curved surface," as recited in claims 2 and 15. But as I described in Sections 9.1.2 and 9.3.2, both Kim and Hayashi disclose an electrode cross section that comprises a curved surface. And it is my opinion that it would have been obvious to modify the electrode of Kobayakawa to include the curved surfaces disclosed in Kim and/or Hayashi.

245. Having a "curved surface" on the exposed portion of an electrode, as required by claims 2 and 15 is a mere design choice that provides no utility or technical benefit. Indeed, the '742 patent does not prescribe any benefit or utility to an electrode that comprises a curved surface. Additionally, whether an electrode is curved, like in Kim or Hayashi, or angular, like in Kobayakawa, does not decrease the bonding surface or adversely effect bonding strength. Further, since no machine process is perfect, any corner is curved to some extent.

246. A POSITA would be motived to combine the curved electrodes of Kim or Hayashi with the protruding electrodes of Kobayakawa, for example, to ease manufacturing and/or to better mate with a corresponding electrical connection that receives the protruding electrode. A POSITA would have found no difficulty in modifying the electrodes of Kobayakawa to be curved, as described in Kim or Hayashi, because electrodes have been known to have varying shapes (e.g., rectangular, trapezoidal, curved, etc.) well before 2014.

247. I have considered the scope and content of the prior art, that there are no differences between the claims and the art, the level of ordinary skill in the art, and the lack of any known secondary factors of nonobviousness. There are no differences between the claims and the art. It was well within the level of ordinary skill in the art to have "at least one curved surface." The structures were known. The results were predictable. Using rounded corners results in an operable device. It is therefore my opinion that claims 2 and 15 are rendered obvious by Kobayakawa in view of Kim or Hayashi.

9.5. Claims 1, 5-14, and 20-22 are Obvious in view of Kim, Kobayakawa, and/or Hayashi

248. As I explain in Sections 9.1, 9.2, and 9.3 above, it is my opinion that claims 1, 5-14, and 20-22 are anticipated by Kim, Kobayakawa, and Hayashi. But should any of the limitations recited in claims 1, 5-14, and 20-22 be considered novel

over Kim, Kobayakawa, or Hayashi, it is my opinion that such limitations would have been obvious over any of Kim, Kobayakawa, or Hayashi.

249. As I have shown above, the prior art structures of Kim, Kobayakawa, and Hayashi are substantially similar, if not identical, to the "U-Shaped" electrode claimed in the '742 patent. Any alleged differences between the claims 1, 5-14, and 20-22 of the '742 patent and any of Kim, Kobayakawa, or Hayashi would be inconsequential and would not provide any technical benefit in view of the ordinary level of skill in the art. A POSITA would have found no difficulties in modifying the structures described in Kim, Kobayakawa, or Hayashi to arrive at the subject matter recited in claims 1, 5-14, and 20-22 of the '742 patent.

250. I have considered the scope and content of the prior art, that there are no differences between the claims and the art, the level of ordinary skill in the art, and the lack of any known secondary factors of nonobviousness. There are no differences between the claims and the art. It is therefore my opinion that claims , 5-14, and 20-22 are obvious over any of Kim, Kobayakawa, or Hayashi in view of the ordinary level of skill in the art.

10. "Secondary Considerations of Non-Obviousness

251. I am not aware of any secondary considerations of nonobviousness.

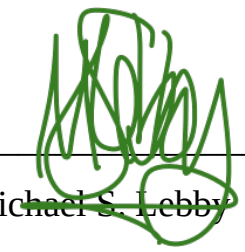
11. Use of Demonstratives

252. I reserve the right to make demonstratives (including product demonstrations, product usage, and videos thereof), charts, graphs, or other similar visual aids for trial based upon the opinions expressed in this report, the data contained in this report, the exhibits or other things cited in this report and/or attached as exhibits to this report.

12. Sworn Statement

253. I, Dr. Michael S. Lebby, do hereby declare and state, that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, under Section 1001 of Title 18 of the United States Code.

Date: May 31, 2024



Dr. Michael S. Lebby