

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VICOR CORPORATION

Petitioner,

v.

DELTA ELECTRONICS, INC.

Patent Owner.

Case No. IPR2024-00705

Patent No. 9,819,263

**DECLARATION OF DR. JOSHUA PHINNEY IN SUPPORT OF
PATENT OWNER'S PRELIMINARY RESPONSE**

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I, Joshua Phinney, do declare as follows:

I. INTRODUCTION

1. I have been retained by Delta Electronics to address issues brought forth in Vicor Corporation's IPR Petition ("IPR2024-00705") against U.S. Pat. No. 9,819,263 (the "'263 Patent").

2. I am being compensated for my time. My compensation is not contingent on any result.

3. I understand that Delta Electronics is submitting my declaration to the PTAB with its preliminary response, and that the response is preliminary in nature. Because of this, I have not provided my full opinion and have not addressed the entirety of the record. In no way should be construed that my not addressing an item is a concession, or that I otherwise bear an opinion on it one way or another. If the PTAB decides to institute, I will more fully provide an opinion.

II. BACKGROUND AND QUALIFICATIONS

4. I am a Principal Engineer in the Electrical and Semiconductors practice at Exponent, a multidisciplinary science and engineering consulting firm with headquarters at 149 Commonwealth Drive, Menlo Park, California 94025.

5. I received a Ph.D. in Electrical Engineering from the Massachusetts Institute of Technology ("MIT") in 2005. I also earned S.M. and B.S. degrees in

Electrical Engineering from MIT and the University of Illinois, Chicago, respectively.

6. My doctoral work at MIT centered on miniaturization of power converters and magnetics. As part of my doctoral work, I constructed and modeled planar magnetic systems, including magnetically coupled, printed magnetic coils that were part of LC (inductor-capacitor) resonators. By incorporating such compact LC resonators into the structure of printed-circuit boards (PCBs), the resulting converter enjoyed multiple benefits, including compact size and a printable, laminated form factor. *See figure below from my doctoral thesis, showing an “air-core” multi-layer laminate structure that I designed.* Other designs that I designed and tested included magnetic materials integrated around printed windings. Through the modeling associated with this dissertation, I become proficient in methods for calculating the electrical impedance of packages and interconnects, as well for improving their heat dissipation and electromagnetic emissions.

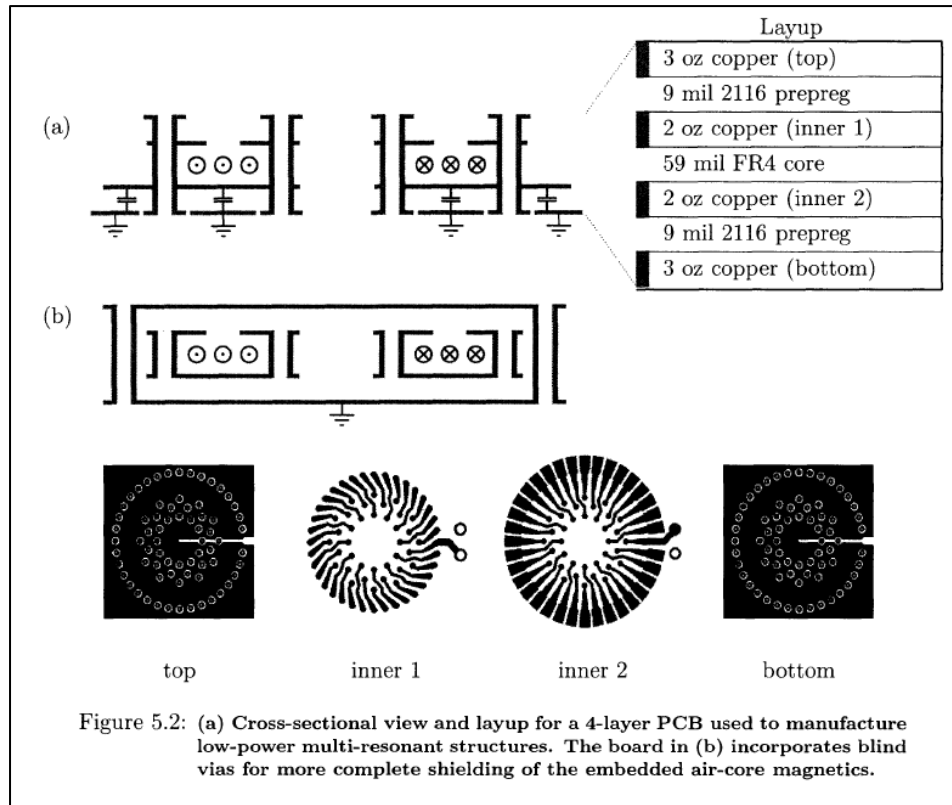


Fig. 5.2 of Phinney Thesis

7. For my publications related to both my Master's and Ph.D. thesis, I received the William M. Portnoy Prize Paper Award (2003) and the IEEE Power Electronics Society Transactions Prize Paper Award (2004). I am the co-inventor on patents for improving the performance of capacitors, EMI filters, and common-mode chokes.

8. After earning my Ph.D., I joined Exponent and have led technical investigations pertaining to power systems, industrial electronics, portable electronic devices, microcomputers, and electromechanical devices. My job functions include analyzing hardware and software of these devices to understand

their modes of failure, and testifying regarding these devices in legal matters involving patents and trade secrets.

9. At Exponent, I have led numerous failure investigations focused on electronic packages and PCBs. Much of this work involves troubleshooting electronics using a variety of techniques, e.g.:

- X-ray and sectioning of packages and interconnects to isolate out-of-tolerance dimensions and short circuits;
- non-destructive (CT) imaging, to reverse engineer structures and perform competitive analyses (e.g., from the standpoint of electrical parasitics and heat transfer);
- electrical measurements of packages and assemblies using automatic test equipment (ATE) to verify electrical tolerances and isolate conductive defects;
- fault-tree analysis and recreation of a propagating faults in PCBs; and
- ionic contamination tests of electronic assemblies, to troubleshoot deposition, cleaning, soldering, and conformal-coating processes.

In addition, I am familiar with bare die handling, lead frames, and wire bonding operations on an industrial scale.

10. I have testified regarding internal circuitry, physical embodiments, and software-defined features, of electronic equipment. Regarding circuitry, I have

testified regarding the power electronics and communication circuitry in microcomputers, portable electronic devices, peripherals, and machine controllers. In addition, I have testified regarding control and compensation in industrial controllers, voltage regulators, and switched-mode power converters. My experience with wireless RF circuitry includes failure analysis of amplifiers, power supplies, matching networks, and multiplexers in satellites, semiconductor-processing equipment, and medical devices.

11. Regarding the mechanical elements of electronic equipment, I have testified regarding buttons and touch interfaces, connectors, linear and rotary actuators, position-measuring devices, and the design and construction of modular housings for computerized equipment and peripherals. In particular, I have testified regarding user interfaces (including buttons, indicators, touch interfaces and card readers) as they are constructed in relation to the housing and underlying electronic assemblies, including PCBs, flex printed circuits, and other connector assemblies within the housing of electronic equipment. In addition while at Exponent, I have conducted design reviews and comparisons of PCBs and integrated circuits in the context of patent, trade-secret, and employment disputes. This work includes the review of design files, layout files, and process design kits for commercial integrated circuits.

12. Additional details about my employment history, fields of expertise, publications, and testimony are further described in my curriculum vitae, which is attached as Appendix A.

III. MATERIALS REVIEWED

13. My opinions expressed in this declaration are based on my education, knowledge and experience with power electronics and communication circuitry, as well as review of documents and materials identified in this declaration, including the '263 Patent, the prior art references and background materials discussed in this declaration, and the other references specifically identified in this declaration. I have considered these materials in their entirety, even if only portions are discussed here. The following is an exemplary list of the materials on which I based on opinion:

- the U.S. 9,819,263 (“’263 patent”) (VICOR-1001);
- the file history of the ’263 patent (VICOR-1002);
- the declaration and curriculum vitae of Dr. R. Jacob Baker, Ph.D., P.E. (VICOR-1003);
- U.S. Patent No. 10,264,664 to Vinciarelli et al. (“Vinciarelli-664”) (VICOR-1005);
- U.S. Patent No. 8,427,269 to Vinciarelli et al. (“Vinciarelli-269”) (VICOR-1006);
- U.S. Patent No. 7,361,844 to Vinciarelli et al. (“Vinciarelli-844”) (VICOR-1007);

- U.S. Patent No. Patent Application Publication No. 2009/0175014 to Zeng et al. (“Zeng-014”) (VICOR-1008);
- U.S. Patent Application Publication No. 2014/0355218 to Vinciarelli et al. (“Vinciarelli-218”) (VICOR-1009);
- U.S. Patent No. 8,966,747 to Vinciarelli et al. (“Vinciarelli-747”) (VICOR-1010);
- J. Phinney, *Multi-resonant Passive Components for Power Conversion* (Doctoral Thesis, Massachusetts Institute of Technology, Oct. 2005) (“Phinney Thesis”) (EX2002);
- “IPC 7093 Design and Assembly Process Implementation for Bottom Termination Components,” (Standards Document, IPC, March 2011) (“IPC 7093 Standard”) (EX2003);
- “VTM™ Current Multiplier VTM2308S60Z1513T00” (Datasheet), Rev. 1.5, Vicor Corporation (2022) (“VTM Datasheet”) (EX2004);

and any other material I refer to in this declaration in support of my opinions.

14. I may also consider additional documents and information in forming any necessary opinions — including documents that may not yet have been provided to me. My analysis of the materials produced in this matter is ongoing and I will continue to review any new material as it is provided.

15. This declaration represents only those opinions I have formed to date.

IV. LEVEL OF ORDINARY SKILL IN THE ART

16. The ’263 Patent identifies the relevant field of art as follows: “[t]he present disclosure relates to a power converting technology, and more particularly, to a power converter and a method for manufacturing the same.” ’263 Patent, 1:13-15. Based on that description of the field of art, my experience, and the

information I have reviewed for purposes of this proceeding, I believe a person of ordinary skill in the art (“POSITA”) in September 2014 would have had a Bachelor’s degree in electrical engineering, or a related field, and one to two years of experience with the design or implementation of integrated power converters or packaging, or equivalent training and work experience in the field. Formal education can substitute for work experience and relevant work experience could substitute for formal education.

17. My level of skill in the art as of September 2014 was at least that of a POSITA. I am qualified to provide opinions concerning what a POSITA would have known and understood at that time, and my analysis and conclusions herein are from the perspective of a POSITA as of that date.

V. RELEVANT LEGAL STANDARDS

18. I am informed by attorneys from Perkins Coie of the relevant legal principles related to patent validity, and hereby describe my understanding of the legal principles and how I apply them in my analysis.

A. Claim Construction

19. I understand that claim terms are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art at the time of the invention when read in the context of the specification and prosecution

history unless a patentee sets out a different definition or clearly disavows claim scope.

20. I further understand that extrinsic evidence such as expert or inventor testimony, dictionaries, and learned treatises can help determine the meaning of claim terms, although that evidence is less significant than the claims, specification, and prosecution history.

B. Anticipation

21. I understand that anticipation under 35 U.S.C. §102, a single asserted prior art reference must disclose all of the claim limitations as arranged or combined in the claim, either explicitly or inherently to a person of ordinary skill in the art. I also understand that in order for a reference to inherently disclose a claim limitation, that claim limitation must necessarily be present in the reference and may not be established by probabilities or possibilities.

22. I understand that different embodiments and references cannot be combined to anticipate. Additionally, I understand that for a reference to be an anticipating reference, it must describe the claimed subject matter with sufficient clarity to establish that the subject matter existed and that its existence was recognized by persons of ordinary skills in the field of the invention.

C. Obviousness

23. I understand that even if a patent claim is not anticipated, the claim is invalid if it claims an aspect of an invention that would be obvious to a POSITA at the time of the alleged invention. Specifically, I understand that if the differences between the asserted claim and a single prior art reference or a combination of prior art references are such that the subject matter as a whole would have been obvious to a POSITA at the time the invention was made, a patent may be invalid for “obviousness.”

24. I understand that an obviousness evaluation can be made by using a single reference or by combining several prior art references. For example, a single reference, when considered in view of the knowledge of a POSITA, could render a claim obvious.

25. I also understand and have been informed by counsel that a determination of obviousness is made after weighing the following factors: (1) level of ordinary skill in the pertinent art; (2) the scope and content of the prior art; (3) the differences between the prior art as a whole and the claim at issue; and (4) as appropriate, secondary considerations of non-obviousness.

26. In evaluating obviousness, both the prior art and the claimed invention should be viewed through the knowledge and understanding of a POSITA at the time of the invention—*hindsight* should not be used to decide whether a claim is

obvious. In particular, it is my understanding that to render a patent claim invalid as being obvious from a combination of references, *indication* should be given as a whole to suggest the motivation, desirability and thus the obviousness, of making the proposed combination in a way that would produce the patented invention.

27. I understand that an explicit teaching, suggestion, or motivation to combine prior art references is not required. I also understand that an obviousness analysis involving two or more references generally must account for a *reason* why a POSITA would have made a particular combination and that there would have been a reasonable expectation of success. I understand that the POSITA's common sense or ordinary creativity can be used by itself as a motivation for combining references. I understand that a particular combination of prior art references can be made by merely showing that it was obvious to try the combination. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, common sense may be a good reason for a POSITA to pursue known options.

28. I am informed and understand that a patent claim composed of several elements is not proven obvious merely by demonstrating that each of its elements was, *independently*, known in the prior art. When combining multiple prior art reference or elements to argue the combination is obvious, I understand that I

should consider whether there is an “apparent reason” or *motivation* to combine the prior art references or elements in the way the patent claims.

29. I am informed and understand that when the prior art “*teaches away*” from combining prior art references or certain elements, discovery of a successful means of combining them is more likely to be nonobvious. A prior art reference may be said to “teach away” from a patent when a person of ordinary skill in the art, upon reading the reference, would be *discouraged* from the path set out in the patent or would be led in a direction divergent from the path that was taken by the patent. Additionally, a prior art reference may “teach away” from a claimed invention when substituting an element within that prior art reference for a claim element would render the claimed invention *inoperable*.

30. I am informed and further understand that to ascertain the scope and content of the prior art, it is necessary to first examine the field of the inventor’s endeavor and the particular *problem* for which the invention was made. The relevant prior art includes prior art in the field of the invention, and also prior art from other fields that a person of ordinary skill in the art would look to when attempting to solve the problem.

31. In evaluating obviousness, I understand that one must look at the claimed subject matter as a whole and through the eyes of a POSITA at the time the invention was made. In other words, when determining obviousness, one

considers the perspective of a hypothetical POSITA. I further understand that the asserted claims of the patent should be read from the point of view of a POSITA at the time the claimed invention was made. To evaluate whether a patent claim would have been obvious, I understand that one may analyze the interrelated teachings of multiple prior art references.

32. I further understand that it is assumed a hypothetical POSITA knows and has all relevant prior art in the field of endeavor covered by the asserted patent and all analogous prior art. I understand that the POSITA must interpret the references for what they teach based on the skill level of that person. A POSITA is not necessarily an expert, and the question is what the POSITA would think, not what someone who's an expert in the field would think.

33. I understand that at least the following rationales may support a finding of obviousness: (1) combining prior art elements according to known methods to yield predictable results; (2) simple substitution of one known element for another to obtain predictable results; (3) use of a known technique to improve similar devices (methods, or products) in the same way; (4) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (5) "obvious to try"—choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; (6) a predictable variation of work in the same or a different field of endeavor if a

POSITA would be able to implement the variation; (7) there existed a known problem for which there was an obvious solution encompassed by the patent's claims at the time of the claimed invention; (8) known work in one field may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to a POSITA; and (9) some teaching, suggestion, or motivation in the prior art that would have led a POSITA to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

34. I also understand that evidence of so-called “objective indicia” or “secondary considerations” should be considered when determining whether an asserted claim would have been obvious. “Objective indicia” include: (1) commercial success attributable to the invention; (2) long-felt but unsolved need for the invention; (3) failure of others; (4) skepticism by experts; (5) praise by others; (6) teaching away by others; (7) recognition of a problem which the claimed invention addresses; (8) copying by others; and (9) unexpected results. But these secondary considerations only apply if there is a “nexus” between the asserted secondary consideration and claimed invention, and the secondary considerations cannot be due to extraneous factors, such as marketing or unclaimed features of an embodiment of the invention.

35. I also understand that if others having ordinary skill in the field independently made the claimed invention at about the same time the inventor made the invention, often referred to as “simultaneous invention,” this can be an indication of obviousness. I understand that simultaneous invention can be persuasive evidence that the claimed apparatus or method was merely the product of ordinary engineering skill. I understand that invention even within a year can be considered a comparatively short time.

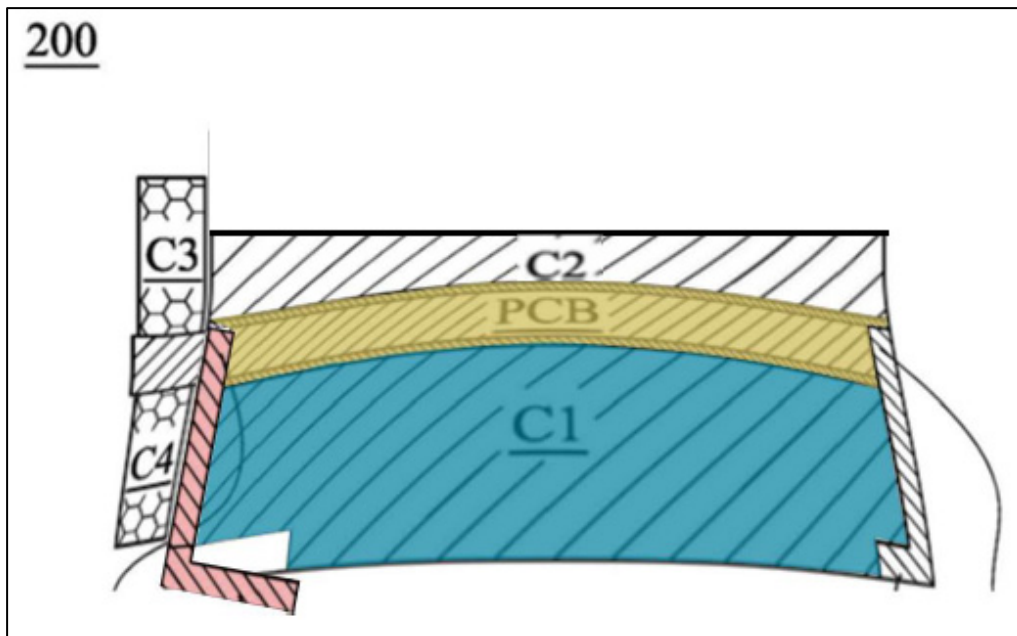
VI. OVERVIEW OF THE '263 PATENT

36. I have reviewed and analyzed the '263 Patent. This section outlines my opinion as to the technical inventions captured and claimed in the '263 Patent.

37. The '263 Patent is directed to improvements in the design and manufacture of power converters. *See generally '263 Patent.*

38. The '263 Patent identifies the concepts of efficiency and power density, which are two key metrics in the field of power converter design. *See '263 Patent, 1:17-25.* The optimization of these key metrics is a challenge in this field. Another challenge in this field is structural integrity and durability of a power converter, particularly with respect to mitigating mechanical stress within a power converter. It is commonly known that the converter heats up during operation, which may cause stress changes and warping of a carrier (e.g., a printed circuit board, PCB) within a power converter.

39. Generally, warping is caused by releasing of uneven stresses, which can lead to electrical connection failures. Below I have demonstrated an example of electrical connection failure occurring due to warping in the modified version of FIG. 2 of the '263 Patent. I include this modified version of FIG. 2 only for demonstrative purposes, and ***do not suggest*** that the power converter illustrated in FIG. 2 would actually warp as shown, or warp at all.



Modified Figure 2 of '263 Patent

40. Optimizing a power converter design for structural integrity (*i.e.*, mitigating warping and stress), however, will sacrifice one or both of the two key metrics of efficiency and power density. For example, a thicker carrier is less likely to warp, or may warp to a lesser degree. But manufacturing of the thicker carrier is more costly, and good power density or efficiency would be sacrificed.

The thicker carrier occupies space within the power converter that could otherwise be used for components. It also requires larger room for fitting power converters in electronic devices such as servers. The counterexample is a very thin carrier that maximizes power density and efficiency. Larger space of the power converter would be composed of components that deliver the power converting functionality. Room can be saved for stacking power converters in electronic devices. However, the thinner carrier would be more susceptible to warping and stress.

41. Simultaneously controlling both warping/stress mitigation and power density was a key consideration behind the development of the '263 Patent's disclosed solutions. This long-felt need but *unresolved* issue was addressed by the inventors' innovation— by disposing carriers at 1/3 to 2/3 of a height of the power converter. *See, e.g., '263 Patent, 5:3-22, 5:43-59.*

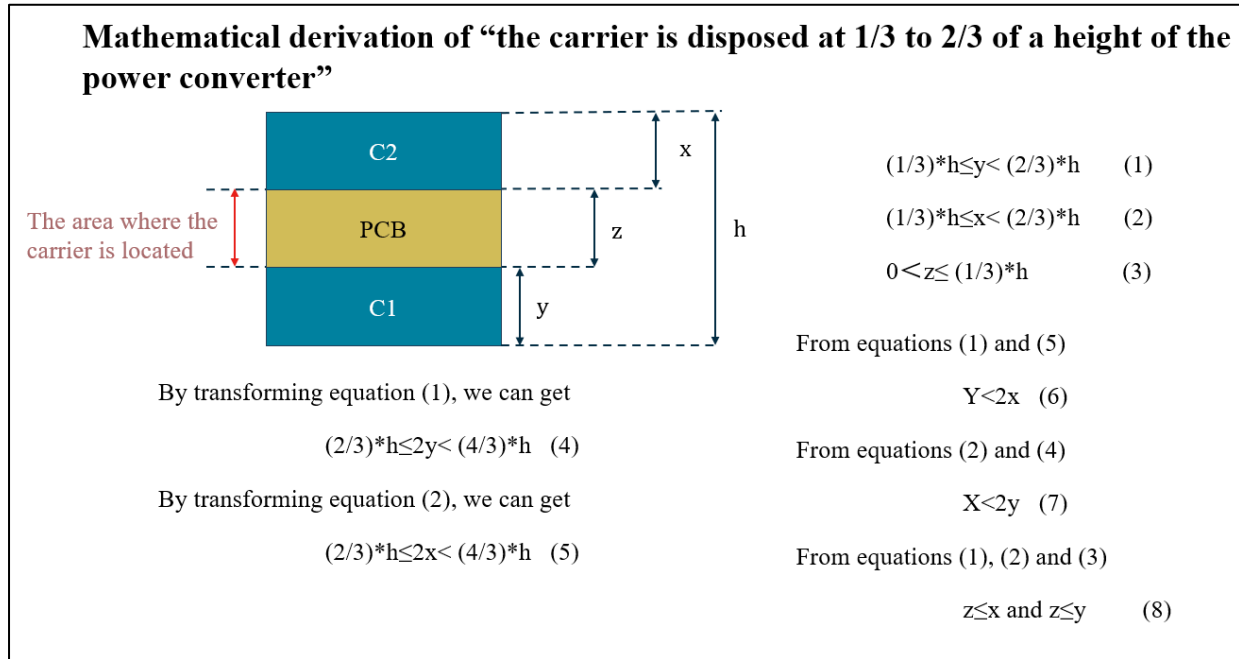
42. This unique height range within the power converter necessarily determines a ratio of thicknesses of upper components and lower components. In effect, the '263 Patent discloses requirements that the height or thickness of upper components “is not greater than twice” that of the lower components, and *vice versa. Id.*

43. In particular, the inventors' innovation in simultaneously controlling power density and structural/mechanical integrity can be derived starting from a carrier thickness requirement first. In order to maintain adequate power density,

the carrier thickness is limited to a third of the power converter's height; that is, the maximum thickness for a carrier is a third of the power converter's height. Then, because the carrier's thickness has an upper limit, potential warping due to relative thinness of the carrier should be guarded against. To do so, the upper components cannot be more than twice as thick as the lower components, and *vice versa*, thus establishing a component thickness ratio requirement. When combining the constraint on maximum carrier thickness and the constraint on component thickness ratio or difference, the carrier is limited to being "disposed at $1/3$ to $2/3$ of a height of the power converter."

44. Specifically, an example derivation of the claimed $1/3$ to $2/3$ height range is shown below. First, the carrier thickness requirement is represented in Equations 1-3, where the carrier's thickness is less than or equal to a third of the total height (Equation 3). The lower component C1's thickness y is between a third and two thirds of the total height (Equation 1), and the upper component C2's thickness x is also between a third and two thirds of the total height (Equation 2). Equation 1 can be transformed to Equation 4, and Equation 2 can be transformed to Equation 5. Using these transformed Equations 4-5, the component thickness ratio requirements can be derived in equations 6 and 7. Finally, Equation 8 can be derived from Equations 1-3 to show that the carrier thickness is less than or equal to the individual component thicknesses (i.e., x , y). With these equations, the PCB

is placed at 1/3 to 2/3 of a height of the power converter and does not extend outside this 1/3 to 2/3 height range.



45. Therefore, the 1/3 to 2/3 height range for the carrier neatly defines both carrier thickness and component thickness ratios, in consideration of ***structural integrity and power density*** factors. A precise location of the carrier can also be derived from those two relations. In other words, carrier that is not disposed at the 1/3 to 2/3 height range would likely suffer from less optimized power density or less optimized structural integrity. For example, a carrier that extends below the 1/3 to 2/3 height range (*i.e.*, into the bottom third of the power converter) would result in either one or both of: (i) the upper components being more than twice the thickness of the lower components (meaning more

susceptibility to warping/stress), or (ii) the carrier being thicker than a third of the power converter (meaning less power density).

46. Overall, the power converter designs disclosed in the '263 Patent advance the field of power converter design and manufacture at least through this incorporation of power density and warping/stress mitigation.

VII. CLAIM CONSTRUCTION

47. As noted above, I understand that claim terms are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art at the time of the invention. Extrinsic evidence such as expert or inventor testimony, dictionaries, and learned treatises can help determine the meaning of claim terms, although that evidence is less significant than intrinsic evidence including the claims, specification, and prosecution history.

48. I reserve the right to supplement my opinions if the PTAB institutes.

49. At this preliminary stage, I believe no construction of any other term other than its ordinary and customary meaning is necessary to resolve the invalidity challenges set forth in the Petition. Therefore, for all other claim terms considered in this Declaration, I have applied the ordinary and customary meaning of those terms as they would have been understood by a POSITA at the time the invention was made.

50. Petition contends that limitation [1g] is a product-by-process limitation, which I discuss below.

A. Limitation [1g]: “wherein the first connection part is fabricated by mechanical support of the first electronic component.”

51. I am informed that claims directed to products and devices are by default interpreted in their structural sense. I am informed that claim language is interpreted as product-by-process only if that language does not describe structure.

52. Limitation [1g] recites “wherein the first connection part is fabricated by mechanical support of the first electronic component.” In my view, [1g] conveys structural meaning and should not be construed as product-by-process. In particular, the mechanical support of the first electronic component for the first connection part describes a structural feature, and this interpretation is supported by the '263 Patent. This structure associated with [1g] is exemplified by various figures in the '263 Patent (as *opposed to process* or flowchart figures). FIG. 1 (reproduced below), for example, shows connection parts P1/P2 that are “fabricated by mechanical support of the first electronic component [C1].” See '263 Patent, 4:47-49.

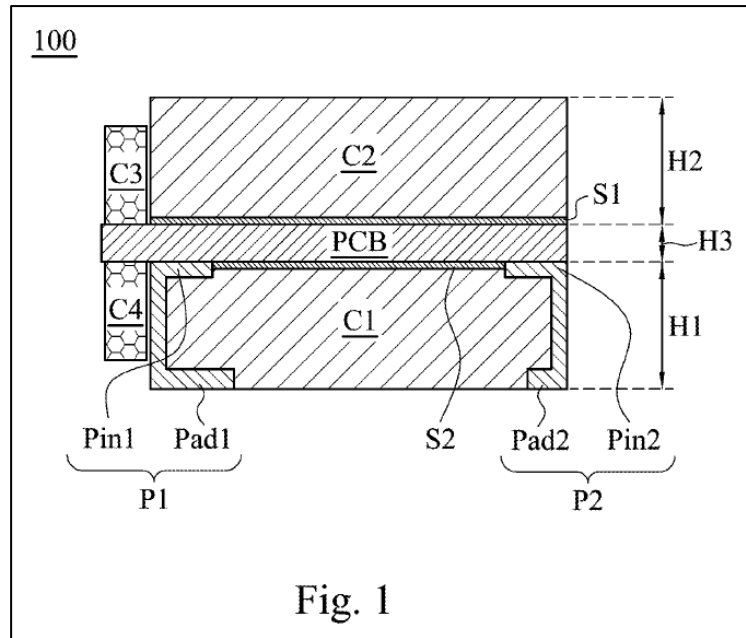


Figure 1 of '263 Patent

53. As another exemplary embodiment for this term, the '263 Patent discloses “curving the connection part by mechanical support of the first electronic component to fix the connection part at the first electronic component.” '263 *Patent*, 10:48-50. This example further explains the connection part can be curved to be affixed to the first electronic component for the mechanical support. Physical attachment between objects, such as fixtures, is structure. A POSITA would understand that “wherein the first connection part is fabricated by mechanical support of the first electronic component” conveys structure, under its plain and ordinary meaning, which is consistent with the '263 Patent specification.

VIII. ANALYSIS OF PETITIONER'S GROUNDS

A. Grounds 1A-1C Do Not Show Unpatentability of the Claims.

a. Ground 1A: Claim 1's Features Are Not Disclosed in Vinciarelli-664.

i. Vinciarelli-664 does not disclose [1f].

54. Limitation [1f] recites “wherein the carrier is disposed at 1/3 to 2/3 of a height of the power converter.” It is my view that Ground 1A does not meet [1f].

55. As an initial matter, I am informed that non-scale drawings of prior art patent documents cannot be relied upon for particular sizes if the accompanying specification is silent on those sizes. I do not find that Vinciarelli-664's figures are scale drawings, and there is no disclosure within Vinciarelli-664 of the sizes of features depicting in those drawings. Nowhere in Vinciarelli-664 explicitly discusses carrier or PCB thickness, or positioning the PCB at a certain height range. Meanwhile, [1f] requires particular sizes, at least one of which being a carrier thickness so that the carrier is disposed entirely within the 1/3 to 2/3 range. The Petition appears to only rely upon rough annotations on Vinciarelli-664's figures to show [1f]. Petition, 31-33.

56. Without specific description in Vinciarelli-664's text, a POSITA would not understand Vinciarelli-664 as limiting the PCB position at the claimed height range or otherwise extending outside the claimed height range. It would be even more strenuous to argue that Vinciarelli-664 discloses positioning the PCB at

the claimed range – “1/3 to 2/3 of a height of the power converter.” Therefore, it is my opinion that Ground 1A does not show [1f] because there is nothing in Vinciarelli-664, including its figures, that show the particular sizes for meeting [1f].

57. Nonetheless, because Petitioner and Dr. Baker appear to rely upon Vinciarelli-664’s figures (Petition, 31-34; VICOR-1003, ¶103), I also considered Vinciarelli-664’s figures and discussed my viewpoints below.

58. I disagree with the conclusions drawn by Petitioner and Dr. Baker that “the figure[s] clearly show[] that the carrier is within the claimed range.” *See* VICOR-1003, ¶ 103. To the contrary, at least FIG. 1, which Petitioner cites to, demonstrates that the carrier is outside the claimed range. In measuring the relative positions of these components, I printed out a 200% scaled-up version of FIG. 1 of Vinciarelli-664 on standard printer paper (8.5 inches by 11 inches) and ruler-measured each layer of FIG. 1’s module. My measurement reveals that, on the printout:

- A. The bottom encapsulant layer (103) is about 0.38 inches;
- B. The middle PCB (101) is about 0.46 inches; and
- C. The top encapsulant layer (102) is about 0.46 inches.

I converted this to percentages, which resulted in the bottom encapsulant layer (103) being disposed at 0% - 29.2% along the power converter’s height, the middle PCB

(101) being disposed at 29.2% - 64.6%, and the top encapsulant layer being disposed at 64.6% - 100%. This demonstrates that FIG. 1 depicts the middle PCB (101) *outside* of the claimed range. Specifically, the middle PCB (101) is drawn to extend into the bottom third of the module (since 29.2% is less than 33.3%, or 1/3), and the bottom of the middle PCB is located squarely below the 1/3 height of the power converter. Thus, the cited reference fails to meet the claimed limitation as showing the middle PCB being disposed outside of the 1/3 to 2/3 height range.

59. I've also done another exercise, to demonstrate that [1f] is not met by Vinciarelli-664. Taken below is an excerpt of FIG. 1 with the specific area in question blown-up alongside a ruler in the Microsoft® PowerPoint software showing more precision. For the ease of demonstration, the first four inches are shaded; the first inch is red, the second inch is green, the third is yellow, and the fourth is blue.

Annotated Cutout of Figure 1 of Vinciarelli-664

-26-

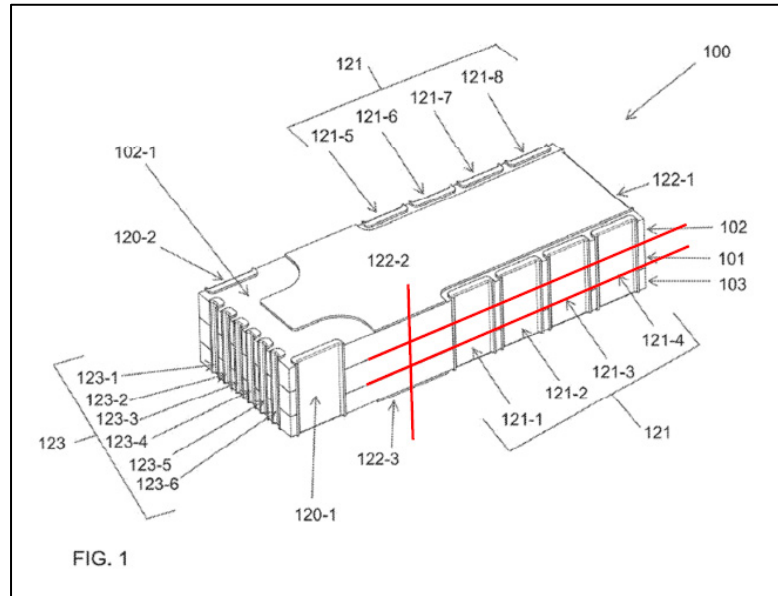
carrier is larger than $1/3$ (33.3%), and the carrier's bottom is below the $1/3$ height of the power converter.

60. This measurement also demonstrates that Vinciarelli-664's middle PCB (101) is disposed outside of the claimed height range. These precise findings are consistent with my measurements based on measuring the printout as described above.

61. Failing [1f]'s requirements means that the illustrated carrier fails on the power density aspect that is required by this quantitative limitation. Because the illustrated carrier is larger than $1/3$ of the power converter height and too thick to be disposed entirely within the $1/3$ to $2/3$ height range, it is my view that power density has not been optimized relative to mechanical stress as the manner embodied in [1f], and as contemplated by the patented invention.

62. Dr. Baker could not derive precise dimensions by using an eyeball test. As shown in Dr. Baker's annotated figure (reproduced below), he drew two lines on FIG. 1 and then dashed to the conclusion that "the carrier is within the claimed range" and so does not extend outside " $1/3$ to $2/3$ of the height of the power converter." Other than the red lines drawn on FIG. 1, Dr. Baker conducted no analysis and did not even scientifically measure to derive his conclusion that the carrier is within the $1/3$ to $2/3$ height range. While at this, I again note that figures are not drawn to scale and that this exercise was prompted by Dr. Baker's analysis

to show that Vinciarelli-664 fails to disclose any dimensions or sizes in its description.



VICOR-1003, ¶103; Petition, 32

ii. Dr. Baker is wrong that sandwiched PCBs meet [1f].

63. I also note that Dr. Baker makes an incorrect assumption that is inconsistent with the '263 Patent, and the Petition also advances with that incorrect assumption. Specifically, Dr. Baker states “[a] centered printed circuit board with components on both sides would meet this height requirement.” VICOR-1003, ¶63. Dr. Baker continues, “the circuit board in thus embodiment is centered within the magnetic cores and thus disposed at 1/3 to 2/3 of a height of the power converter.” VICOR-1003, ¶104.

64. However, Dr. Baker is incorrect. This would effectively mean any PCB sandwiched by components on both sides meets [1f], but this is wrong. As I

stated previously, [1f] simultaneously incorporates both a carrier thickness requirement and a component thickness ratio requirement; it is through both these requirements acting together that the carrier ends up within the claimed $1/3$ to $2/3$ height range. Specifically, [1f] incorporates both requirements: (i) the carrier thickness be less than a third of the power converter's total height; and (ii) upper components are not more than twice the thickness of the lower components, and *vice versa*. The result is that [1f] requires both carrier thickness and carrier position. On a higher level, these dual requirements of [1f] optimizes both power density and warping/stress mitigation. This is clear because a very thick PCB would not satisfy [1f]; it would extend outside of " $1/3$ to $2/3$ of a height of the power converter" and thus sacrifice power density. That would defeat the purpose of the invention contemplated in addressing the flaws that were observed in the prior art.

65. As such, the Petition fails as a centered PCB with components on both sides does not meet [1f], because [1f] requires more.

iii. Vinciarelli-269 also does not disclose [1f].

66. Next, Vinciarelli-269 also does not disclose this limitation. Petitioner and Dr. Baker rely upon Vinciarelli-269 in combination with Vinciarelli-664 for this limitation, but again, they do not point to any portion of Vinciarelli-269 that discusses carrier thicknesses. Vinciarelli-269 discloses some variables relating to

some thicknesses within a power converter module, but none of those correspond to a carrier thickness. *See Vinciarelli-269*, FIG. 9. These include assembly thicknesses T1/T2 and transformer thicknesses D1/D2. *Id.*, 9:57-10:3. Neither of these relate to carrier thickness. Vinciarelli-269 discloses variables F1/F2 (in FIG. 2, reproduced below) relating to a height of the interior spaces within a transformer. *Id.*, 10:53-67, FIG. 18B. Vinciarelli-269 discloses these interior spaces “are greater in height than the maximum thickness of the PCB 10 and the minimum gap size required for the top 261 and bottom 262 interstitial gaps.” *Id.* However, this does not inform particular thickness of the PCB itself, nor the claimed range - “1/3 to 2/3 of a height of the power converter.”

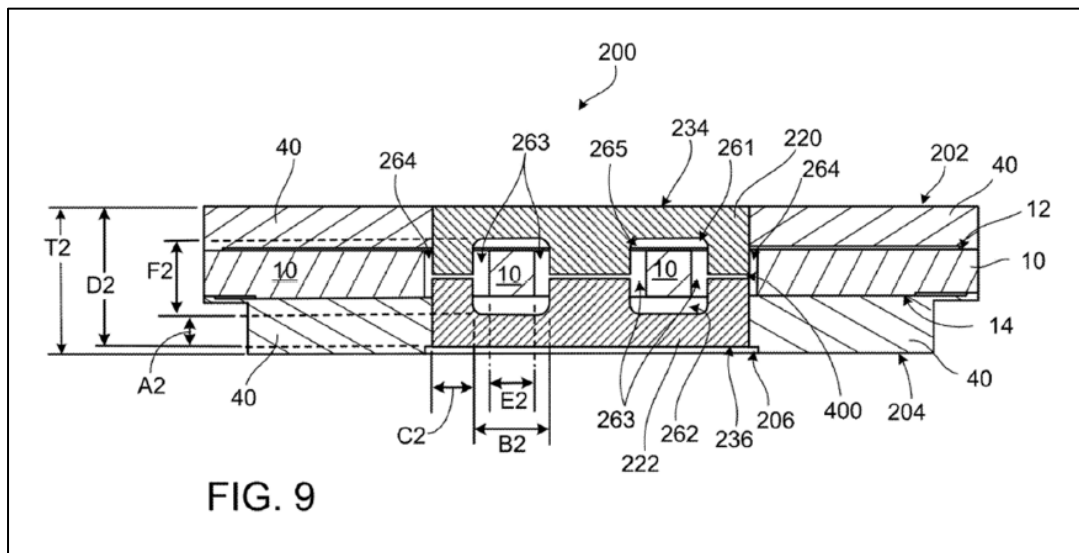


Figure 9 of Vinciarelli-269

67. Prompted by Petitioner and Dr. Baker’s reliance on eyeball testing of FIG. 9 of Vinciarelli-269, I again measured the components despite understanding

that patent figures are not drawn to scale. As with my previous exercise, I printed out FIG. 9 in a standard printer paper (8.5 inches by 11 inches) and measured the bottom layer (40), the middle layer or PCB (10), and the upper layer (40). In this first iteration, I began measuring the bottom layer from the bottom of height T2 in FIG. 9. Vinciarelli-269 generally teaches making the core structure thickness (D2) and the assembly thickness (T2) approximately equal. *Vinicarelli-269*, 9:59-64, 10:4-25. Encapsulant may be shaved off (reducing T2 to reach D2), or a larger core structure may be used (increasing D2 to reach T2). *Id.* Therefore, both a T2-tall power converter and a D2-tall power converter should be considered.

68. In the first iteration, my measurement shows, on the printout:

- A. The bottom layer (40) is about 0.92 inches;
- B. The middle layer or PCB (10) is about 0.80 inches; and
- C. The top layer (40) is about 0.72 inches.

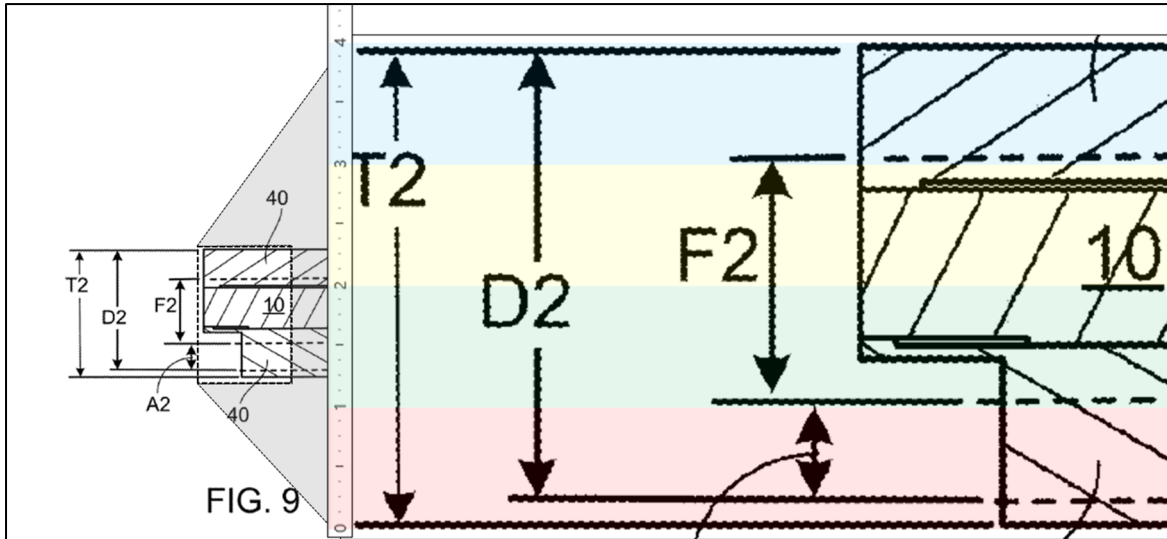
I converted this to percentages, which resulted in the bottom layer (40) being disposed at 0% to 37.7% along the power converter's height, the middle layer or PCB (10) being disposed at 37.7% to 70.5%, and the top layer (40) being disposed at about 70.5% to 100%. This establishes that FIG. 9's PCB extends into the top third of the module where the top of the PCB is located squarely above the 2/3 height of the power converter—*outside* of the claimed 1/3 to 2/3 height range.

69. In the second iteration (D2-tall power converter), my measurement reveals, on the printout:

- A. The bottom layer is about 0.82 inches;
- B. The middle PCB is 0.80 inches; and
- C. The top layer is about 0.72 inches.

Converting to percentages, this results in the middle PCB being disposed at 35.0% to 69.2% of the power converter's height. This also results in the middle PCB being 34.2% of the total height. This demonstrates that, even in a D2-tall power converter, the top of the PCB sits in the top third of the module, *again outside* of the 1/3 to 2/3 height range. Additionally, the illustrated PCB is too thick, because 34.2% is greater than 33.3%, and cannot fit entirely within the 1/3 to 2/3 height range.

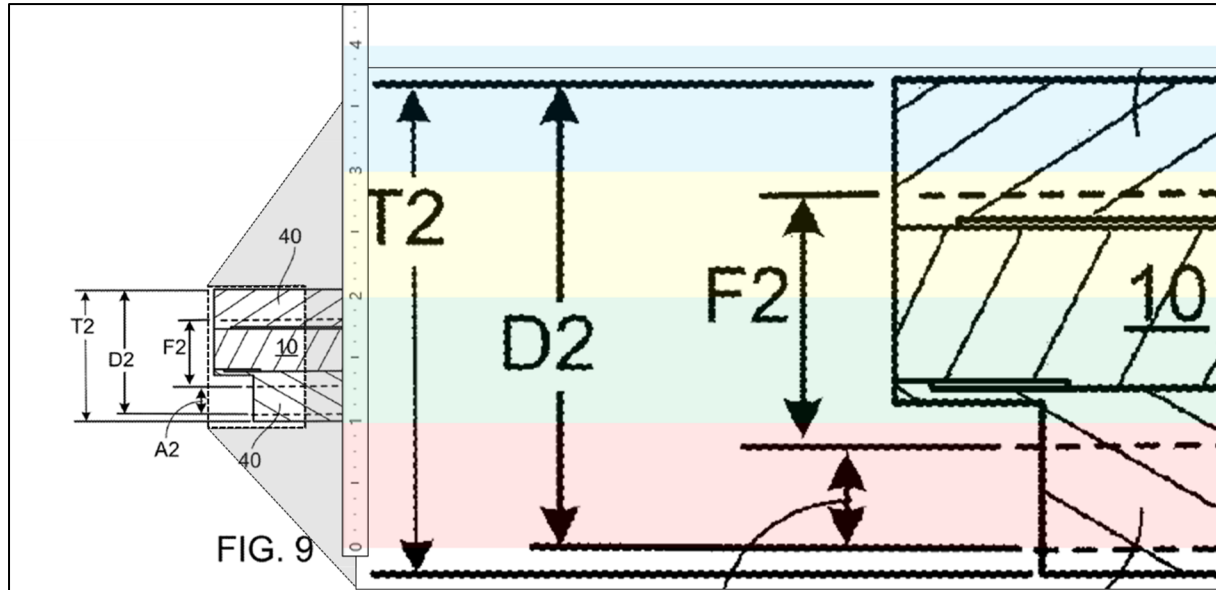
70. I have done another exercise, to demonstrate that [1f] is not met by Vinciarelli-269. The below excerpts of FIG. 9 follow the same exercise with respect to Vinciarelli-664 as demonstrated above using precisely measured shapes in a consistent PowerPoint scale with inch markers shaded.



Annotated Cutout of Figure 9 of Vinciarelli-269

71. Whether taking total thicknesses T2 or D2, Vinciarelli-269 does not illustrate a PCB disposed within the 1/3 to 2/3 height range. As depicted above, the lower encapsulant 40 is approximately 1.6 inches, while the PCB 10 extends from 1.6 inches to 2.8 inches on the ruler. The upper encapsulant above the PCB extends from 2.8 to 4 inches on the ruler. This makes the ratio 1.6 / 1.2 / 1.2, i.e., 40% / 30% / 30%. As such, the PCB extends outside of the 1/3 to 2/3 height range, and thus [1f] is not met.

72. The same conclusion is drawn if the power converter is considered to span only D2. Shown below (where the PowerPoint ruler is moved to start at the bottom of D2), the bottom encapsulant is approximately 1.3 inches, the PCB is approximately 1.2 inches, and the upper encapsulant is approximately 1.2 inches. This results in a ratio of 1.3/1.2/1.2, i.e., 35% / 32.5% / 32.5%.



Annotated Cutout of Figure 9 of Vinciarelli-269

73. These ratios are similar to my measuring the figures with a ruler, as described above. This results in the top of the PCB extending above the $\frac{2}{3}$ height of the converter (into the top third of the converter), and thus [1f] is not met.

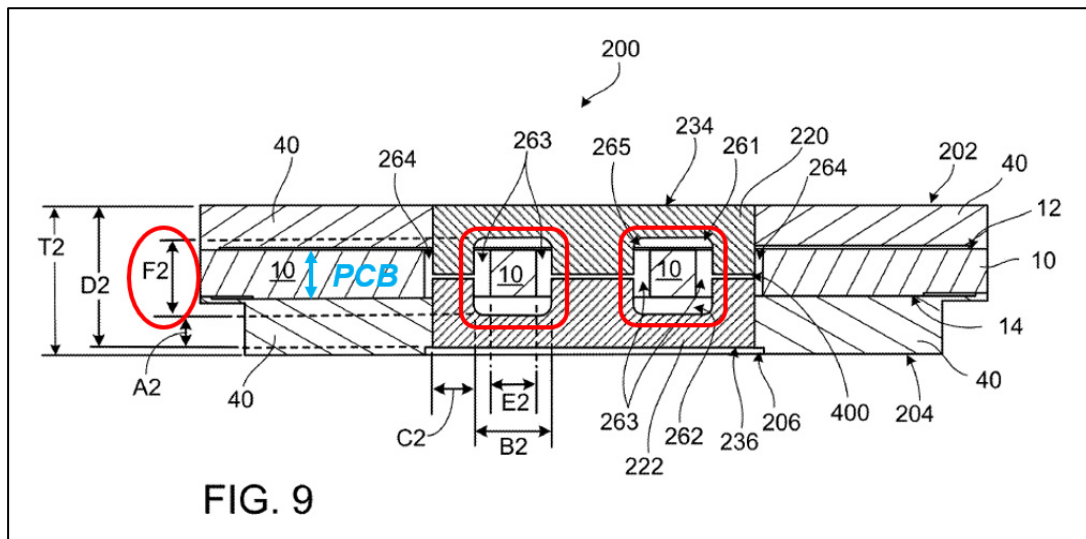
74. These measurements all demonstrate that Vinciarelli-664's middle PCB (101) is disposed *outside* of the claimed height range. These precise findings are consistent with my measurements based on measuring the printout as described above.

75. Therefore, Vinciarelli-269 does not teach a PCB that is disposed within the claimed height range. Neither Dr. Baker nor the Petitioner pointed to evidence contradicting it.

iv. Vinciarelli-269 teaches the opposite of Dr. Baker’s analysis of [1f].

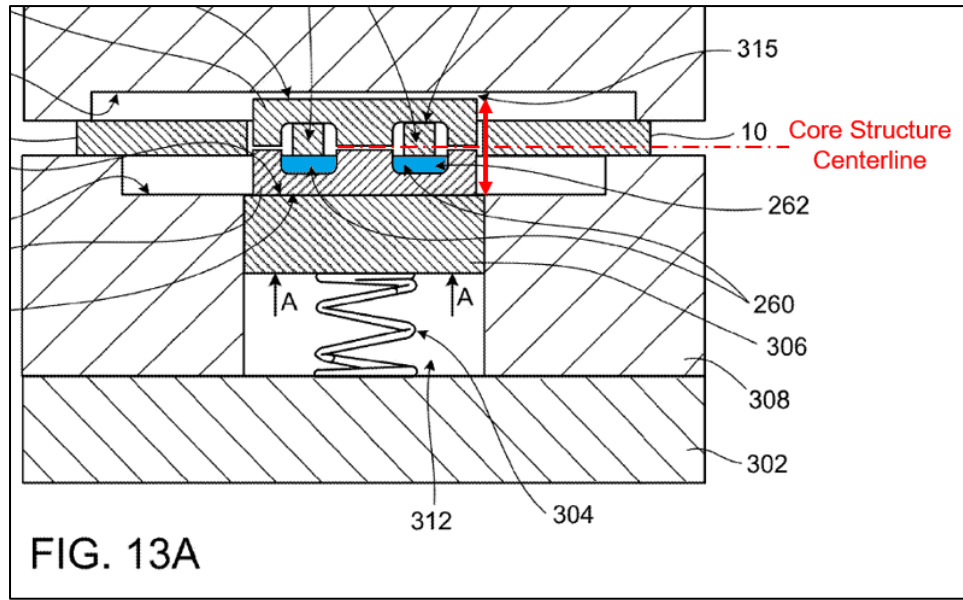
76. In my view, Vinciarelli-269 also teaches the opposite of Petitioner and Dr. Baker’s characterization of Vinciarelli-269. Petitioner and Dr. Baker conclude that Vinciarelli-269’s circuit board is halfway within the transformer, thus “in the middle of the power converter.” VICOR-1003, ¶106. As I have opined above, a PCB positioned halfway within the transformer does not meet [1f]. But in addition to this not meeting [1f], Vinciarelli-269 teaches away from a circuit board being halfway within a transformer.

77. Vinciarelli-269 discloses that the “legs” of the two E-shaped core halves composing a transformer face each other, forming large interior spaces between those “legs.” See *Vinciarelli-269*, FIG. 9 (reproduced below with annotation). Vinciarelli-269 discloses that the PCB is positioned somewhere within the interior spaces formed by the magnetic core halves. *Id.*

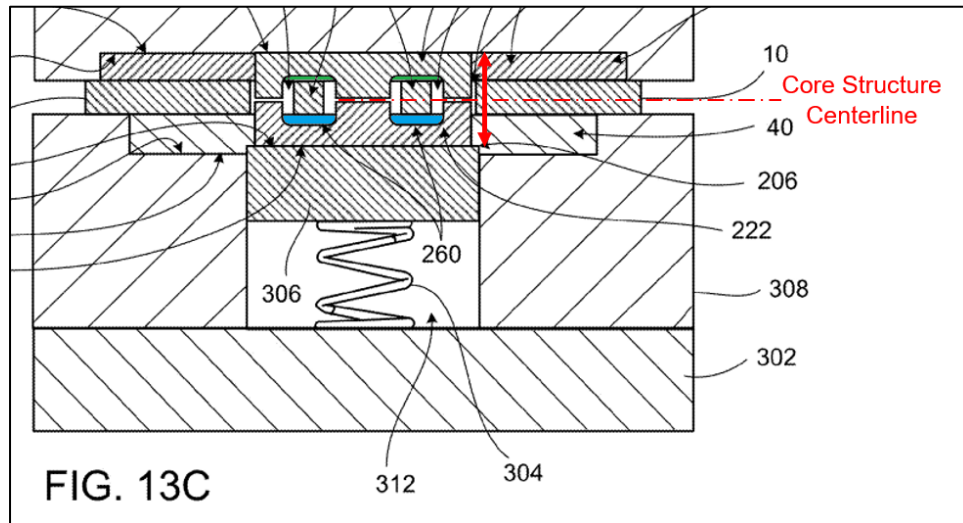


78. Vinciarelli-269 explains that the large interior spaces are intended to allow offset and biased positioning of the PCB from a center region between the matching core halves. *Vinciarelli-269*, 10:53-11:12. Vinciarelli-269 refers to a top interstitial gap 261 and a bottom interstitial gap 262 that give freedom in disposing the PCB ***away from the center*** between the core halves. *Id.*

79. Vinciarelli-269 discloses “clamping [the PCB] relative to the mold ***and biasing*** [the transformer] ***in position*** against a predetermined feature of the mold.” *Id.*, 3:15-34. “The minimum height F2 of interior space 260 is set to allow the assembled core 210 to ***move vertically relative to the PCB 10*** which may be used during the manufacturing process to adjust the core surface 234 ***into a precise position relative to the PCB*** for encapsulation.” *Id.* (emphasis added); *also id.*, 11:1-12. The core structure can be moved upward relative to the PCB, so that the PCB is positioned below the vertical center of the core structure. *Id.* The core structure can also be moved to a lowered position, resulting in the PCB being positioned above a vertical center of the core structure. *Id.*, 12:7-27, FIGs. 13A-13C (reproduced below with annotation). Therefore, Vinciarelli-269 teaches positioning the PCB offset from the center.



Annotated Excerpt of Figure 13A of Vinciarelli-269



Annotated Excerpt of Figure 13C of Vinciarelli-269

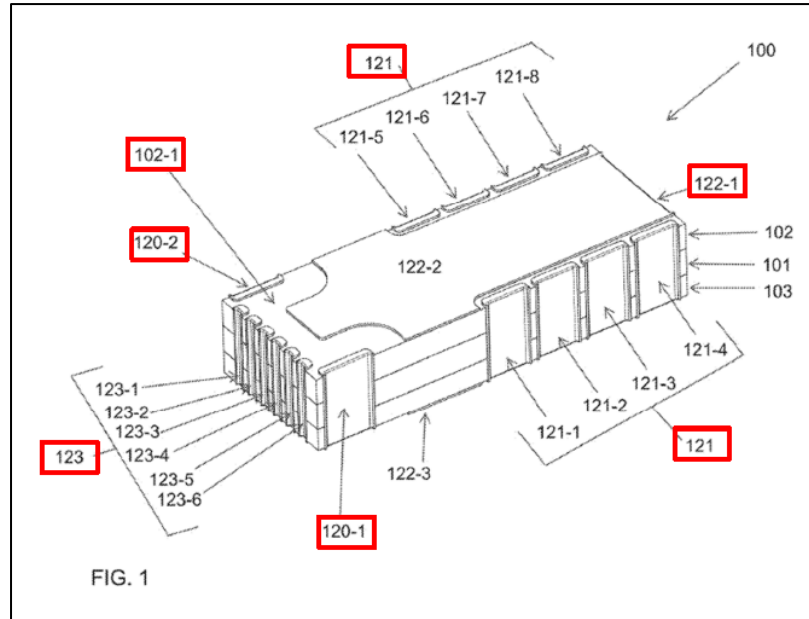
80. Vinciarelli-269 does not teach a PCB that is positioned halfway within a transformer and instead literally teaches a PCB that is *not* positioned halfway within a transformer. As such, Petitioner and Dr. Baker are incorrect in their conclusion that Vinciarelli-269 teaches a PCB halfway within a transformer.

However, based on my opinions stated above, this is moot because [1f] requires more than a PCB occupying a central region.

v. Vinciarelli-664 does not disclose [1g]’s structure.

81. Limitation [1g] recites “wherein the first connection part is fabricated by mechanical support of the first electronic component.” As I have opined above, [1g] describes some structure, in light of the ’263 Patent disclosing: “curving the connection part by mechanical support of the first electronic component to fix the connection part at the first electronic component.” *See ’263 Patent*, 10:48-50.

82. Vinciarelli-664 does not disclose the structure associated with [1g]. Vinciarelli-664 discloses that “a plurality of electrical contacts, e.g., 120-1, 120-2, 121, 122-1, and 123, [are] situated in grooves located along all four perimeter edges of the module.” *Vinciarelli-664*, 5:56-60. Vinciarelli-664 also discloses that castellation being performed to form these grooves and the electrical contacts situated in the grooves. *Vinciarelli-664*, 9:25-48, 11:24-36. However, I do not find any explicit disclosure or suggestion within Vinciarelli-664 of whether or how the electrical contacts are fixed to the module’s sidewall or grooves.



Petition, 22

83. I also reviewed Dr. Baker's analysis of Vinciarelli-664 with respect to [1g]. Dr. Baker did not find whether or not Vinciarelli-664 discloses that the sidewall contacts are mechanically supported by any components of the assembly. *See* VICOR-1003, ¶¶107-109. Dr. Baker also did not find whether or not Vinciarelli-664 discloses that the sidewall contacts are fixed at any components. *See id.* I also note that the Petition lacks a discussion of this structure that I have associated with [1g]. Petition, 35.

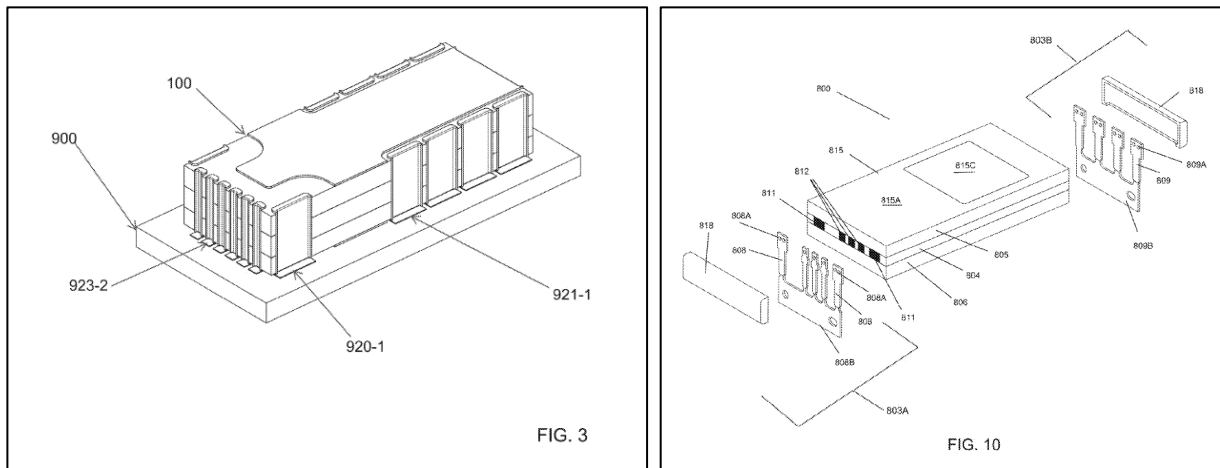
84. Therefore, I have the opinion that the Petition and Dr. Baker have not demonstrated that [1g]'s structure existed in the prior art.

vi. [1b] does not necessarily exist in Vinciarelli-664.

85. As previously noted, I am informed and understand that anticipation requires that all of the claim limitations be disclosed in a single prior art reference as arranged or combined in the claim. I am informed that this means that different embodiments and references cannot be combined to anticipate. I am also informed that in order for a reference to inherently disclose a claim limitation, that claim limitation must *necessarily* be present in the reference and may not be established by probabilities or possibilities.

86. I am informed that the Petitioner combined distinct embodiments for limitation [1b], which recites “a first electronic component disposed at the lower surface of the carrier” and “a second electronic component disposed at the upper surface of the carrier.” I have reviewed the Petition’s analysis of [1b] under Ground 1A, and I have the opinion that the Petition resorts to combining embodiments due to Vinciarelli-664 not illustrating components disposed on both upper and lower carrier surfaces in its figures. This opinion is also based on my review of Dr. Baker’s statements, which point to the fact that, in Vinciarelli-664’s illustrations, “the encapsulant layers 102 and 103 cover the components mounted on the printed circuit board 101.” VICOR-1003, ¶76 (citing *Vinciarelli-664*, 6:21-27). Because encapsulant covers any components that may exist on a carrier surface, I therefore conclude that each illustrated figure of Vinciarelli-664 does *not*

necessarily include both an electronic component on the lower carrier surface and an electronic component on the upper carrier surface. For example, while FIG. 3 (reproduced below) may show encapsulant layers on both the upper and lower carrier surfaces, it is not conclusive nor necessary that FIG. 3's module includes components *on both* carrier surfaces.



Figures 3 and 10 of Vinciarelli-664

87. I have reviewed each of Vinciarelli-664's thirteen figure sheets, and only see an electronic component depicted in FIG. 10 (reproduced above). But in FIG. 10, the illustrated magnetic core 815C is *shown* on the upper surface of the carrier, and there is no view of any components mounted on the lower surface of the carrier. In the field of power converter design, it is possible for components to only be mounted on one side of the carrier. A power converter may only have components on one side of the carrier when one side of a metal-clad laminate is used for the routing of wide traces. Power converters frequently include traces as

broad or even broader than the horizontal dimension components, as well as low-impedance conductive planes. In many power converter designs, having components on one side of a substrate can result in a simpler and less costly assembly.

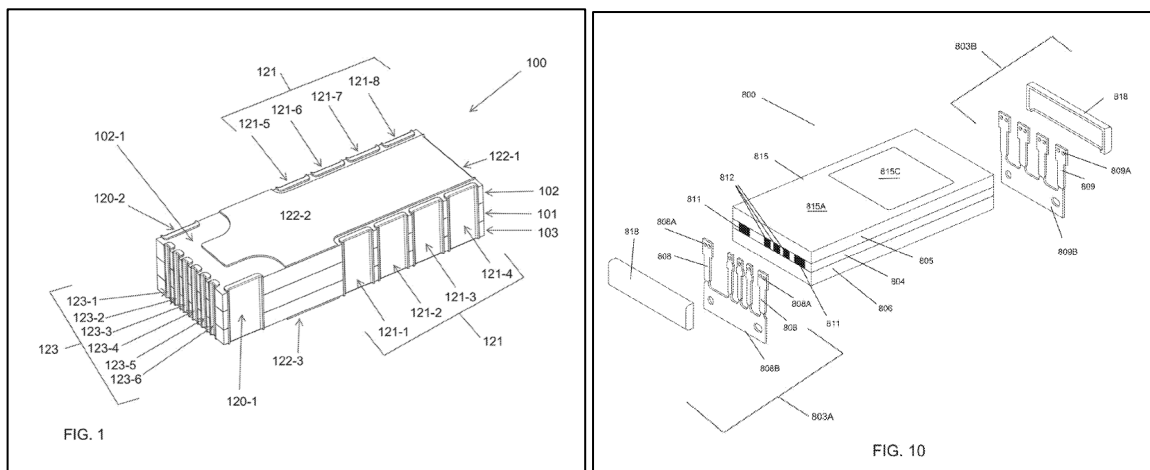
88. Therefore, I have the opinion that the electronic module disclosed in Vinciarelli-664 does not necessarily include “a first electronic component disposed at the lower surface of the carrier” and “a second electronic component disposed at the upper surface of the carrier.” I am informed that [1b] is therefore not anticipated by Vinciarelli-664. I also do not opine on the probability or possibility that the electronic module disclosed in Vinciarelli-664 does include components disposed on both surfaces, because I am informed that inherency of a claim limitation may *not* be established by probabilities or possibilities.

vii. [1d] does not necessarily exist in Vinciarelli-664.

89. Continuing here is my understanding that anticipation requires that all of the claim limitations be disclosed in a single prior art reference as arranged or combined in the claim. I am informed that this means that *different* embodiments and references cannot be combined to anticipate.

90. Limitation [1d] requires “a first terminal electrically coupled to the upper surface or the lower surface of the carrier.” I have the opinion that Vinciarelli-664 does not disclose this limitation because Vinciarelli-664 does not

teach terminal connections on the upper/lower surfaces of its PCB. Specifically, Vinciarelli-664's contacts 120-1, 120-2, 121, and 122 "extend from the bar codes up and down the sidewalls and onto selected portions of the top and top [sic] and bottom surfaces of the module." *Vinciarelli-664*, 6:56-60. But, any connection point of these contacts is not the PCB's upper/lower surface. For example, the bar codes (811 and 812 in FIG. 10, reproduced below) are on the *side* surfaces/edges of the PCB, and not on the top or bottom surfaces of the PCB.



Figures 1 and 10 of Vinciarelli-664

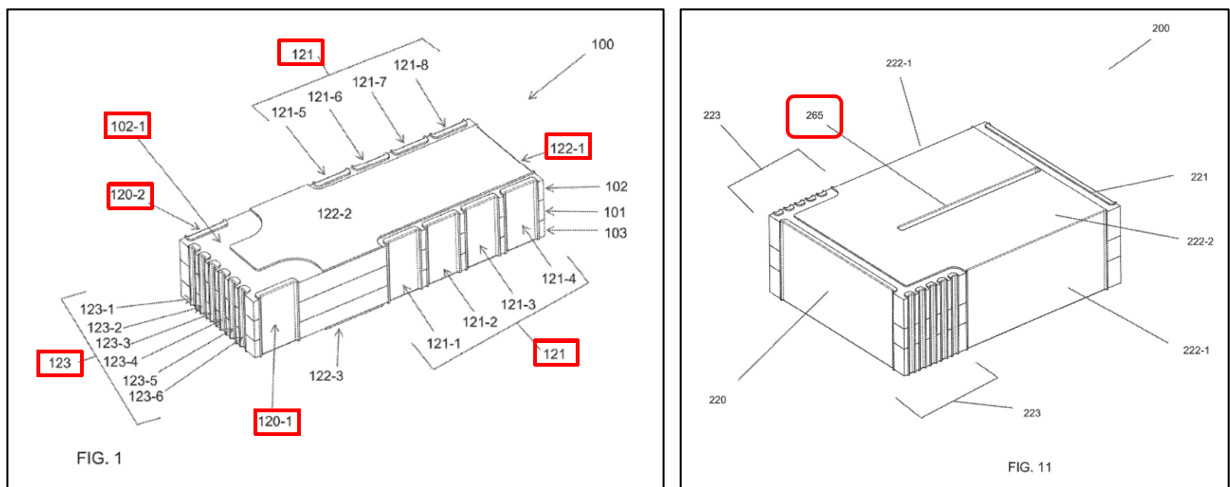
91. My review of the Petition suggests that Petitioner reaches the same conclusion that [1d] is not met due to the bar codes only being on the PCB side surfaces/edges (as opposed to the top or bottom surfaces). This is my view because I note that the Petition turns to different embodiments to complete its analysis of [1d]: (i) Vinciarelli-747 to discuss conductive through-holes (Petition, 23-25), (ii) the FIG. 11 embodiment for a thermal conduit (Petition, 25-26), and

(iii) Vinciarelli-844 to discuss a board that includes conductive runs 65 (Petition, 26-27). I have reviewed each of these three teachings and have confirmed that Vinciarelli-664 discloses none specifically in relation to FIG. 1, which depicts the contacts 120-1, 120-2, 121, and 122. As further explained below, I believe that none of these three teachings necessarily exist in the FIG. 1 module of Vinciarelli-664. I also do not opine on the probability or possibility that the contacts are connected to the PCB's upper/lower surfaces in Vinciarelli-664, because I am informed that inherency of a claim limitation may not be established by probabilities or possibilities.

92. Firstly, the Petition proposes to modify Vinciarelli-664 to replace its buried vias with conductive through-holes that are coupled to the contacts according to Vinciarelli-747. Petition, 23-25. I do not find that Vinciarelli-664 discloses these conductive through-holes as alternatives to the buried vias or bar codes. Instead, these conductive through-holes are only introduced in Vinciarelli-747. I also find that Vinciarelli-747 *points away* from having upper/lower connections on its PCB. Vinciarelli-747 states that “[i]n the alternative to buried conductive features, conductive through-holes . . . may be used . . . to form interconnects extending through the thickness of the PCB from top surface to bottom surface” but later states that “[a] penalty of using through-holes for the interconnects is the *loss of surface area* on the top and bottom of the PCB which

may otherwise be used for setback or other safety and agency approval requirements.” *Vinciarelli-747*, 16:40-49. It is apparent to a POSITA reading *Vinciarelli-747* to notice these drawbacks for providing connections at the top/bottom surfaces. POSITAs would be discouraged to incorporate those through-holes into *Vinciarelli-664* as a result. Dr. Baker does not address why a POSITA would still attempt the modification in light of the drawbacks explicitly identified in *Vinciarelli-747*.

93. Secondly, the Petition describes a combination of two distinct embodiments in *Vinciarelli-664* to replace the bar codes. The two different embodiments being combined are shown respectively in FIG. 1, which includes the contacts connected to the bar codes, and FIG. 11 (shown below).



Annotated Figures 1 and 11 of Vinciarelli-664

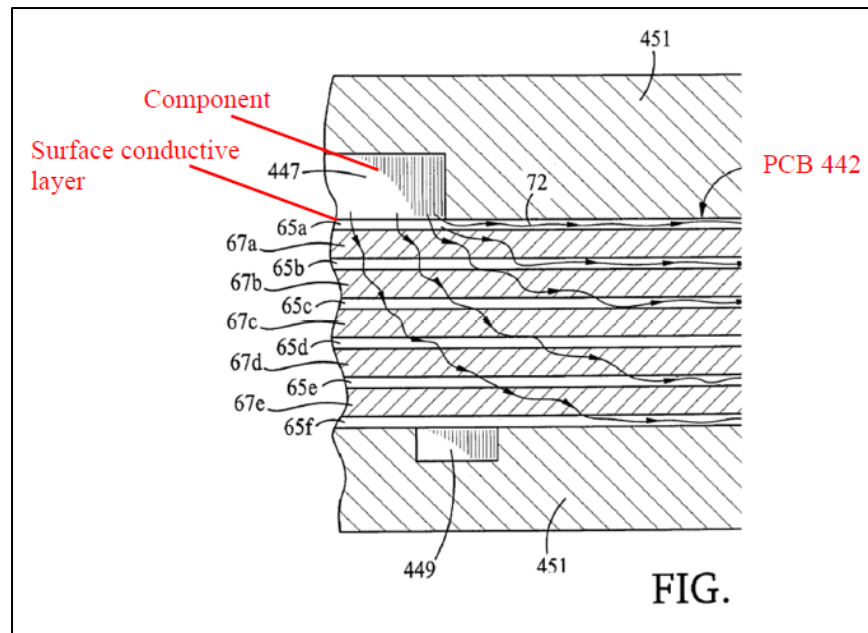
94. Besides the form factor difference, there are electrical connection differences. *Vinciarelli-664* discloses that the FIG. 1 device has a top shield 122-2

“separated from the input contacts 120-1 and 120-2, output contacts [121-X], and control contacts [123-X].” *Vinciarelli-664*, 10:62-11:5. On the other hand, Vinciarelli-664 discloses that FIG. 11’s device has “a conductive shield 222-2 on the top of the module which may as shown be electrically and connected to the common contacts 222-1.” *Id.*, 13:7-10. The Petition’s analysis did not articulate any motivation for a POSITA to combine these two *different* embodiments, or specifically for a POSITA to modify the FIG. 1 embodiment to include the thermal conduit feature of FIG. 11. That is, Vinciarelli-664 only describes that the FIG. 11 device (a different device with a squarer shape) has the thermal conduit but does *not* describe the thermal conduit in the context of the FIG. 1 device (a different device). As such, there is no teaching or suggestion in Vinciarelli-218 that the FIG. 1 device includes the thermal conduit. The Petition also does not explicitly explain that the thermal conduit would or even can be ported from the FIG. 11 device to the FIG. 1 device, nor explain why a POSITA would make that modification. *See* Petition, 25-26.

95. Thirdly, the Petition reproduces an excerpt of Vinciarelli-844’s FIG. 10, which shows multiple buried conductive runs. Petition, 27 (Petitioner-annotated excerpt of FIG. 10 reproduced below). The Petition appears to use this excerpt of FIG. 10 to show that the conductive runs 65a, 65b, . . . 65f are electrically coupled together, and therefore, a contact coupled to one buried

conductive run is then electrically coupled to runs on the surfaces of the carrier.

However, I note that the arrows in the Petition's excerpt of FIG. 10 represent heat and *not electrical flow*. I also note that this configuration of conductive runs is not included in Vinciarelli-664 itself in connection with the bar codes, and Dr Baker provides no indication or suggestion that the bar codes in Vinciarelli-664 necessarily have the same configuration as depicted in Vinciarelli-844. See VICOR-1003, ¶¶93-96.



Petition, 27

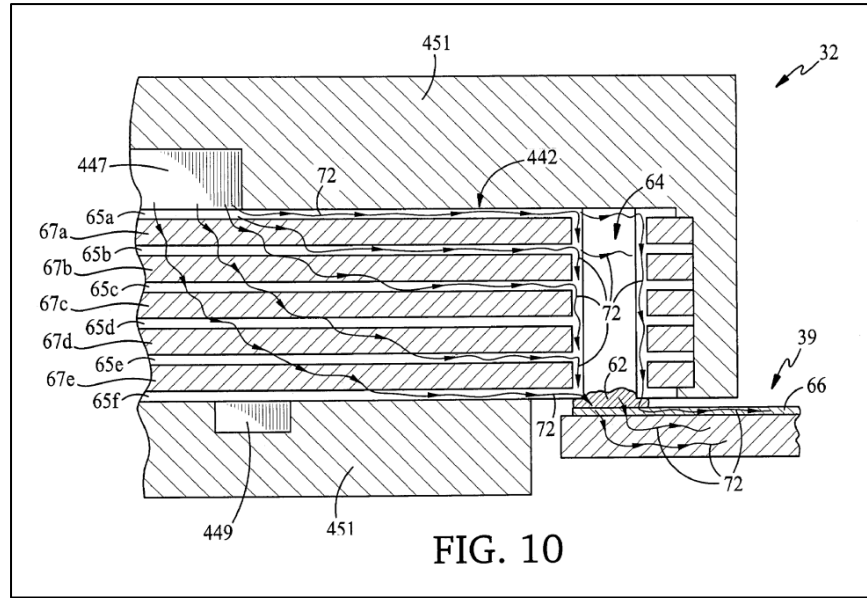


Figure 10 of Vinciarelli-844

96. Therefore, I have the opinion that [1d] does not exist in Vinciarelli-664.

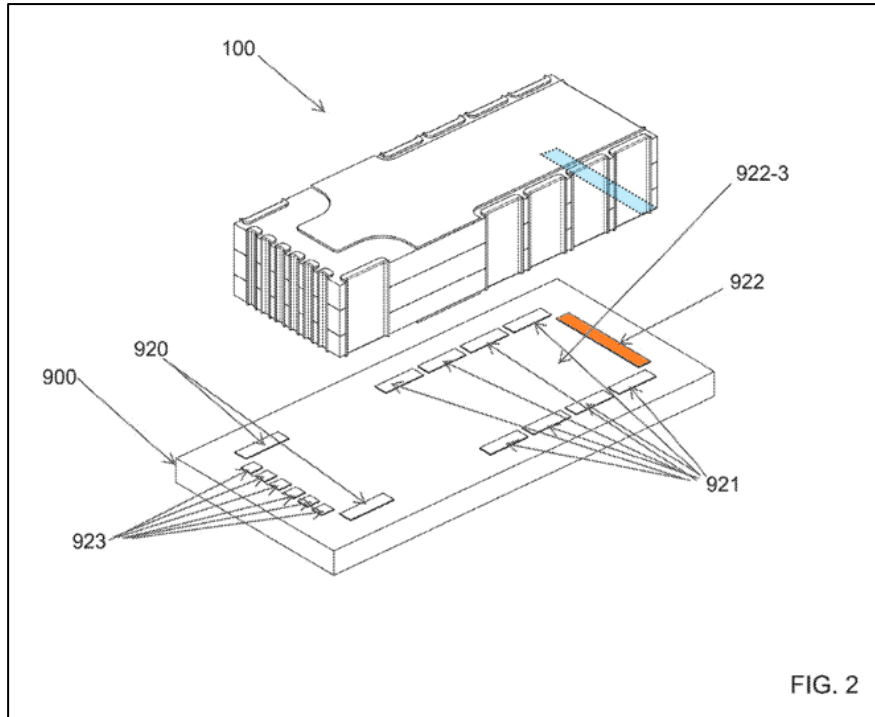
viii. [1e] does not necessarily exist in Vinciarelli-664.

97. It is my understanding that anticipation requires that all of the claim limitations be disclosed in a single prior art reference as arranged or combined in the claim. I am informed that this means that *different* embodiments and references cannot be combined to anticipate.

98. Limitation [1e] requires “a second terminal attached to a surface of the first electronic component apart from the carrier, wherein the second terminal of the first connection part is a bonding pad.” In my view, Vinciarelli-664 fails to disclose this feature, because Vinciarelli-664’s bottom shield/contact 122-3 cannot satisfy both “a second terminal attached to a surface of the first electronic

component” and “the second terminal . . . is a bonding pad.” Additionally, Petitioner’s arguments of what a POSITA would understand in Vinciarelli-664 to meet this limitation are incorrect.

99. I do not find any explicit illustration of the bottom shield/contact 122-3 in Vinciarelli-664. With respect to description, Vinciarelli-664 discloses that the bottom shield/contact 122-3 mates with conductive pad 922 of a customer’s PCB 900. Vinciarelli-664 discloses: “Although conductive pad 922 is shown in FIG. 2 as mating with only a small portion of the common contacts 122-3 on the bottom surface of the module 100, it will be appreciated that contact 922 may be enlarged to extend below module 100 to provide greater contact area with the contact 122-3 on the bottom of the module.” *Vinciarelli-664*, 6:66-7:4. Based on this description and lack of illustration, it is therefore my understanding that the bottom shield/contact 122-3 would be shaped as demonstrated (in blue) in the annotated version of Vinciarelli-664’s FIG. 2 shown below.



Annotated Figure 2 of Vinciarelli-664

100. In particular, it would be generally well understood that the bottom shield/contact 122-3 cannot be significantly larger than the conductive pad 922 on the customer board. Significant problems would occur if a bottom shield/contact 122-3 having a large area was to be soldered to the small conductive pad 922 on the customer board. First, slippage of the bottom shield/contact 122-3 across and off of the conductive pad 922 could occur. Second, large bubbles (voids) are more prone to forming in the solder joints between a large bottom shield/contact 122-3 and the small conductive pad 922. Third, when the amount of solder paste is too little, the smaller soldering area has negative thermal effects. Conversely, when

the amount of solder paste is too much, the device is easily lifted off of the customer board, resulting in poorly soldered pads.

101. This understanding of a small bottom shield/contact 122-3 is also supported by international industry standards and Petitioner's practice in their own products. For instance, the IPC 7093 Standard discusses "Land Pattern Design Calculations" and involves clearances that prevent Vinciarelli-664's bottom shield/contact 122-3 from having a significantly larger area than the conductive pad 922. *See* EX2003, §6.1.3.2 ("Land Pattern Design Calculations").

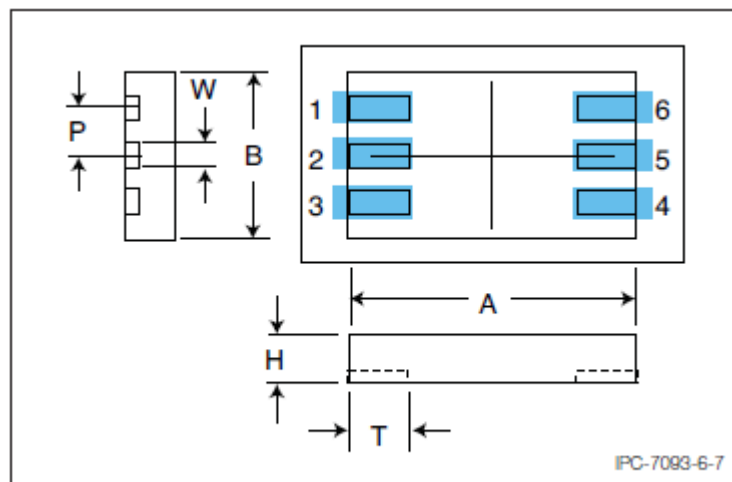


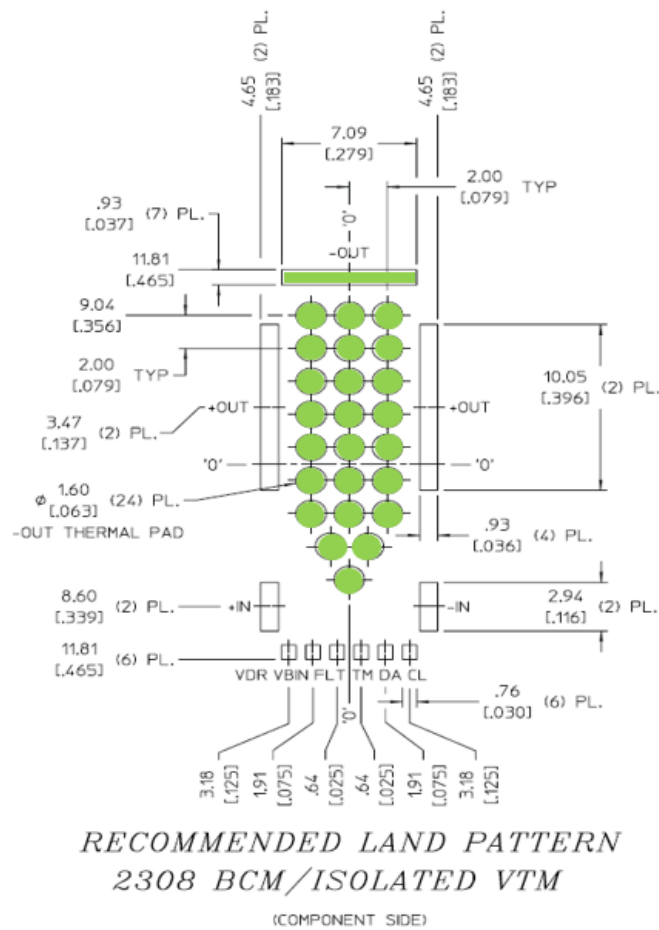
Figure 6-7 QFN Component and Land Pattern Composite

Figure 6-7 of IPC 7093 Standard

102. Petitioner also includes an image of their own Vicor product in its Petition, which also shows a small contact for mating to a small pad that is isolated from a shielding area. *See Petition*, 37 (annotated added). This small pad as depicted resembles the annotation made above with Vinciarelli-664's FIG. 2.



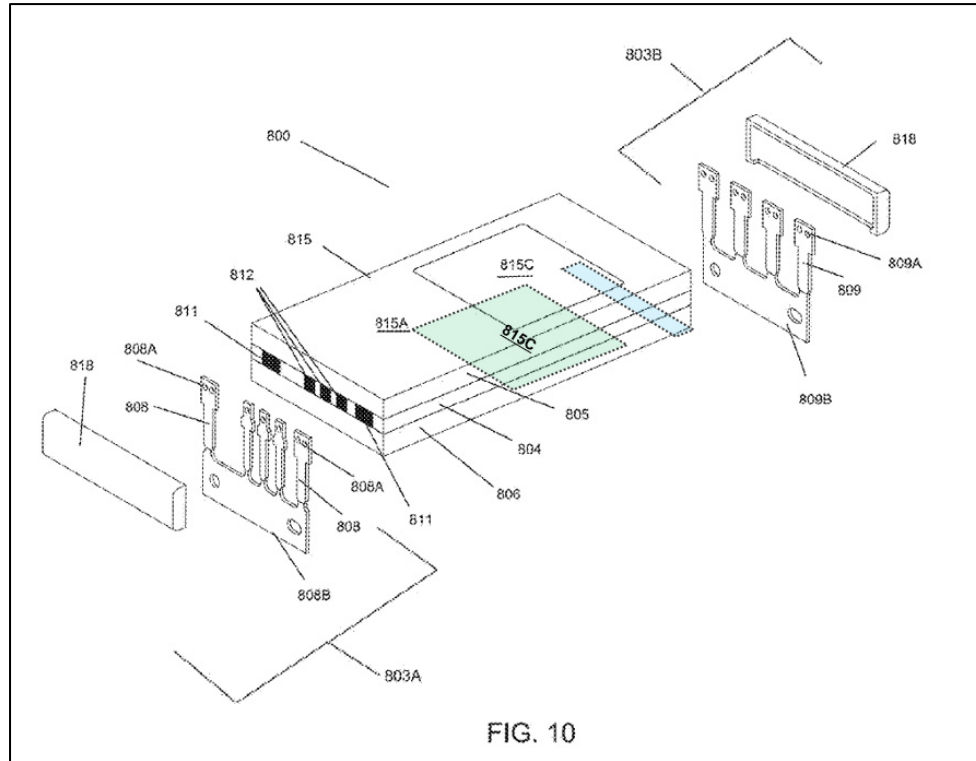
103. This same design consideration (module and board pads approximately resembling one another) would be recognized by a POSITA at the time of the invention and also would continue to be recognized today. For example, the VTM Datasheet shows that a land pattern having multiple small spots is recommended. *See* VTM Datasheet, 21 (reproduced below with green annotation).



VTM Datasheet, 21

104. Therefore, in view of Vinciarelli-664's lack of illustration of the bottom surface of its module, a skilled artisan would understand that the bottom shield/contact 122-3 mentioned by Vinciarelli-664 would be small, similar to the pad 922. Because of these reasons, it is thus my view that Petitioner's statement that "[a] skilled artisan would have understood the bottom common contact would be comparable in size to the top contact to provide shielding" is incorrect.

105. With this understanding of a small bottom shield/contact 122-3, it is my opinion that the bottom shield/contact 122-3 would not attach to a surface of the exposed core in the bottom surface of Vinciarelli-664's module. Vinciarelli-664's FIG. 10 shows an exposed core surface in the top surface of module, and an exposed core surface in the bottom surface of the module would be in the same relative location. However, when placing the bottom shield/contact 122-3, it would not overlap with the exposed core surface and therefore could not be attached to the exposed core surface. *See Vinciarelli-664*, FIGs. 1, 2, and 10 (FIG. 10 annotated and reproduced below). In the annotated version of FIG. 10 below, the green annotation projects a surface of the exposed core on the bottom of the module, and the blue annotation represents the bottom shield/contact 122-3 that is shaped/sized as discussed above.



Annotated Figure 10 of Vinciarelli-664

106. As a result, Vinciarelli-664 does not meet [1e] because of the bottom shield/contact 122-3 that it describes cannot satisfy each part of [1e]. A POSITA would not understand that the bottom shield/contact 122-3 is large like the illustrated top shield/contact 122-3 due to the many practical problems that would arise. Therefore, the bottom shield/contact 122-3, because of its purpose in mating with pad 922, is small and would not attach to a surface of the exposed core. Alternatively, if the bottom shield/contact 122-3 were to be large, contrary to the POSITA's understanding, then the bottom shield/contact 122-3 could not function as a bonding pad that mates with pad 922, for the same practical problems discussed above.

107. Therefore, it is my opinion that Vinciarelli-664 does not meet [1e].

b. Ground 1B: The Deficiencies of Ground 1A Are Not Cured.

i. Ground 1B does not show that [1f] is met.

108. Ground 1B relies on Ground 1A, and generally discusses that the challenged claims would be rendered obvious in combination with Vinciarelli-269, Vinciarelli-844 and Vinciarelli-747. Petition, 48-53.

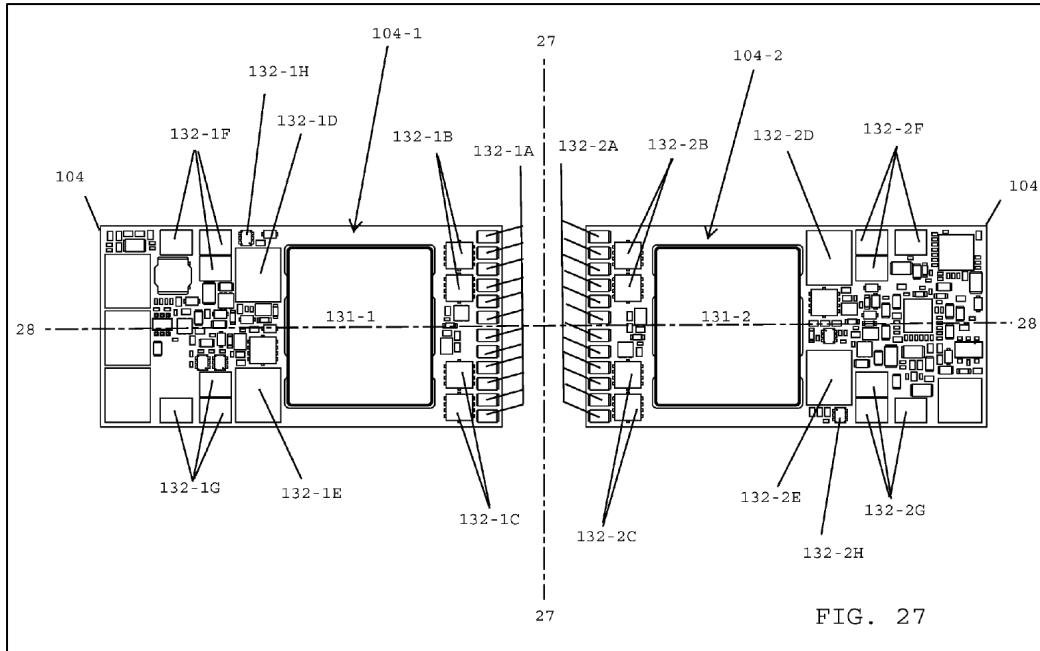
109. As described above, Vinciarelli-664 (and Vinciarelli-269) fail to teach [1f]. While the Petition describes [1f] limitation in a passing under Ground 1B, it appears to repeat Ground 1A's analysis of [1f] by alleging that a skilled artisan would find it obvious to have "roughly equal size component on both sides." Petition, 52 (citing VICOR-1003, ¶129).

110. The Petition and Dr. Baker do not provide support or rationale for their argument; Petitioner only appears to describe the general rough centering of a PCB, which is defective to meet the precise sizings of [1f], as I have explained with Ground 1A. Petitioner's citation to Dr. Baker (VICOR-1003, ¶129) is not even related to [1f], and instead describes placing power converters near loads and making them small (reproduced below):

129. A skilled artisan would have been further motivated to turn to Vinciarelli-269 for details concerning the designing of compact transformers for power converters and would provide transformers that have windings in the printed circuit board and transformer core halves above and below the windings. Vinciarelli-269, 2:10-33, FIGS.

1, 5, 8, 9, 18 (A, B), and 19 (A, B). Vinciarelli-269 explains that “[c]ores of the type shown in FIG. 1 are known in the field of planar magnetics and are commonly used in applications where sizes reduction is important.” Vinciarelli-269, 6:16-17. For example, one of the applications for small power converters is for placement at or near the “point of load,” and thus a skilled artisan would be motivated to reduce the size of the power converter as much as possible. Even in other applications, there is a general motivation in circuit layout to reduce space as much as possible so that more functionality may be fit into a smaller package. This can be readily seen in the trend to reduce the size of computing components generally, and particularly components in computer servers servicing the Internet and corporate computing, so that more computing may be provided in a smaller footprint. Given that power converters of the type at issue here have applications in such computing systems, a skilled artisan would be motivated to reduce the size of the power converter.

111. Petitioner cites to two columns of Vinciarelli-747 for relating to [1f]. Petition, 52 (citing *Vinciarelli-747*, 22:46-24:49). This section refers to Vinciarelli-747’s FIG. 27 (excerpted below), but FIG. 27 does not describe the symmetry of component *sizes* in the vertical direction. It instead refers to symmetrical components, but that is not relevant to analysis for [1f]. Moreover, Dr. Baker only generically repeats Petitioner’s statements and broad recitation to two whole columns of Vinciarelli-747. VICOR-1003, ¶131. Vinciarelli-747 does not cure the deficiencies of Ground 1A that fails to disclose [1f].



112. Therefore, I have the opinion that Ground 1B does not meet [1f].

ii. Ground 1B does not include any proper motivations to combine.

113. In my opinion, Ground 1B fails to provide motivations to arrive at the claimed invention. Petitioner's challenge to the claims under Ground 1B can be summarized in the following statement:

It would have been obvious to a skilled artisan to look to [the '269 patent], [the '844 patent], and [the '747 patent] to *provide details concerning power converters* that may be absent from Vinciarelli-664 for all the reasons discussed in Ground 1A. VICOR-1003, ¶¶123-132. See discussion for each claim in Ground 1A regarding the combination of Vinciarelli-664, [the '269 patent], [the '844 patent], and [the '747 patent].

Petition, 48-49 (emphasis added).

114. Ground 1B suffers the same deficiencies as missing the same limitations that are absent in Ground 1A. I understand that the petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon. Ground 1B does not meet this requirement because it does not specifically identify any claim limitation of claim 1, and not provide a motivation to arrive at any of those claim limitations.

115. For instance, neither the Petition nor Dr. Baker addressed the dissuading disclosure from Vinciarelli-747, which counteracts the combination of Vinciarelli-747's through holes with Vinciarelli-664's disclosure of buried vias. Specifically, Vinciarelli-747 states that "[a] penalty of using through-holes for the interconnects is the loss of surface area on the top and bottom of the PCB which may otherwise be used for setback or other safety and agency approval requirements." Vinciarelli-747 at 16:40-49. Petitioner identifies no incentive and does not address why a POSITA would have made the proposed combination.

116. As such, Petitioner fails to identify a proper motivation for Ground 1B.

c. Ground 1C: The Combination of Vinciarelli-664 and Zeng-014 Does Not Render the Claims Unpatentable.

i. Ground 1C does not show that [1f] is met.

117. As I have discussed above, Ground 1A does not show that [1f] is met. Here, Ground 1C does not analyze Zeng-014 at all for [1f] or make any arguable

reference to this limitation. Ground 1C only includes a refer-back; it states “*See* Ground 1A, [1d]-[1f].” Petition, 61. Therefore, Ground 1C fails to meet [1f] for the same reasons discussed with Ground 1A.

ii. The Petition does not present a proper motivation to combine Vinciarelli-664 and Zeng-014.

(a) A POSITA would find manufacturing incompatibilities in Petitioner’s combination of Vinciarelli-664 and Zeng-014.

118. Ground 1C is based upon a proposed combination of Vinciarelli-664 and Zeng-014. I have reviewed Petitioner’s and Dr. Baker’s reasoning for why and how a POSITA would combine Vinciarelli-664 and Zeng-014. In my view, their reasonings are clearly wrong, and it is my opinion that a POSITA would not be motivated to form the proposed combination. In at least a first reason, motivation is lacking due to *incompatibilities of manufacturing processes, which cannot be reconciled*, between Vinciarelli-664’s bulk production at scale and Zeng-014’s individual and specific lead frame wrapping. First, Vinciarelli-664 is directed to a method for making electronic modules with “complex contact structures” on their surfaces. *Vinciarelli-664*, Title, Abstract. In this method, multiple electronic modules are formed “by encapsulating *panels containing pluralities of electronic modules delineated by cut lines* and having conductive interconnects buried within the panel along the cut lines.” *Id.* (emphasis added). Vinciarelli-664 discloses: its

module formation method “start[s] with an encapsulated and preferably lapped panel [of un-singulated modules]” and then finishes with singulation “to separate individual modules from the panel.” *Id.*, 8:27-11:63. Each of the figures via which Vinciarelli-664 teaches its module formation method depicts a panel that includes multiple un-singulated modules. *Id.*, FIGs. 4-9.

119. Vinciarelli-664 discloses that the “complex contact structures” are formed *prior to singulation* during this manufacturing method. *Id.*, 8:46-9:48 (“A. Castellation”), 10:12-11:16 (“C. Plating”; “D. Patterning”; “E. Finish Plating”). Forming these contacts while the modules are un-singulated and part of a large panel has a clear purpose and clear benefits. For one, the top shields 122-2 for every module in a panel can be substantially formed at the same time, via the depositing of the material layers that form the top shield 122-2 across the entire panel. Additionally, as Vinciarelli-664 demonstrates through FIGs. 7-9, castellation and cutting along a cut line allows for production of the sidewall contacts for both modules on either side of the cut line simultaneously.

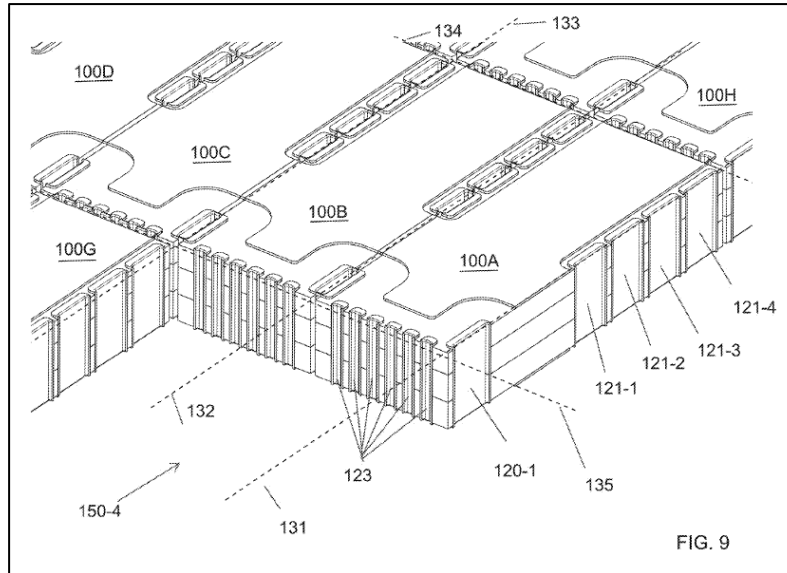
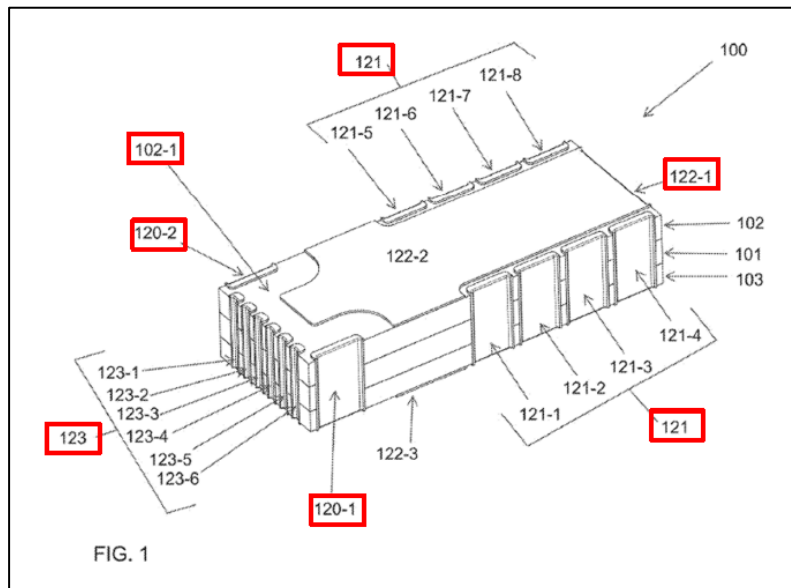


Figure 9 of Vinciarelli-664

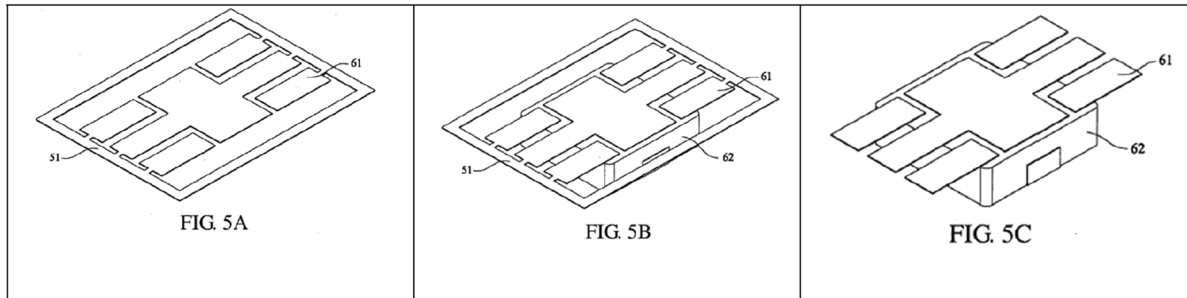


Annotated Figure 1 of Vinciarelli-664

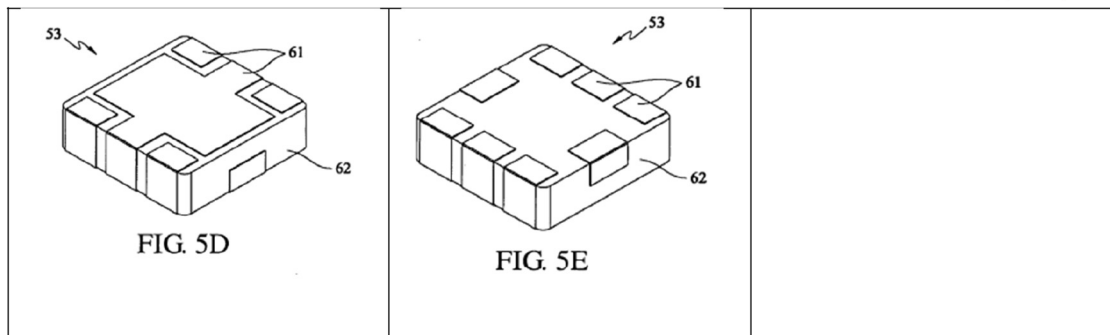
120. Therefore, Vinciarelli-664 is rooted with the idea of producing electronic modules *at scale*. Vinciarelli-664 confirms this by stating that “the contacts will be formed preferably before the panel is singulated to facilitate bulk

processing of common sized panels compared with individual modules of varying sizes and shapes.” *Vinciarelli-664*, 8:53-60. This is consistent with today’s efforts in electronic assembly production, where printed circuit boards are manufactured as larger panels to optimize production efficiency and reduce costs. In a process called panelization, multiple PCB layouts are combined into a single panel by tiling the individual designs to fit efficiently within a standard panel size (e.g., 18 by 24 inches). Subsequent steps such as photolithography, lamination, drilling, and plating benefit from repeatability of standard handling and tooling, as well as the economy of scale.

121. By contrast, Zeng-014 discloses a “a method to form the first conductive layer 61 on a body surface of the inductive component 62.” *Zeng-014*, [0062]-[0064]. Specifically, Zeng-014 discloses wrapping around one individual three-dimensional object to result in conductors located on multiple surfaces of the three-dimensional object. *Id.* FIGs. 5A-5E of Zeng-014 first depict a frame 51 that includes multiple conductors (i.e., portions of a first conductive layer 61). *Id.*, [0062], FIGs. 5A-5C. This frame has a wider area than a body surface of an individual electronic component (e.g., an inductor) that is to be wrapped with the conductors. *Id.*



122. As a result, the frame can be compressed onto the surface of the component, and the multiple conductors are bent and wrapped onto the side surfaces of the component. *Id.*; *see also id.*, FIGs. 5D-5E.



123. I initially note that an individual one of Vinciarelli-664's modules while still part of the panel cannot be wrapped around in a traditional or conventional sense. Prior to singulation, not all of the module's surfaces are exposed for contacts to be wrapped thereon. Therefore, wrapping must occur *after singulation* to access those sides of Vinciarelli-664's modules made accessible via the singulation, and wrapping would be performed individually, repeatedly, and specifically on each module. This is consistent with the Petition's and Dr. Baker's proposed combination. Petitioner and Dr. Baker specifically propose that "[i]n the

combination, a skilled artisan would modify the method of manufacture disclosed in Vinciarelli-664 to replace the process of cutting slots between the modules in the panel and filling the slots with conductive material, and instead apply the lead frame of Zeng-014 after the modules are *singulated*, and thus make the manufacturing process less sophisticated and more suitable for factories making prior art products.” Petition, 60-61; VICOR-1003, ¶144 (emphasis added).

124. I disagree that a POSITA would do so because the POSITA would recognize that Vinciarelli-664’s *bulk/scale production* and Zeng-014’s lead frame wrapping for *individual components* are inherently incompatible with one another. Modifying Vinciarelli-664’s bulk production to instead use individual frame wrapping makes the manufacturing process *significantly less operable and efficient* than its original design. In practice, wrapping a lead frame on a component takes effort, precision, and time to perform correctly. Performing lead frame wrapping on individual modules would create a bottleneck in Vinciarelli-664’s production process and could require a ten-fold or greater ramification of the production channel to handle singulated components for packaging. This is akin to the scale of integrated-circuit assembly plants (e.g., operated by Amkor), that maintain hundreds and hundreds of wire bonders and molding machines to process the bare dice that are processed as single wafers (i.e., together on one substrate) at the semiconductor fab. Manufacturing facilities that implement Petitioner’s and

Dr. Baker's combination would find it *counterproductive* and nearly impossible to keep up with the global market's demand. This would be much more costly as they at least would need to invest resources in scaling up their capabilities dramatically.

125. In fact, Vinciarelli-664 itself explicitly emphasizes how intrinsic and of critical importance bulk production is to its teachings. Vinciarelli-664 discloses:

The slots or holes, e.g. 160, 161, 162, 163, may preferably be cut vertically down, from a surface, e.g. top surface 102-1 or bottom surface 103-1 (not shown) of the encapsulated panel 150 along the cut-lines in the areas where *the contacts will be formed preferably before the panel is singulated to facilitate bulk processing of common sized panels compared with individual modules of varying sizes and shapes.*

Vinciarelli-664, 8:53-60 (emphasis added).

126. Replacing Vinciarelli-664's pre-singulation contact formation with a post-singulation contact formation based on Zeng-014's teachings would be a significant modification that conflicts with the purpose and preferences disclosed in Vinciarelli-664. A POSITA would not make a modification to a prior art reference when said modification would defeat the stated purpose of that prior art reference. Indeed, it would be physically impossible to wrap Vinciarelli-664's electronic module using a frame if those side surfaces are not exposed.

127. Dr. Baker seems to recognize this incompatibility but nonetheless supports the combination on the basis of newness of technology, but I continue to find a lack of motivation for a POSITA to combine the prior art references. Dr. Baker first acknowledges that Vinciarelli-664's process at scale is advantageous, as "there is no need to attach and bend contacts against the module after it is cut from the panel." VICOR-1003, ¶139.

128. Nonetheless Dr. Baker provides another alleged motivation in support of the proposed combination:

a skilled artisan would have been motivated to use such established manufacturing technologies which would lower the risk factors involved in the manufacturing process from using a newer technology (and of course, the skilled artisan would have been motivated to use new technology as well—both motivations exist and the deciding factor would be the available manufacturing equipment).

VICOR-1003, ¶144.

129. Dr. Baker says that some facilities lack the equipment to "reliably cut and metalize the slots in the panels" according to Vinciarelli-664's bulk production process. *Id.* Dr. Baker then states that the lead frame wrapping of Zeng-014 could then be used instead with available equipment so that facilities do not need to acquire new equipment to perform Vinciarelli-664's process. *Id.*, ¶¶ 140, 144. Dr. Baker also states that, by only relying on available equipment and avoiding new

equipment, facilities can “lower the risk factors involved in the manufacturing process from using a newer technology.” *Id.*

130. I do not believe that a POSITA would sacrifice the production output scale and efficiency that I mentioned above for the sake of using available manufacturing equipment. I also disagree with Dr. Baker’s reasoning of avoiding the need to obtain new equipment, because unless a facility is willing to accept a huge drop in production output, it would at the very least still need to acquire additional units of its existing equipment to maintain its production output.

131. For at least this reason, a POSITA would not be motivated to make the modification to Vinciarelli-664’s teachings to incorporate Zeng-014’s teachings, as Petitioner proposes.

(b) A POSITA would not remove necessary features of Vinciarelli-664’s manufacturing process without hindsight.

132. There are additional reasons why there is no proper motivation to combine Vinciarelli-664 and Zeng-014 as Petitioner proposes. A POSITA would need to consider realistic and practical complexities in Vinciarelli-664’s power level and module pin-outs, and the Petition’s silence of these considerations make the combination based on hindsight.

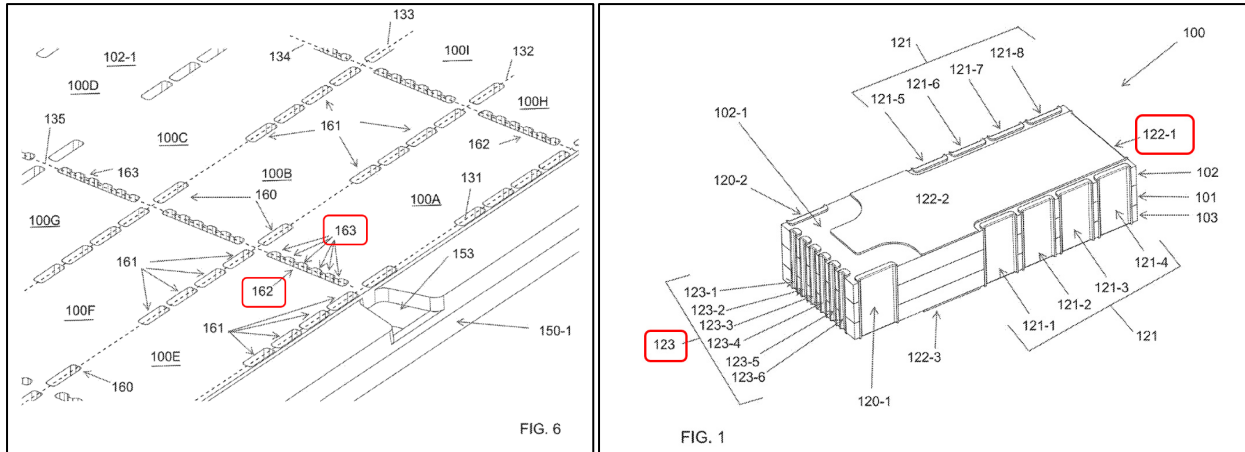
133. A POSITA would understand that the current level of the lead is proportional to its thickness. A thinner lead may be easier to bend, but would not

be unable to convey higher currents. For higher currents, thicker leads would be used, but those leads would have to be thicker. A POSITA would have understood that, with thicker leads, curving may cause damage to the body. Petitioner and Dr. Baker's analysis does not show or prove such manufacturing consideration analysis that a POSITA would consider when determining whether and how to make the combination of Vinciarelli-664 and Zeng-014. It is my understanding that hindsight should not be used to decide whether a claim is obvious. Without this analysis that a POSITA would undertake, it is my view that the purported combination is trivially assembled and hindsight-driven only for the purpose of reaching the claimed limitations.

134. The Petition appears to bypass other critical considerations that a POSITA would make in view of the differences between Vinciarelli-664's module contacts and Zeng-014's wrapped contacts. This bypassing by Petitioner makes the combination appear based only upon hindsight. Specifically, Vinciarelli-664's module is illustrated with seventeen contacts allocated in all four side walls. The particular lead frame wrapping shown in FIGs. 5A-5E of Zeng-014 results in three contacts on two opposing side walls. A POSITA would need to consider how to incorporate a much higher number of contacts in the lead frame, to determine the space between contacts, width/thickness of each contact, and more. The Petition and Dr. Baker's statements lack this type of analysis that a POSITA would

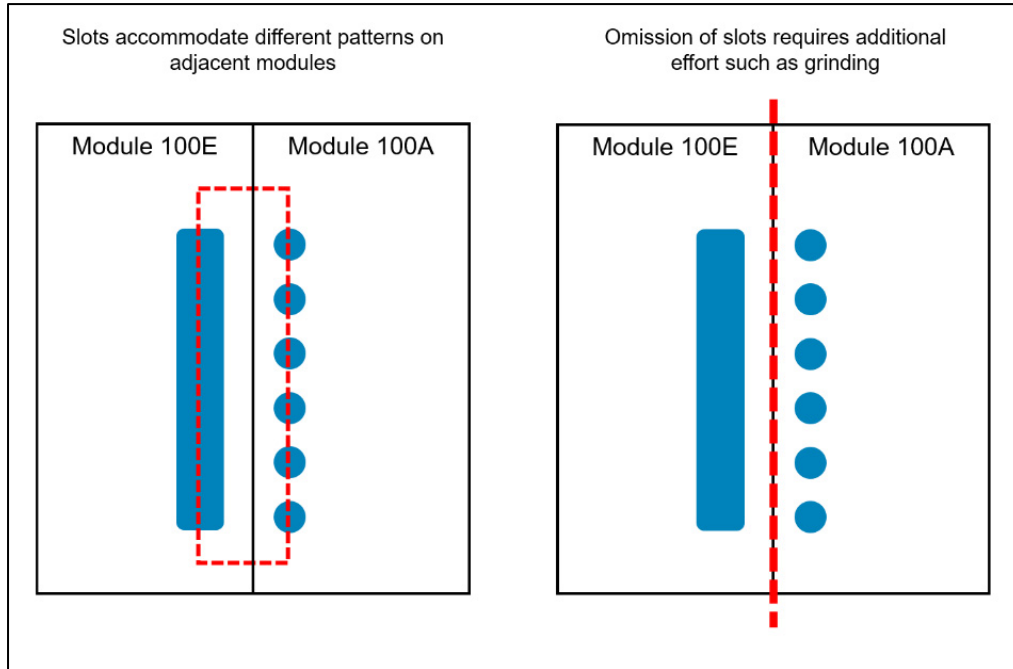
undergo. As such, in my view, the Petition does not suitably explain a POSITA's motivation to combine these two teachings, and the combination of Vinciarelli-664 and Zeng-014 is hindsight-driven for at least this reason.

135. Finally, a POSITA would not omit Vinciarelli-664's process of cutting and filling slots because those steps are a necessary cornerstone in the production of Vinciarelli-664's module. *See* Petition, 61 ("a skilled artisan would modify the method of manufacture disclosed in Vinciarelli-664 to replace the process of cutting slots between the modules in the panel and filling the slots with conductive material"). Each one of Vinciarelli-664's slots is a gap that is cut to expose and form different contact patterns on each of the neighboring modules. For instance, the slot openings 163 and 162 in Vinciarelli-664's FIG. 6 are not symmetrical and are advantageous in revealing and guaranteeing the position of different patterned contacts. That is, adjacent contacts in neighboring modules in the panel may have completely different functions and sizes (e.g., compare contacts 123 and contact 122-1 in Vinciarelli-664's FIG. 1) that need to be isolate and revealed to form contacts therewith.



Annotated Figures 1 and 6 of Vinciarelli-664

136. A POSITA would have understood that replacing these slot-based processes is a clear step backwards. For instance, without the slots, additional process such as grinding would be necessary in order to reveal the correct portions along the perimeter edges of the modules so that lead frame contacts could be wrapped in the right place. This is demonstrated in the below diagram, which approximately corresponds to a top-down view of the boundary between modules 100E and 100A in FIG. 6. The large blue area in module 100E represents the contact 122-2 for module 100E, while the individual blue areas in module 100A represents the contacts as 123 for module 100A, consistent with FIG. 1.



Diagrams related to slot openings 162, 163 in Figure 6 of Vinciarelli-664

137. My example diagram above left demonstrates that a POSITA would understand the criticality of Vinciarelli-664's slot cutting to the rest of Vinciarelli-664's teachings. As demonstrated in Vinciarelli-664's FIG. 6, the slot that is cut can be asymmetrical to reveal and expose different contact patterns on adjacent or neighboring modules. Furthermore, the slot width and/or shape can be particularly configured to easily expose a maximum interconnect area. For example, my example diagram above shows the right edge of the slot cut (red dashed rectangle) passing through the maximum diameter of each circular interconnect areas in module 100A. If the right edge of the slot cut was shifted to the left or right, less than the maximum diameter of the circular interconnect areas in module 100A would be exposed.

138. My diagram above also demonstrates that simply cutting along the boundaries of modules in the panel would not fulfill the goal of exposing interconnects for contacts to be formed therewith. Without slots and with only a straight cut along the boundary, additional processes such as grinding down the module sidewall are needed to reveal the interconnect areas. Further, the grinding would have to be precisely performed to expose the maximum interconnect area or the interconnect areas would have to be enlarged. However, if enlarging the interconnect areas, more PCB area is heavily occupied, thus reducing power density. A POSITA would see these as significant challenges resulting from only cutting straight along module boundaries and not cutting slots.

139. Therefore, a POSITA would understand that the cutting and filling of slots between adjacent and neighboring modules in the panel has a specific central purpose to Vinciarelli-664's method of manufacture. Because of this, a POSITA would not consider the cutting and filling of slots in Vinciarelli-664's method to be easily replaceable simply with Zeng-014's lead frame wrapping, as Petitioner describes.

140. Therefore, for at least each of these reasons discussed above, a POSITA would not have been motivated to combine Vinciarelli-664 and Zeng-014.

iii. The combination does not disclose [1g]’s structure.

141. It is my opinion that the Petition’s proposed combination does not meet the structure associated with [1g]. As stated above, this structure provides a mechanical support to the first connection part by the first electronic component and the first connection part being fixed at the first electronic component.

142. In the Petition’s proposed combination, Zeng-014’s lead frame contacts are wrapped around Vinciarelli-664’s modules. VICOR-1003, ¶147. However, I have found no indication in the Petition or by Dr. Baker that there is mechanical support to the Zeng-014’s lead frame contacts by any component of a wrapped module. I also have found no indication that Zeng-014’s lead frame contacts are fixed at the first electronic component.

143. To the contrary, Dr. Baker’s description of this proposed combination seems to point away from this structure. Dr. Baker indicates that, in the proposed combination, “[t]he components may have different heights and therefore some components will have more encapsulant over them that [sic] other components, or no encapsulant at all.” VICOR-1003, ¶147. Dr. Baker therefore describes that a contact may be *separated from a component by some amount of encapsulant*. This separation is a different structure than mechanical supporting and attaching the component to the contact. Therefore, it is my opinion that the proposed

combination of Vinciarelli-664 and Zeng-014 does not have the same structure associated with or resulting from [1g].

B. Ground 2 Does Not Show Unpatentability of the Claims.

a. Ground 2 Does Not Teach [1f].

144. Petitioner’s Ground 2 is based upon a combination of Vinciarelli-218 and Zeng-014. According to Petitioner, a POSITA would modify a module disclosed in Vinciarelli-218 by performing Zeng-014’s lead frame wrapping on it. Petition, 73. It is my opinion that Ground 2 does not show that [1f] is met.

145. I have reviewed Vinciarelli-218 and find no explicit discussion of carrier thickness. The Petition seems to rely upon two teachings within two teachings in Vinciarelli-218. The first is FIG. 34, and the second is a discussion of “Symmetrical Distribution Between PCB Surfaces.” Neither teaches [1f], as I explain below.

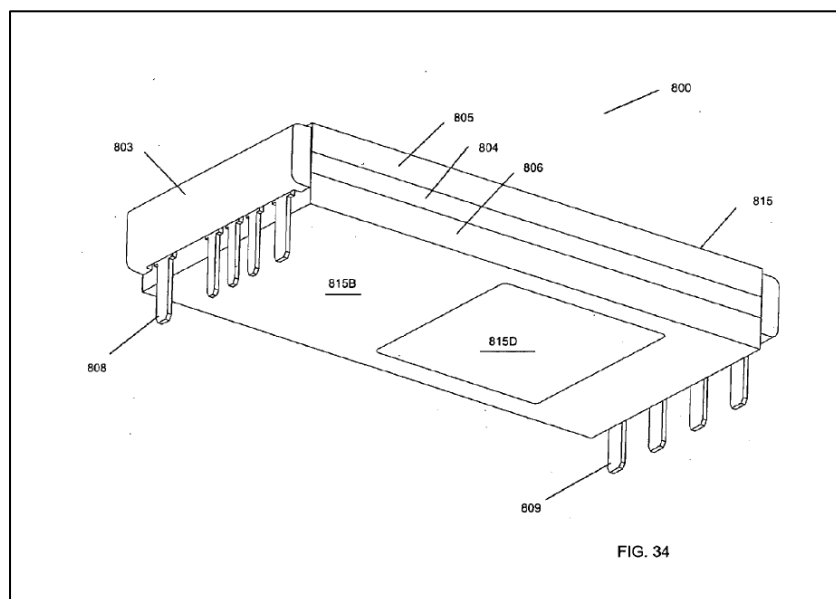


Figure 34 of Vinciarelli-218

146. First, I understand that patent figures are not drawn to scale. I have not found any description within Vinciarelli-218 that describes the dimensions or sizes of the components shown in FIG. 34. Therefore, it is not evident whether or not the carrier 804 shown in FIG. 34 is disposed within the claimed height range or extends outside the claimed height range. For instance, while the carrier 804 is sandwiched between two layers, it cannot be determined *where exactly* it is located at.

147. Second, Vinciarelli-218's description of component symmetry does not meet [1f] because it does not teach carrier thickness. The component symmetry taught by Vinciarelli-218 mirrors the components on one side of the PCB to the other side of the PCB. *Vinciarelli-218*, [0147]-[0148]. At a given point along the horizontal plane of the PCB, the component mounted above and the component mounted below may have approximately the same individual thickness due to being the same component (*e.g.*, the same capacitor).

148. At best, component symmetry may imply a component thickness ratio of exactly one. That is, different units of the same component do not necessarily have the same thickness, and in my view, a preference for the same component at a mirrored point is not necessarily a preference for any relationship of component thicknesses at that mirrored point. Nonetheless, Vinciarelli-218 does not

incorporate this component symmetry requirement with anything else, and it appears that component symmetry is a unilateral factor for Vinciarelli-218's power converter design.

149. As I discussed previously, [1f] incorporates a carrier thickness and component thickness ratio, and without a constraint on carrier thickness, [1f] is not met. Here, Vinciarelli-218's discussion of component symmetry lacks any specific discussion of carrier thickness. Despite discussing symmetric components, I do not find any parameters, dimensions, or sizes from which a meaningful teaching related to carrier thickness can be derived. It cannot be determined whether or *not* the PCB between symmetric components is disposed at 1/3 to 2/3 of the power converter's height or outside of that range.

150. Therefore, it is my opinion that Vinciarelli-218 does not teach [1f].

151. I also note Dr. Baker's incorrect conclusion continues here. As I stated previously, it is incorrect that "[a] centered printed circuit board with components on both sides would meet this height requirement." This is because [1f] incorporates a carrier thickness requirement, and a centered printed circuit board does not relate to carrier thickness.

152. Dr. Baker's error can be demonstrated in the drawing below. As shown below, a PCB is centered or halfway in the converter's height, but extends

well past the claimed $1/3$ to $2/3$ height range (shaded in green) below the $1/3$ height (in red) and above the $2/3$ height (in blue).

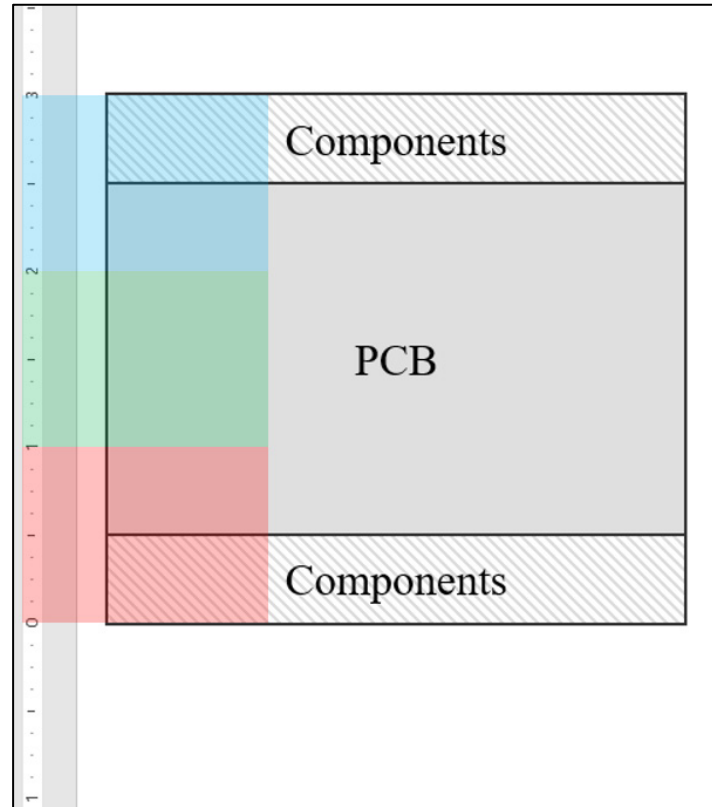


Diagram demonstrating Dr. Baker's error with [1f]

153. Moreover, it is my opinion that Dr. Baker does not establish any actual motivations for a POSITA to reach [1f]. Dr. Baker states “There are *only a finite* number of possible placements. . . . When there are components on both sides of the board, the board would generally be in the middle and *more often than not* would fall within the claimed range.” VICOR-1003, ¶175 (emphasis added). It is my opinion that this is not a scientific or rigorous conclusion. In particular, given the lack of prior art teaching of PCB thickness, Dr. Baker is actually

incorrect: there are an infinite number of possible carrier configurations, including a 2/3 thick PCB, a 5/12 thick PCB, a 6/15 thick PCB, and so on, none of which satisfy [1f]. Therefore, this statement by Dr. Baker is also flawed.

154. Here, the Petition appears to only state that Vinciarelli-218 discloses a centered PCB, consistent with Dr. Baker's incorrect conclusions. *See* Petition, 78-80. The Petition does not supplement these incorrect conclusions with a consideration of carrier thickness. It is therefore my opinion that the Petition has not shown that [1f] is met.

b. Ground 2 Does Not Teach [1g]'s Structure.

155. It is my opinion that Ground 2's prior art combination does not meet the structure associated with [1g]. As stated above, this structure includes the first connection part being fixed at the first electronic component.

156. In the Petition's proposed combination, Zeng-014's lead frame wrapping process is applied to Vinciarelli-218's module, and this involves curving a lead frame contact against Vinciarelli-218's module. Petition, 80. However, I have found no indication in the Petition or by Dr. Baker that this proposed combination results in mechanically supporting the curved lead frame contact with a component of Vinciarelli-218's module, or in the curved lead frame contact being fixed at the component. Therefore, I have the opinion that the prior art combination does not meet the structure associated with [1g].

c. A POSITA Would Not Be Motivated to Combine Vinciarelli-218 and Zeng-014.

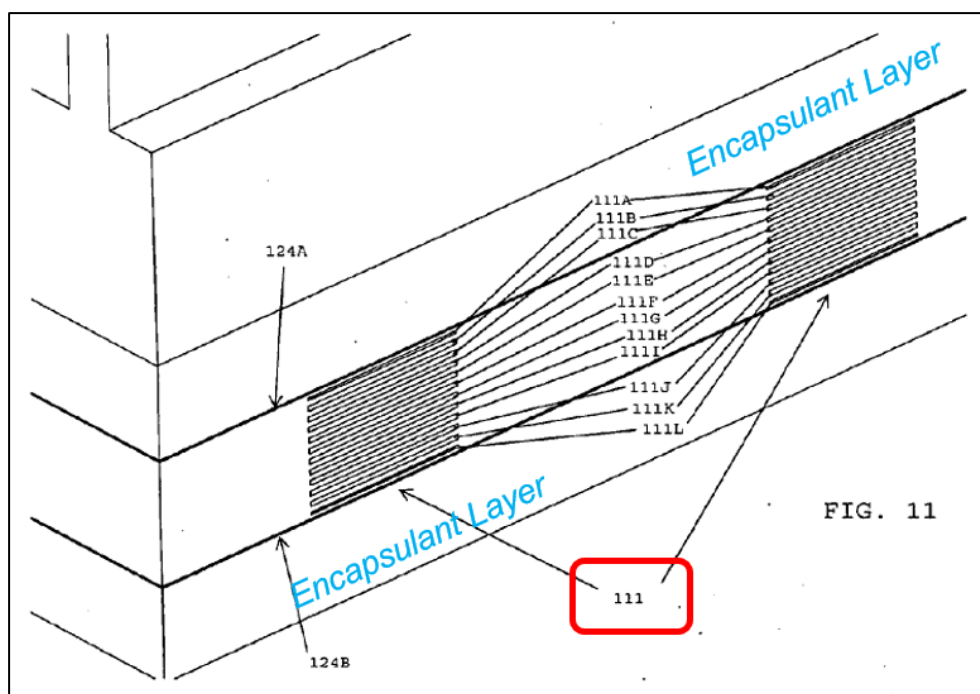
157. It is my opinion that a POSITA would not be motivated to combine Vinciarelli-218 and Zeng-014. First, it is my opinion that a POSITA would not be motivated to turn to Zeng-014's lead frame wrapping in light of Vinciarelli-218's own adapter solutions. Second, I have reviewed the Petition's motivation reasoning and find that it is contradictory.

i. A POSITA would not incorporate Zeng-014's lead frame wrapping due to Vinciarelli-218's existing adapter solutions without hindsight.

158. A POSITA would view Zeng-014's teachings as an inferior alternative to solutions already described in Vinciarelli-218. In particular, a POSITA would consider Zeng-014's lead frame wrapping to be infeasible for contacting PCB side edge "bar codes," compared to Vinciarelli-218's adapters specially suited for that purpose.

159. Vinciarelli-218 discloses a need to connect to interconnection features that are disposed on the side edges of a module's PCB ("bar codes") and exposed through panel singulation. The interconnection features have a limited footprint due to encapsulation and panel singulation. The interconnection features are *not on the upper/lower surfaces* of the PCB panel because they would be covered by the encapsulant. Therefore, the interconnection features are necessarily located along the side surfaces/edges of the PCB, which are relatively small. Vinciarelli-

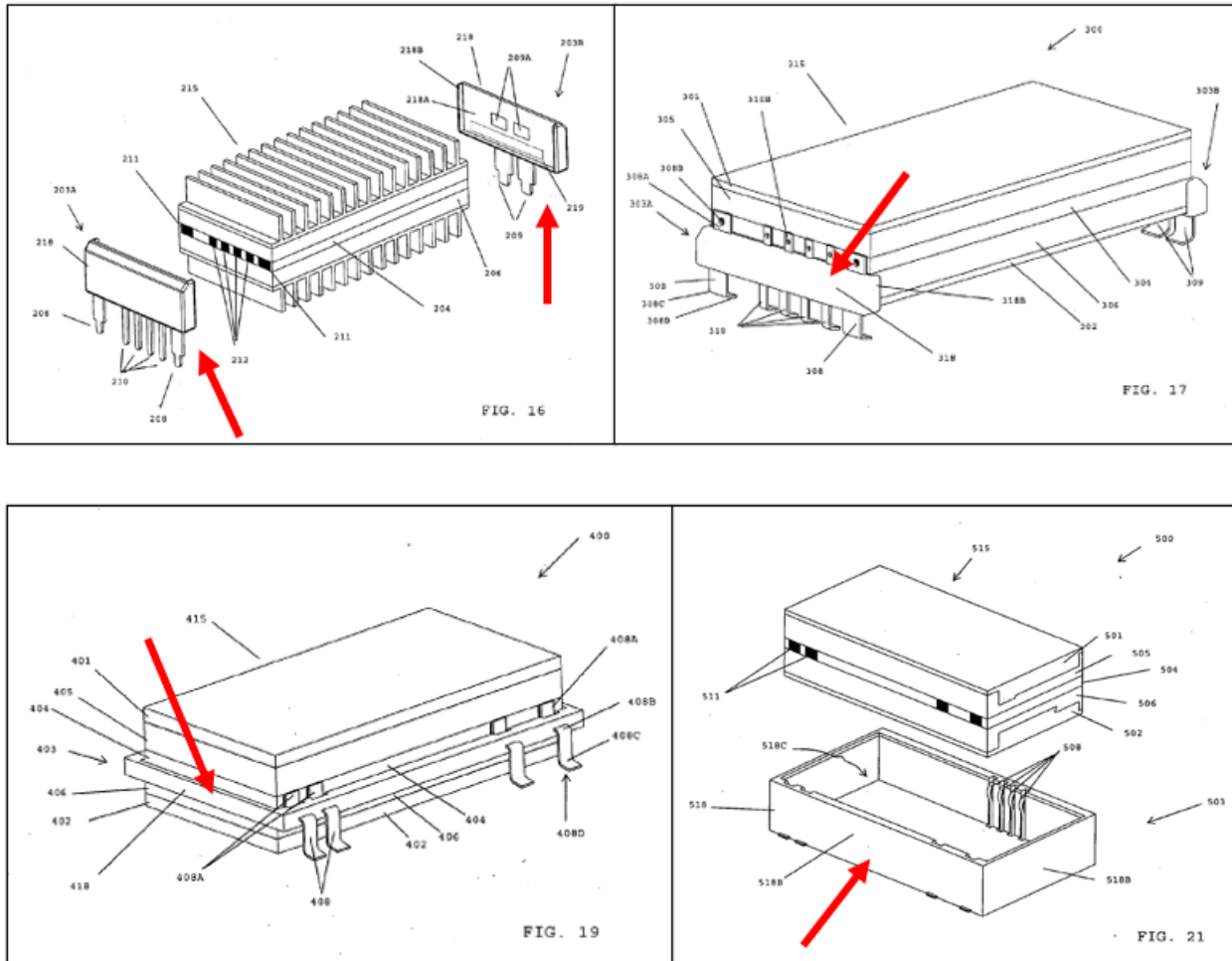
218 states that these interconnection features “may be embedded in the PCB panel
124, *preferably along the boundaries* of the individual circuits” and are exposed
on the PCB side edges when a module is singulated from the panel. *Vinciarelli-*
218, [0107]. Specifically, these interconnection features are described as “bar
codes”, with multiple conductive strips arranged vertically along the *edges* of the
PCB. *Id.*, [0108], FIG. 11 (reproduced below with annotation).

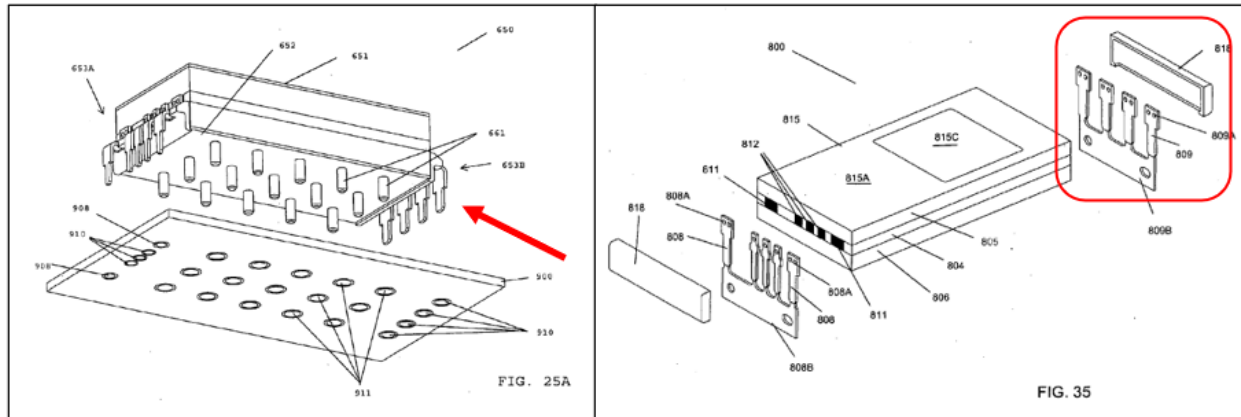


Annotated Figure 11 of Vinciarelli-218

160. A POSITA would initially view the small footprint of these bar codes as a potential problem. However, a POSITA would find the solutions to this potential problem later on in Vinciarelli-218. Vinciarelli-218's disclosure provides "various types of connectors or adapters [that] may be coupled to the exposed interconnects . . . at the edges of the singulated module." *See Vinciarelli-*

218, [0160]; *see also id.*, [0112]-[0133], FIGs. 13-26, 35 (selectively reproduced below with annotation).





Annotated Figures 16, 17, 19, 21, 25A, and 35 of Vinciarelli-218

161. For example, the Horizontal Through-Hole Mount adapter shown in FIG. 16 (see above) includes “exposed areas [of two power terminals that] align with their respective interconnects when the adapters 203A, 203B are assembled onto the module 215.” *Id.*, [0116]. As another example, the Surface-Mount Lead Frame includes a frame body that “leave[s] a portion of the terminals exposed for making connections to their interconnects during assembly and for post assembly inspection.” *Id.*, [0124]. In heat-sink-less embodiments (FIGs. 33-35), adapters 803A, 803B are attached to the horizontal ends of the module where the bar codes are exposed. *Id.*, [0158]-[0160], FIGs. 33-35. Vinciarelli-218 discloses that one of these adapter units can be assembled forming an adapter body to terminals provided on a lead frame, which is removed after assembly. *Id.*

162. A POSITA would readily appreciate that the wide variety of these adapters are well-suited for providing electrical contact to the small bar codes,

while also providing versatility to different customer needs. *See id.*, [0132]. It is my opinion that a POSITA reading Vinciarelli-218 would readily recognize these adapters as the solution to the earlier concerns of small bar codes.

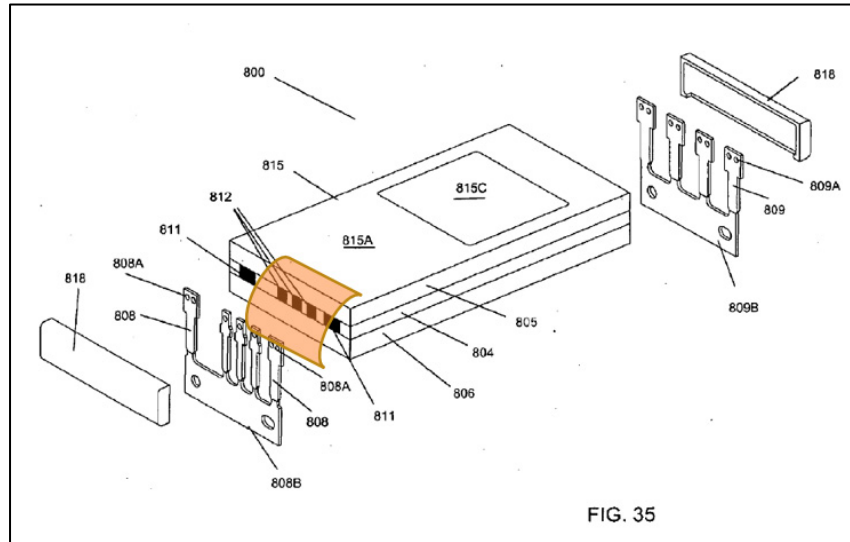
163. The Petition’s proposed combination appears to use Zeng-014’s lead frame wrapping as a solution for connecting to the small bar codes of Vinciarelli-218’s module. Petition, 74. The Petition states that “[t]he skilled artisan would recognize that the conductive layer 61 would provide contacts to the interconnects and that the conductive layer and interconnects would each be adjusted as necessary to make the desired electrical contacts.” *Id.* It is my opinion that a POSITA would not do so ***unless driven by hindsight***, given Vinciarelli-218’s disclosure of the adapters (identified above) and the likely electrical failures resulting from the combination (explained below).

164. Petitioner states that the combination is based upon “applying Zeng-014’s lead frame to the module of Vinciarelli-218 and curving the contacts against the module such that the modules form a unitary structure with contact surfaces on the top, bottom, and sides of the module, as taught by Zeng-014.” Petition, 73. Petitioner further explains that “the lead frame in Zeng-014 . . . would be curved over module 800 from the bottom to the top” to replace Vinciarelli-218’s adapters. Petition, 73-74.

165. It is unclear whether Petitioner specifically proposes that Zeng-014's lead frame wrapping is used in addition to the adaptors incorporated in each of Vinciarelli-218's embodiments, or whether Zeng-014's lead frame wrapping is to replace the adaptors in each Vinciarelli-218 embodiment. If it is the former, Petitioner does not explain how Zeng-014's contacts can be incorporated with the adaptors. For instance, are Zeng-014's contacts first wrapped and then the adaptors pressed onto the contacts? There is no motivation that is explained for making such combinations. If it is the latter, then it appears that the combination is driven by hindsight, due to the Petitioner omitting certain important technical features in Vinciarelli-218 for different technical features in Zeng-014. As further explained below, there is no motivation for a skilled artisan to replace Vinciarelli-218's adaptors with Zeng-014's contacts.

166. In particular, a reasonable POSITA would immediately recognize that curving and wrapping a lead frame onto Vinciarelli-218's module as prescribed by Petitioner would fail to *reliably establish and maintain electrical contact with* the bar code interconnects. The portions of the lead frame bent from the bottom (or top) onto the Vinciarelli-218's FIG. 35 module's side surface would retain a degree of bow and bend. Thus, a contact bent onto a module sidewall would not be flush against the module sidewall. From this bowing and bending, there would be a significant gap between the lead frame contact and the side edge bar codes, and it

would be difficult to establish an electrical contact between a curved contact and a bar code interconnect. This bending and bowing is demonstrated in the annotated figures below.



Annotated Figure 35 of Vinciarelli-218

167. The bending or bowing is a first obstacle to using wrapped/curved lead frame contacts to contact the bar code interconnects. It is my opinion that this is sufficient to deter a POSITA from forming the combination proposed by the Petition. A POSITA would avoid these bending/bowing problems and stick with Vinciarelli-218's own adapters.

168. Even assuming a POSITA would still attempt to use a curved and bowed contact to contact the bar code interconnects, a POSITA would encounter more problems with conductive filler material. Solder, for instance, wets to metal regions (called "pads") where the solder can form a fillet to ensure a stable and

reliable electrical connection. No such pad is present in the Vinciarelli-218's bar codes, which consist of metal-layer edges and interdigitated (non-wetting) substrate. Using conductive epoxy, neither Vinciarelli-218 or Zeng-014 elucidate how such an epoxy could be applied, formed or cured, while simultaneously bending Zeng-014's lead frame into place. A POSITA would have no motivation or expectation of success in deviating from the methods, already explained in Vinciarelli-218, for forming connections to the bar codes.

169. Therefore, it is my opinion that a POSITA would recognize that lead frame wrapping is not particularly well-suited for targeting Vinciarelli-218's bar codes.

170. A POSITA would also understand that the current level of the lead is proportional to its thickness. A thinner lead may be easier to bend, but would not be unable to convey higher currents. For higher currents, thicker leads would be used, but those leads would have to be thicker. A POSITA would have understood that, with thicker leads, curving may cause damage to the body. Petitioner and Dr. Baker's analysis does not show or prove such manufacturing consideration analysis that a POSITA would consider when determining whether and how to make the combination of Vinciarelli-218 and Zeng-014. It is my understanding that hindsight should not be used to decide whether a claim is obvious. Without

this analysis that a POSITA would undertake, it is my view that the combination is hindsight-driven only for the purpose of reaching the claimed limitations.

171. Furthermore, Vinciarelli-218's own adapters/connectors do not suffer from such bowing and imprecision that a POSITA would consider as a possible result of applying the lead frame wrapping. None of Vinciarelli-218's adapter/connectors rely upon wrapping, curving, or bending, and can be directly applied onto the side edge bar codes. For instance, the adapters 803A, 803B having terminal portions formed from a lead frame are directly attached or pressed to a heat-sink-less module's side edge bar codes. *Vinciarelli-218*, [0160], FIG. 35. By being attachable directly at the location of side edge bar codes, it is my opinion that Vinciarelli-218's own adapters/connectors are superior in establishing and maintaining electrical connection than the proposed application of Zeng-014's lead frame wrapping.

172. In my opinion, this expected failure is sufficient for a POSITA to not be motivated to apply Zeng-014 to Vinciarelli-218.

ii. None of Petitioner's reasons to combine are supported.

173. I have also reviewed Petitioner's stated reasons for combining Vinciarelli-218 and Zeng-014. I believe that those reasons are inconsistent and conflict with one another.

174. The Petition first argues that Vinciarelli-218's encapsulated embodiment would have Zeng-014's lead frames to "provide a compact surface mount version of the module." Petition, 71. This combination, however, would lead to the exact opposite result. Placing lead frames atop (and below) Vinciarelli-218's embodiment increases size, not decreases it. Moreover, the only reason to have conductors both on top and bottom is to allow stacked modules. Stacked modules (i.e., one Vinciarelli-218 module on top of another) also increases overall vertical size.

175. The Petition's second and third reasons both contradict the motivation to decrease size, because they involve stacking devices and adding connection parts, which increases overall size and footprint. *See* Petition, 72.

176. Petitioner's fourth reason that a POSITA would have made the combination also lacks any support. It is simply an argument based on Zeng-014's broad and generic statement that it applies to other electronic components. The Petitioner and Dr. Baker did not provide any specific reason that a POSITA would select Vinciarelli-218 to combine from indefinite number of electronic components.

177. Additionally, Petitioner's fifth reason generically refers to increased power density and decreasing area but it is not clear how the combination achieves these improvements. These improvements generally concern space savings, but

appear to be at odds with the increase in vertical footprint through extra lead-frames atop and on the bottom of the structure, and the stacking of devices.

178. As described above a POSITA would not have had a reasonable expectation of success as claimed by Petitioner (Petition, 74) due to warping and soldering issues. This is explained in more detail below.

179. Petitioner does not answer the question regarding why a POSITA would modify Vinciarelli-218 to add conductors atop it. Doing so goes against Vinciarelli-218's other teachings. For example, Petitioner does not explain how the added conductors would be incorporated and integrated with the adaptors already included in each of Vinciarelli-218's embodiments. Vinciarelli-218 also describes making its devices compatible with heating dissipation, *i.e.*, via heatsinks. *Vinciarelli-218*, [0082], FIG. 1. Vinciarelli-218 does have a singular embodiment lacking a heatsink (*Vinciarelli-218*, [0159]-[0160]) but a POSITA would not have read it outside of the context of the rest of the patent which is directed to heat dissipation. A POSITA would not view an embodiment of Vinciarelli-218 lacking a heatsink as being one that does not dissipate heat. Every other embodiment is directed to heat dissipation, and making one of those devices stackable via conductors on top, would cause heat to get trapped on the lower devices. *See Vinciarelli-218*, FIGs. 1-4, 6-10B, 12, 15-16, 25-26, and 28. A POSITA would not have made that combination.

180. Therefore, it is my opinion that the Petition does not include an actual motivation for a POSITA to apply Zeng-014 to Vinciarelli-218.

C. Ground 3 Does Not Show Unpatentability of the Claims.

a. Ground 3 Does Not Teach [1f].

181. Ground 3 appears to rely upon Vinciarelli-218 for teaching [1f] and incorporates that teaching into Zeng-014. Petition, 90-92. In particular, Ground 3 shows FIG. 6 of Vinciarelli-218, which it states includes a PCB at 1/2 of the height of the power converter.

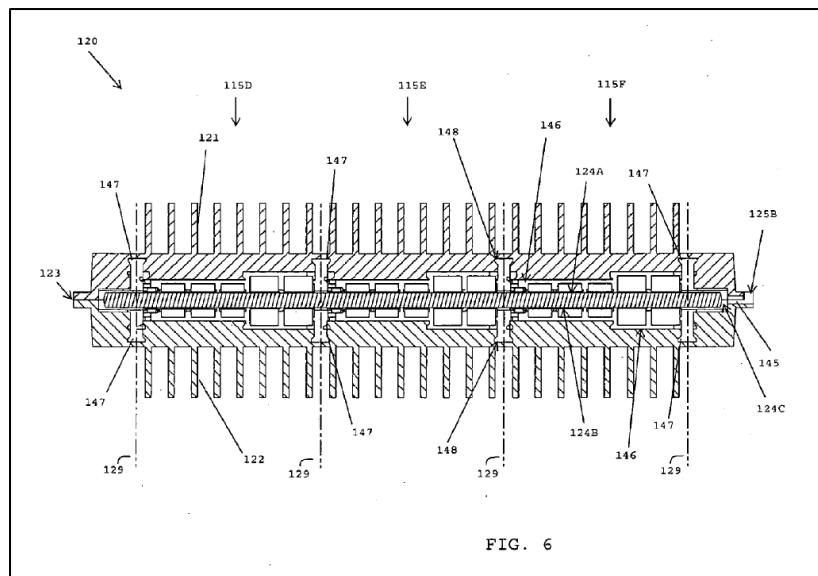
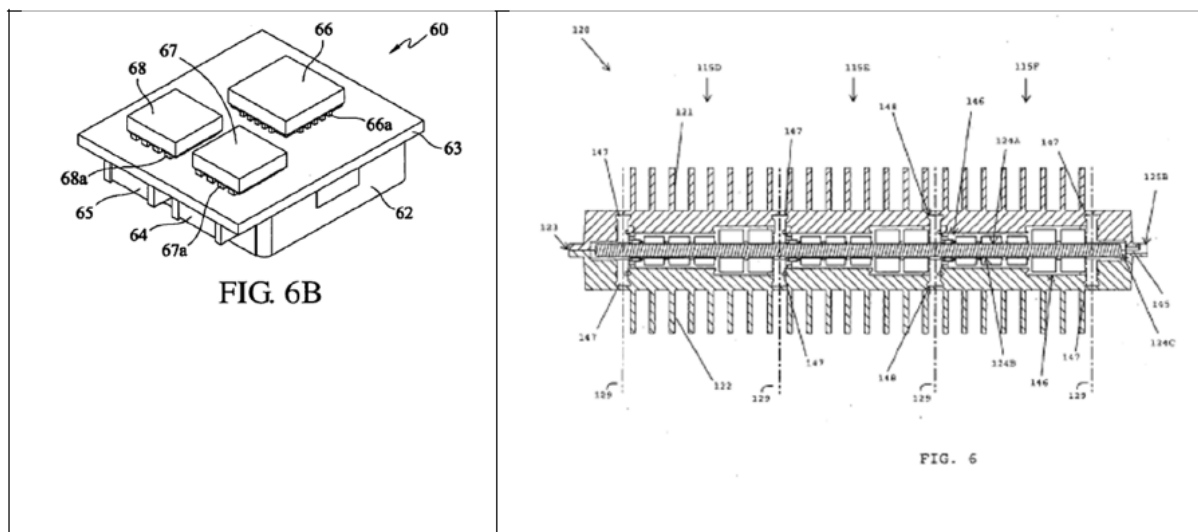


Figure 6 of Vinciarelli-218

182. As I have opined above, a PCB merely occupying a center region of the PCB does not meet [1f]. Without carrier thickness, it cannot be determined whether a PCB (occupying the center or not) is disposed within the claimed height range or extends outside of the claimed height range.

183. I have not found this discussion of carrier thickness in Vinciarelli-218, and as such, Ground 3's combination does not meet [1f]. First, I note that FIG. 6 is not considered to be drawn to scale, and therefore, carrier thickness information cannot be determined from FIG. 6. Second, Vinciarelli-218's discussion of symmetrical components also has no teaching of carrier thickness, as I found previously.

184. It is also my opinion that Petitioner's prior art combination is flawed. Petitioner argues that a POSITA would have modified Zeng-014 to have its assembly and carrier to be exactly sized as depicted in Vinciarelli-218's FIG. 6. The Petition describes going "from the form factor on the left below to the form factor on the right" (referring to a side-by-side view of Zeng-014's FIG. 6B and Vinciarelli-218's FIG. 6, reproduced here). Petition, 92. Accordingly, Petitioner's prior art combination primarily revolves around form factor considerations.



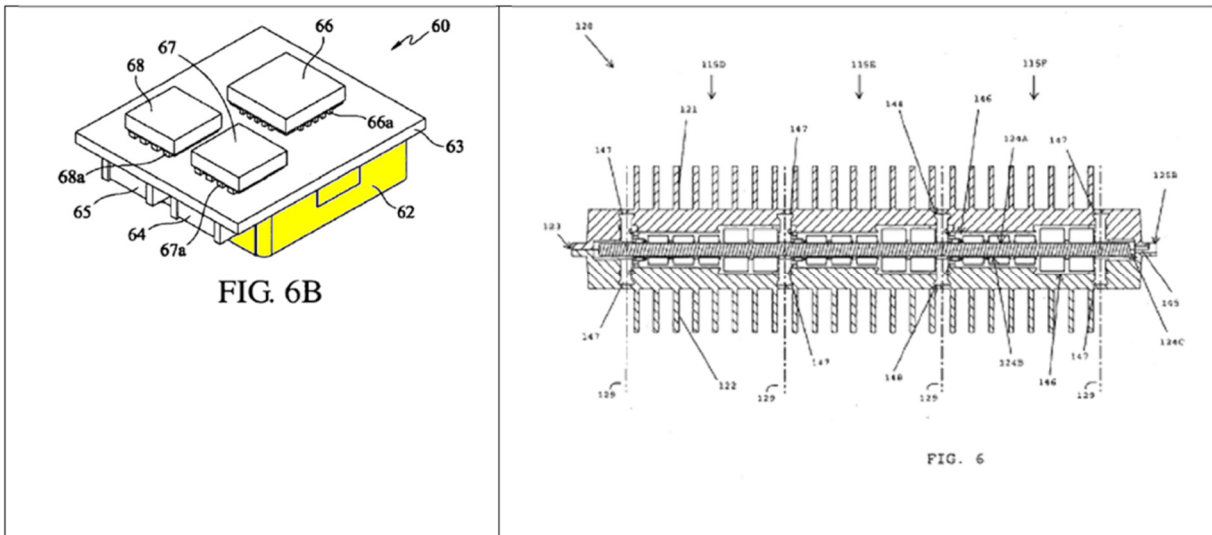
Side-by-side view of Zeng-014's FIG. 6B and Vinciarelli-218's FIG. 6**(Petition, 92)**

185. Petitioner's prior art combination appears to assume two things: (i) Vinciarelli-218's FIG. 6 meets [1f], and (ii) a modified Zeng-014 would automatically meet [1f] accordingly. As discussed above, the first assumption is wrong.

186. The second assumption is also wrong. The Petition does not show that Zeng-014's assembly modified to be encapsulated according to Vinciarelli-218's FIG. 6 would meet [1f]. Petitioner states that the modification by a POSITA revolves around form factor, but these aspects of packaging and form factor are purely external aspects of a power converter and are irrelevant to the positioning and thickness of the PCB that is internal within the power converter. Adding encapsulant on and around Zeng-014's converter would not bring or move the carrier in Zeng-014's converter into the claimed 1/3 to 2/3 height range.

187. For instance, consider the sizing of Zeng-014's components and principally component 62 (annotated yellow) which Petitioner uses heavily for all other limitations relating to the first component. *See* Petition, 89-90 ([1g]), 88-89 ([1c]), 88 (1[b]). There is no indication in Zeng-014 that these components sizings and the carrier thickness places the carrier in the claimed height range. To that point, it is my view that Petitioner does not dispute this, because Petitioner only

relies upon Vinciarelli-218. However, adding Vinciarelli-218's encapsulant on Zeng-014's assembly does not suddenly push the carrier from outside the claimed height range and into the claimed height range. That is, encapsulating Zeng-014's power converter to change its overall form factor or silhouette does not change the sizes of the converter's components nor the thickness of the converter's carrier.



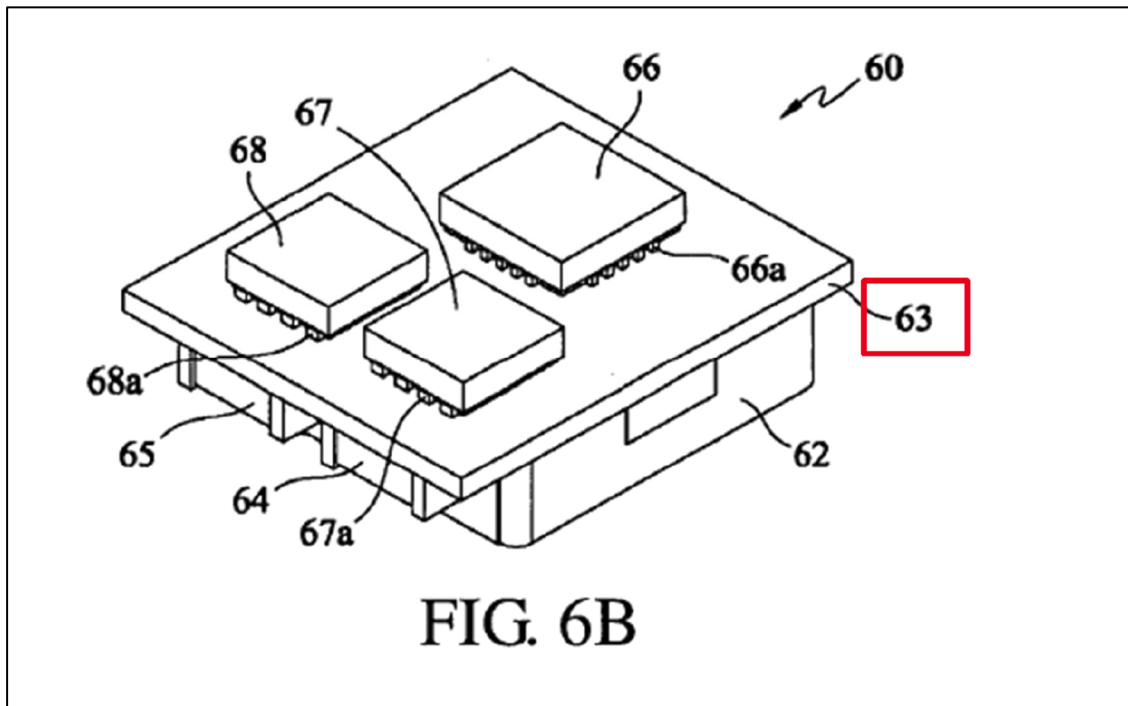
Annotated Figure 6B of Zeng-014 (left) and Figure 6 of Vinciarelli-218 (right)

188. As a result, it is my opinion that Ground 3 does not show that [1f] is met.

b. No Proper Motivation to Combine Zeng-014 and Vinciarelli-218 Is Presented.

189. It is my opinion that a POSITA would not apply Vinciarelli-218 to Zeng-014. Doing so would render key aspects of Zeng-014 *inoperable* and would otherwise require hindsight.

190. The Petition begins with Zeng-014's disclosure of a power converter assembly. Petition, 86-87. Zeng-014 discloses that this power converter, or a "DC to DC converter," includes a carrier that supports electronic components, and these components can include inductors, control chips, capacitors, and transistors. *E.g.*, *Zeng-014*, [0085], FIG. 6B (reproduced below).



191. Zeng-014's teachings relating to wrapping surface conductors onto components apply to this power converter assembly. *Zeng-014*, [0068]-[0069]. That is, each of the components in the power converter, including but not limited to the inductive component 62, can include surface conductors. *Id.*, [0067]-[0071], FIG. 6B (shown above). Because of the disclosed benefits of using wrapped

surface conductors, it is my opinion that a POSITA would likely wrap surface conductors on as many components within the assembly as possible.

192. The Petition then proposes adding encapsulation onto Zeng-014's assembly in the spirit of Vinciarelli-218, for the purpose of making Zeng-014's assembly cuboid shaped. Petition, 87. Indeed, Vinciarelli-218 includes disclosure of adding encapsulant for an assembly based on enclosing the assembly in mold or heat sink panels and injecting the encapsulant. The Petition states, "Vinciarelli-218 discloses an improvement to such a module *by encapsulating the components to make a cuboid shaped module* that provide [sic] ease of manufacturing, produce a multiplicity of modules at a time, and that may be of a small size and surface mounted to a customer board." *Id.*, 91 (emphasis added). Accordingly, the Petition seems to rely on form factor allegedly being the POSITA's motivation. *See id.* The Petition presents the following figures from Zeng-014 and Vinciarelli-218 respectively in support of its alleged combination (Vinciarelli-218's encapsulant that "make[s] a cuboid shaped module" being annotated in blue). *Id.*, 92.

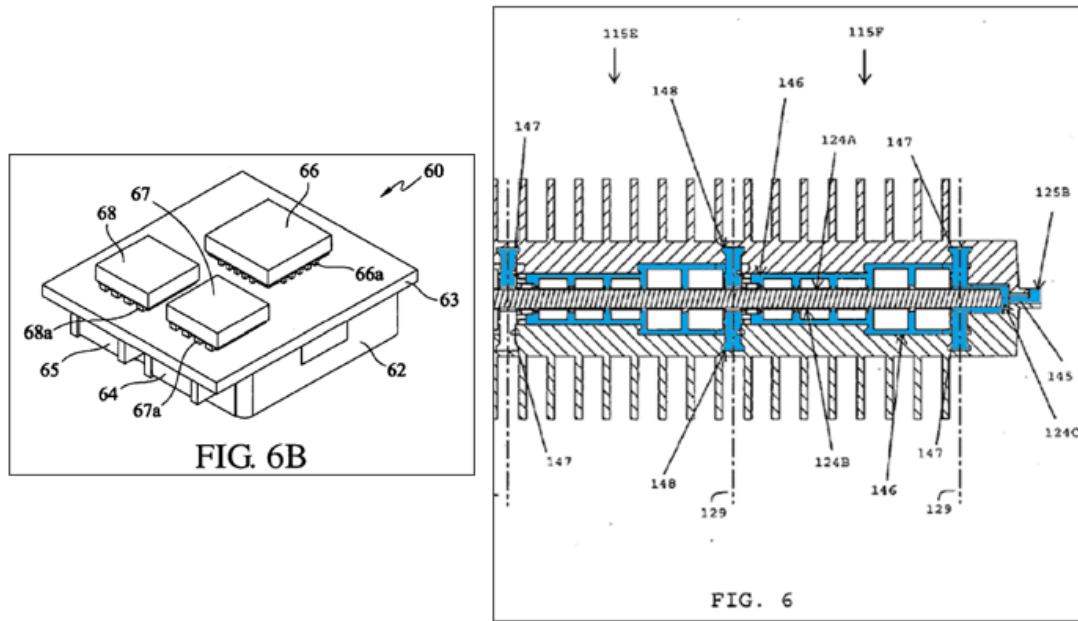


Figure 6B of Zeng-014 (left) and Annotated Figure 6 of Vinciarelli-218 (right)

193. I disagree with this proposed motivation because it is counter-productive and not credible. A POSITA would recognize that making Zeng-014's assembly cuboid-shaped using encapsulant would lead to over-molding, burying, and covering of the assembly components. While Vinciarelli-218 does disclose some cuboid-shaping encapsulation that leaves an exposed core surface, a POSITA would understand that every other assembly component with a shorter height than the exposed core is fully buried underneath the encapsulant. Assemblies such as those in Zeng-014 and Vinciarelli-218 typically include various different components (e.g., "inductors, control chips, capacitors, and transistors") having different heights.

194. Surface conductors of buried assembly components are inoperable. If a surface conductor of an assembly component is buried under encapsulant, then nothing can contact the surface conductor to fulfill its purpose in forming electrical connections. For instance, Zeng-014 discloses another electronic component “stack[ing] on and [being] electrically connected to [a wrapped] inductive component,” but this becomes impossible if the wrapped inductive component is buried under encapsulant. *See, e.g., Zeng-014*, [0013].

195. Given my opinion that a POSITA would not be motivated to form the proposed combination, I further believe that the Petition’s reasoning appears like hindsight. The Petition appears to identify Vinciarelli-218’s PCB edge connections: “Vinciarelli-218 discloses that conductors may be brought to the edge of the printed circuit board, thus easily *allowing the external conductive layer to be electrically coupled* to components within the module *through the printed circuit board.*” Petition, 91. But bringing in this additional aspect of Vinciarelli-218 is a hindsight remedy that is only needed because of the aforementioned counterproductivity, and the POSITA would not be motivated to further incorporate the bar code interconnects. In my opinion, the incorporation of the bar code interconnects is only necessary because of the application of Vinciarelli-218’s encapsulation.

196. Therefore, it appears to me that the Petition proposes to (1) form surface contacts on assembly components for interconnection capabilities, (2) cover the surface contacts with encapsulant thus obstructing those interconnection capabilities, and then (3) incorporate edge connections in the PCB to access those covered contacts to restore those interconnection capabilities. It is my opinion that a reasonable POSITA would not make this combination of steps.

197. Therefore, in my opinion, a POSITA would not be motivated to combine Zeng-014 and Vinciarelli-218.

c. Ground 3 Does Not Teach [1g]’s Structure.

198. It is my opinion that Ground 3’s prior art combination does not meet the structure associated with [1g]. As stated above, this structure includes the first connection part being fixed at the first electronic component.

199. The Petition’s proposed combination appears to involve applying Vinciarelli-218’s encapsulation process to Zeng-014’s power converter assembly. Petition, 91-92. It appears that Zeng-014’s lead frame process would be re-applied after the encapsulation to wrap around the entire assembly. Petition, 93. However, I have found no indication that this re-application of a lead frame wrapping would result in a contact being fixed at a component. Therefore, I have the opinion that the prior art combination does not meet the structure associated with [1g].

d. Ground 3 Does Not Teach The claimed arrangement of [1c]-[1e].

200. Limitations [1c]-[1e] together recite “a first connection part, comprising” “a first terminal electrically coupled to . . . the carrier” and “a second terminal attached to a surface of the first electronic component apart from the carrier.”

201. When interpreting claim 1 as a whole, I interpret the first terminal and the second terminal to be portions of the same connection part. It is also my opinion that a POSITA would understand terminals to refer to ends, and here, [1d] and [1e] may refer to first and second ends of one single connection part. This is supported by the figures of the '263 Patent. FIG. 1 shows one connection part P1, and the first terminal (Pin1) and the second terminal (Pad1) are two ends of the one connection part P1. *'263 Patent*, 4:18-22.

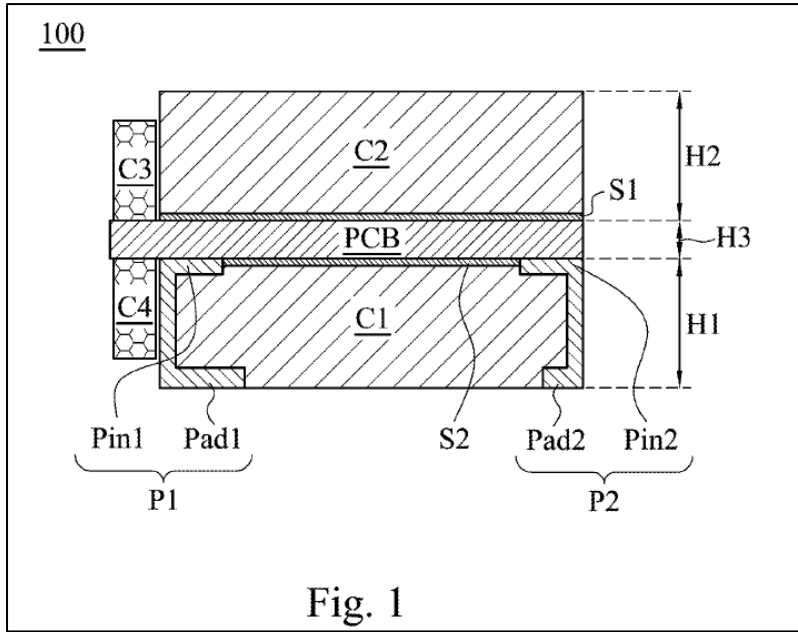
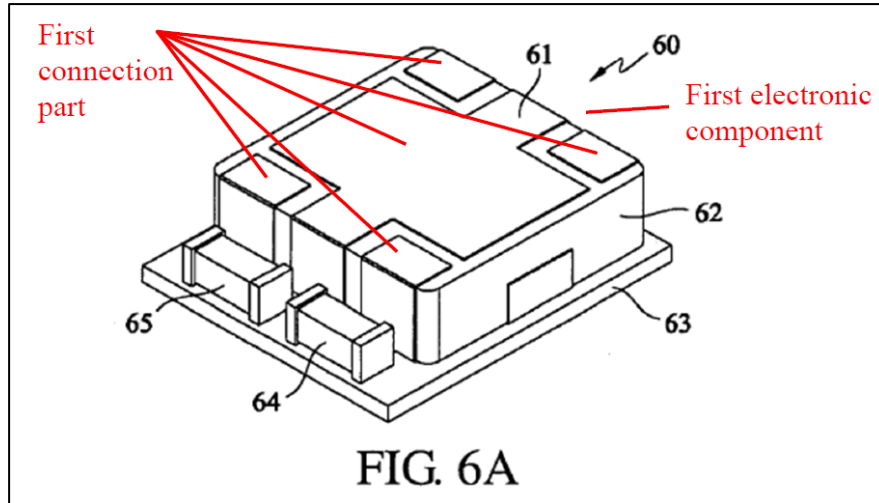


Figure 1 of '263 Patent

202. Based on my review of the Petition's analysis of Zeng-014 with respect to [1c]-[1e], it is my opinion that the Petition has not shown that [1c]-[1e] are met.

203. The Petition generally refers to the entirety of "a conductive layer" disclosed in Zeng-014 as the claimed "first connection part." Petition, 88-89. As shown from Petitioner's annotations on FIG. 6A (reproduced below), it points to *every* portion of the conductive layer 61.



Petition, 89

204. This conductive layer is not a continuous layer wrapped on the entirety of the component's surface. Zeng-014 instead discloses that this conductive layer 61 is formed of multiple conductor islands that are separated from one another. Zeng-014, [0059], [0067] ("conductor regions 42, 43, 44, 47, 48 acting as pins in the connecting conductor that wraps the inductive component 62"), FIGs. 4A-4D. An example of discrete and individual conductors or regions forming the conductive layer can be seen from FIG. 5C of Zeng-014 (reproduced above), which shows five separated conductors that together form the conductive layer. **Each** of the conductors making up the conductive layer occupies a different surface area of the component.

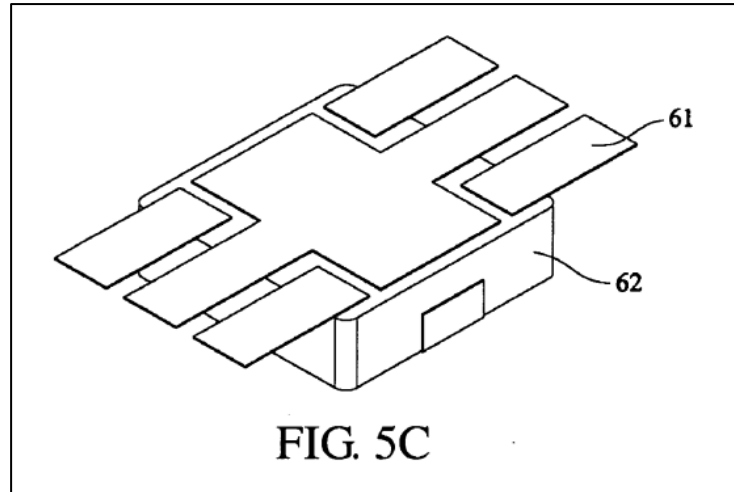
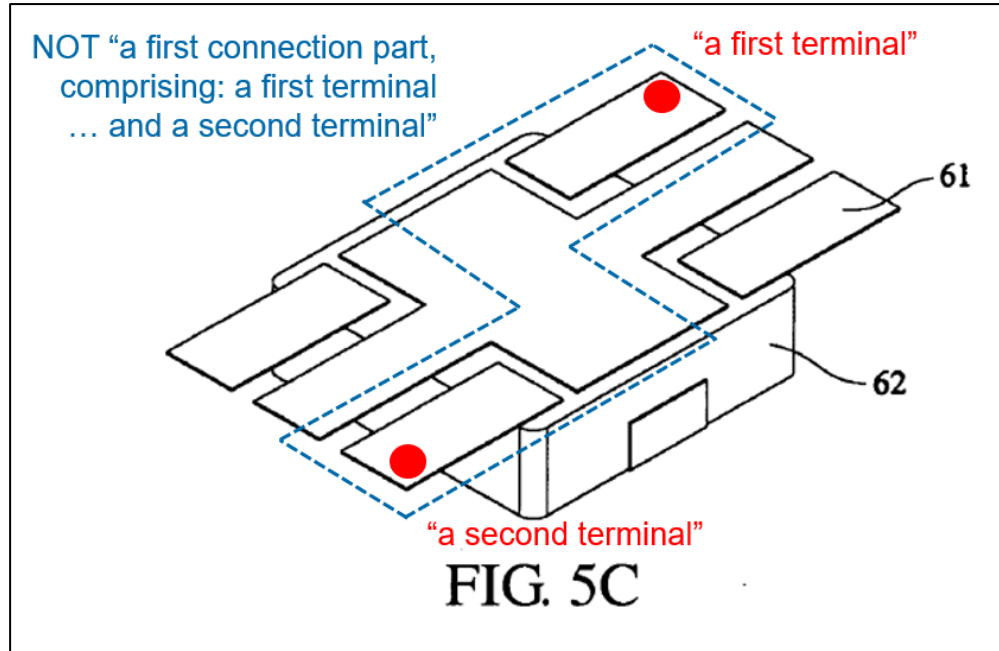


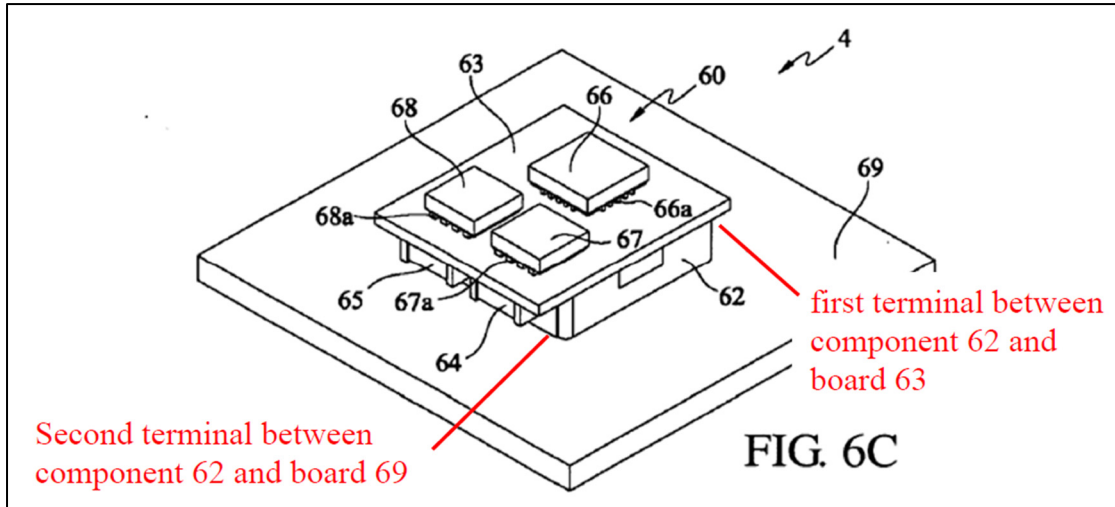
Figure 5C of Zeng-014

205. As such, it is my opinion that, if the entirety of the conductive layer 61 is to be “a first connection part,” the first and second terminals cannot be found on different individual conductors. This is because different individual conductors would not together form one single and contiguous “first connection part.” As demonstrated in the annotated version of Zeng-014’s FIG. 5C shown below, the “first terminal” and the “second terminal” being on different conductors would fail to form one single “first connection part.”



Annotated Figure 5C of Zeng-014

206. It is my opinion that the Petition is unclear and vague in its analysis of Zeng-014 with respect to at least [1d] and [1e]. The extent of the Petition's analysis is that some "portion of 'conductive layer 61' facing 'circuit board 63'" is a first terminal" and that an "opposite side of 'conductive layer 61' from the first terminal" is a second terminal." Petition, 89-90. However, I believe that these first/second terminals are not necessarily on the same conductive island and therefore do not necessarily form a single connection part. There is no specific in Petitioner's annotations or analysis to show that the first terminal and the second terminal are on the same connection part.



Petition, 90

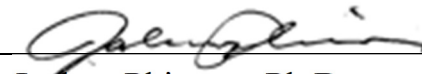
207. Therefore, it is my opinion that Ground 3 does not shown that [1c]-
[1e] are met.

IX. CONCLUSION

208. I, Joshua Phinney, declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: July 10, 2024

Respectfully submitted,



Joshua Phinney, Ph.D.



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Principal Engineer

Professional Profile

Dr. Joshua W. Phinney is a Principal Engineer in Exponent's Electrical Engineering and Computer Science practice. Dr. Phinney's background is in electrical and electronic engineering, particularly related to power electronics, electromagnetics, and electromechanics. His specialties include power supplies, radio-frequency electronics, control systems, printed circuits, integrated-circuit packaging, magnetics design, and power transmission and distribution. He has related experience in embedded software, acoustics, and numerical methods for optimization and simulation.

At Exponent, Dr. Phinney has assisted clients with identifying the root cause of failures in mobile electronic devices, industrial and automotive controllers, capacitors, transformers, amplifiers, and power supplies. He has testified in patent and trade secret litigation regarding computer hardware and software, audio circuitry, mobile telephones, tablets, power supplies, control systems, hard disk drives, and electronic instruments. In addition, Dr. Phinney has assisted clients with electromagnetic assessment issues pertaining to utility and communication infrastructure. These issues include permitting, interference, and environmental impact of radar, AC and HVDC transmission lines, substations, photovoltaic installations, generators, broadcast antennas, and electrified mass transit systems. In addition, Dr. Phinney has written software for data classification and machine learning in radar-return and other image-analysis applications.

Dr. Phinney received his Ph.D. in Electrical Engineering from the Massachusetts Institute of Technology. His doctoral work centered on miniaturization of power converters and electromechanical power conversion. He has related experience in radio-frequency electronics (particularly phase-locked loops and RF amplifiers), network synthesis, system identification, and control. Dr. Phinney is the co-inventor on patents for improving the performance of capacitors, EMI filters, and common-mode chokes.

Academic Credentials and Professional Honors

Ph.D., Electrical Engineering, Massachusetts Institute of Technology, 2005
S.M., Electrical Engineering, Massachusetts Institute of Technology, 2001
B.S., Electrical Engineering, University of Illinois at Chicago (*summa cum laude*), 1999
B.A., Ancient and Classical Languages, Philosophy, Wheaton College, 1995

2004 IEEE Power Electronics Society Transactions Prize Paper Award (for the paper "Filters with Active Tuning for Power Applications"); 2003 William M. Pormoy Prize Paper Award (Awarded by the Power Electronics Devices and Components Committee of the IEEE Industry Applications Society)

APPENDIX A

1993-1994 Lawrence Livermore National Laboratory, Nuclear Chemistry Division. Associated Western Universities internship: Neural-network classification of gamma-ray detector events.

Work History

2005-*present* Exponent, Inc.

Licenses and Certifications

Registered Professional Electrical Engineer, New York, #084129

Languages

German

Patents

U.S. Patent No. 7,242,269: Filter Having Parasitic Inductance Cancellation, July 2007 (with D.J. Perreault and T.C. Neugebauer).

U.S. Patent No. 6,937,115: Filter Having Parasitic Inductance Cancellation, February 2002 (with D.J. Perreault and T.C. Neugebauer).

Publications

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Academic Appointments

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Adjunct Professor, Hofstra University, 2008-2018

Peer Reviewer

- IEEE Transactions on Power Electronics, 2013-2015
- Health Physics Journal, 2007
- IEEE Power Electronics Letters, 2006
- Power Electronics Specialists Conference, Recife, Brazil, 2005
- Power Electronics Specialists Conference, Jeju, Korea, 2006

Professional Affiliations

- Institute of Electrical and Electronic Engineers (member)
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Principal Engineer

Testimony

Convolve, Inc. and MIT v. Compaq Computer Corp. and Seagate Technology, LLC.
Case No. 00 CIV. 5141 in the United States District Court, Southern District of
New York. Deposition 2008

IBM v. ASUSTek Computer, Inc., ASUS Computer International, Pegatron Corporation,
and Unihan Corporation, Certain Computer Products, Computer Components and
Products Containing Same, Case No. 337-TA-628 before the International Trade
Commission. Deposition and trial 2008

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the State of New York, County of Suffolk. Trial testimony 2010

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States District Court, Western District of Washington at Seattle. Deposition 2016.

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No. 3:15CV1526-CAB (MDD) in the United States District Court, Southern District of
California. Deposition 2017.

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Spark Connected v. Semtech Corp., Case No. 4:18-CV-00748 in the United States District Court, Eastern District of Texas, Sherman Division. Hearing 2019.

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