

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Jian-Hong Zeng, et al. Attorney Docket No.: 25808-0012IP1
U.S. Patent No.: 9,819,263
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Filing Date: October 5, 2016
Title: POWER CONVERTER AND METHOD FOR
MANUFACTURING THE SAME

SUPPLEMENTAL DECLARATION OF R. JACOB BAKER, PH.D., P.E.

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EXHIBITS

VICOR-1001	U.S. Patent No. 9,819,263 to Jian-Hong Zeng, et al. (“the ‘263 Patent”).
VICOR-1002	Excerpts from the Prosecution History of the ‘263 Patent (“the Prosecution History”).
VICOR-1003	--
VICOR-1004	Complaint, <i>Delta Electronics, Inc. v. Vicor Corporation</i> WDTX-6-23-cv-00726, W.D. Tex., filed October 23, 2023.
VICOR-1005	United States Patent No. 10,264,664 to Vinciarelli et al. (“Vinciarelli-664”).
VICOR-1006	United States Patent No. 8,427,269 to Vinciarelli et al. (“Vinciarelli-269”).
VICOR-1007	United States Patent No. 7,361,844 to Vinciarelli et al. (“Vinciarelli-844”).
VICOR-1008	United States Patent Application Publication No. 2009/0175014 to Zeng et al. (“Zeng-014”).
VICOR-1009	United States Patent Application Publication No. 2014/0355218 to Vinciarelli et al. (“Vinciarelli-218”).
VICOR-1010	United States Patent No. 8,966,747 to Vinciarelli et al. (“Vinciarelli-747”).
VICOR-1011	Exhibit A to Patent Owner’s Infringement Contentions served on February 26, 2024 (“Infringement Contentions”).
VICOR-1012	U.S. Patent No. 6,934,166 to Vinciarelli et al. (“Vinciarelli-166”).
VICOR-1013	“Design Guide & Applications Manual for VI-200 and VI-J00 Family DC-DC Converters and Configurable

	Power Supplies,” Rev. 3.5, Vicor Corporation (2013) (“Design Guide”)
VICOR-1014	Transcript of Board Call held August 6, 2024
VICOR-1015	--
VICOR-1016	Deposition Transcript of Dr. Phinney March 13, 2025
VICOR-1017	Datasheet for the VTM2308 product
VICOR-1018	Philips Technical Note
VICOR-1019	Amazon page for DZS buck converter found at Amazon.com: DZS Elec 2PCS LM2596 DC-DC Step Down Variable Volt Regulator Input 3.2V-40V Output 1.25V-35V Adjustable Buck Converter Electronic Voltage Stabilizer Power Supply Module : Electronics
VICOR-1020	Digikey website screenshot from NCP1216AFORWGEVB onsemi Development Boards, Kits, Programmers DigiKey
VICOR-1021	NCP1216AFORWGEVB Evaluation Board Manual from Digikey at EVBUM2133 - Implementing a DC/DC Single-ended Forward Converter with the NCP1216A Evaluation Board User's Manual
VICOR-1022	U.S. Patent 10,877,534 to Zeng (“Zeng”)

I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. My name is R. Jacob Baker Ph.D., P.E., and I am a Professor Emeritus of Electrical and Computer Engineering at the University of Nevada, Las Vegas. I have already submitted a Declaration in this proceeding. I submit this Declaration in support of Petitioner's Reply to the Patent Owner Response and to respond to statements made by Dr. Phinney in Exhibit 2005.

2. This declaration contains statements of my opinions formed to date, and the bases and rationale for these opinions. I may offer additional opinions based on further review of materials in this case, including opinions and/or testimony of other expert witnesses.

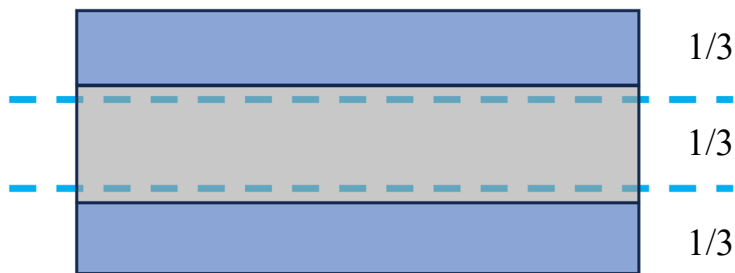
3. For my efforts in connection with the preparation of this declaration, I have been compensated at my usual and customary rate for this type of consulting activity. My compensation is in no way contingent on the results of these or any other proceedings related to the '263 Patent.

II. RESPONSES TO STATEMENTS MADE BY DR. PHINNEY

A. The "Symmetry" Taught by the '263 Patent

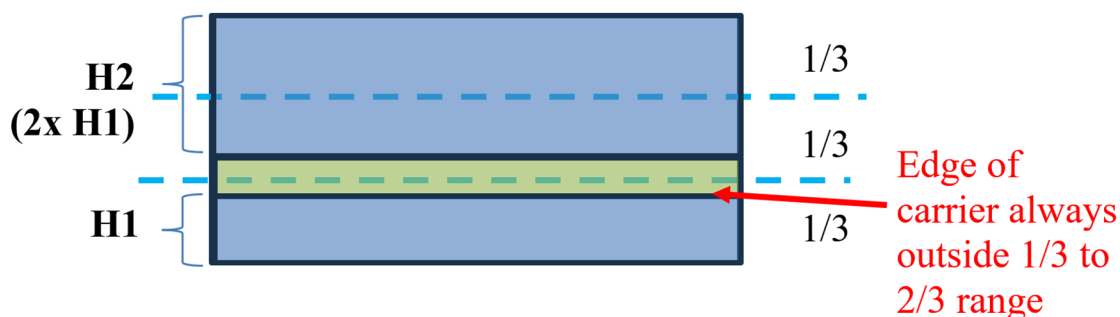
4. I have been asked to comment on the description of embodiments in the '263 patent where "the first electronic component C1 and the second electronic component C2 are symmetric with respect to the carrier PCB." '263 patent, 5:45-47. The paragraph describes two different exemplary symmetries. First, a

symmetry with a fairly loose tolerance is provided (“loose symmetry”): “the definition of the symmetry mentioned above may be that, the second height H2 is not greater than twice the first height H1, or the first height H1 is not greater than twice the second height H2.” ’263 patent, 5:53-57. Second, the patent describes an embodiment with symmetry with tighter tolerance (“tight symmetry”): “In one embodiment, the height of the first electronic component C1 equals to the height of the second electronic component C2.” *Id.*, 5:57-59. Dr. Phinney suggests in his declaration that the disclosure of symmetry of the components in the ’263 patent supports a narrow construction of limitation [1f] whereby the entire carrier is placed within the range of 1/3 to 2/3 of the height of the power converter. Ex. 2005, ¶47. I disagree. As one example, consider a power converter where the upper component has a height equal to the lower component and that height is less than the PCB height. Such a power converter would provide the “tight symmetry” taught in the patent, and such a power converter would have the carrier placed within the 1/3 to 2/3 range, but such a power converter would **not** meet the narrow construction Dr. Phinney and the Patent Owner are seeking. That is, the carrier (the PCB) would not be **entirely within** the 1/3 to 2/3 range. Rather portions of the carrier would extend outside the middle third of the power converter:



5. As another example, consider a power converter that has a top electronic component that is twice the height of the bottom electronic component. This ratio is specifically contemplated in column 5, lines 53-56 and would provide the “loose symmetry” taught by the patent. Any PCB in such a power converter would be partially outside the range of $1/3$ to $2/3$ the height of the power converter. The larger the PCB, the farther the edge of the PCB extends out of the middle third of the power converter.

6. Thus, the ‘263 patent teaches examples where it would actually be impossible for the PCB to be entirely within the range of $1/3$ to $2/3$ of the height of the power converter.



7. Simple math confirms that the PCB in the foregoing example will always be outside the range of $1/3$ to $2/3$ of the height of the power converter if the

upper component is twice the height of the lower component: As explained in the patent, the total height of a converter is the height of the lower component (H_1) plus the height of the upper component (H_2), plus the height of the PCB (H_3). (5:14-17). In the foregoing example, $H_2 = 2 * H_1$, so total component height is ($2 * H_1 + H_1$), which equals $3 * H_1$. Total power converter height, including the height of the PCB, is $3 * H_1 + H_3$. Thus the bottom third of the power converter is $1/3$ of the total height, which is $1/3(3 * H_1 + H_3)$, which may be expressed as: $H_1 + H_3/3$. Thus, the $1/3$ boundary will always be higher than the height of the lower component and one third of the PCB will always be outside the middle third.

8. Conversely, all of the “symmetrical” examples taught in the ’263 patent are necessarily within Vicor’s proposed construction. Even with a 2:1 ratio of H_2 to H_1 , a portion of the PCB will necessarily be within the middle third of the height of the device. Thus, Vicor’s proposed construction, which is that the PCB must be placed within the middle third of the converter, but need not be entirely within the middle third, is consistent with the symmetry discussed in the ’263 patent, and covers all of the disclosed embodiments. By contrast, Delta’s proposed construction, excludes examples that meet the patent’s symmetry teaching, as shown in the previous paragraphs.

9. A skilled artisan would interpret the claim broadly to be consistent with the two examples I provide and would further interpret the claim to reflect where the carrier is to be placed **without regard to the carrier thickness**.

10. I note that Delta's construction leads to an unreasonable result without any technical rationale. Under Delta's construction, a PCB placed in the center of the power converter may be as thick as 1/3 of the height of the power converter. But if the PCB is placed off center, then it must be made thinner. For example, if the PCB is placed close to the 1/3 boundary, it would have to be paper thin so that no edge crosses over that boundary. Delta and Dr. Phinney provide no rationale for such a technical requirement. A skilled artisan reading the '263 patent would be aware that carrier thickness would not be dictated by—and reduced in relation to—the degree to which the components become less symmetric. Notably, there is no maximum height for the power converter in the '263 patent. The height is a design choice depending on the particular space available in a particular application. Thus, no maximum allowable height would explain the narrow construction proposed by the Patent Owner.

B. Vinciarelli-218 Provides the Same Reason for Symmetry as the '263 Patent

11. Vinciarelli-218 teaches that symmetry of components in a power converter (relative to the plane of its PCB) provides various benefits, and in particular, providing symmetry on the top and bottom of the PCB can reduce stress

on the PCB: “Distributing larger components between the two surfaces of the PCB may decrease stresses on the PCB, e.g. due to differences in the coefficient of expansion of the encapsulant, e.g. while curing, which may improve the coplanarity and mechanical integrity of the device.” VICOR-1009, [0143]. A skilled artisan would have understood that thermal expansion applies to operating power converters as well. For example, Vinciarelli-218 states: “The components may be arranged between the PCB surfaces according to heat dissipated during operation. For example, the heat dissipative components may be arranged in a manner that distributes the heat evenly between the two PCB surfaces allowing heat produced by power dissipating devices to be extracted from both surfaces of the PCB improving the thermal performance.” Vicor-1009, [0150]. One aspect of thermal performance is reducing stress due to thermal expansion on the printed circuit board. Thus, the symmetrical distribution of components on the top and bottom of a PCB was not an invention of the ’263 patent. It was already known in the prior art. When the ’263 patent states that symmetry allows a “uniform strain distribution” to be “benefited,” Vicor-1001, 5:45-50, the ’263 patent is repeating the same **known benefit** mentioned in Vinciarelli-218. I understand that “hindsight” involves using the challenged patent to provide the motivation. Here, the motivation to center the PCB does **not** come from “hindsight,” but from the teachings of Vinciarelli-218.

C. Dr. Phinney's Framing of the Ground 3 Combination Still Meets the Connection Part and Terminal Limitations

12. Dr. Phinney states: "Dr. Baker provides no reason why a POSITA would jettison interconnect features of Zeng-014, change the internal circuitry of its power module, then bafflingly re-apply Zeng-014's lead-frame wrapping technique to the resulting 'single module.'" Ex. 2005, ¶183. This statement is not correct as I provided reasons supporting the combination in my first Declaration. I explained that once the Zeng-014 power converter was repackaged as a cuboid, it would resemble the cuboid component in Zeng-014, and that a skilled artisan would recognize that the Zeng-014 wrapping of the Zeng-014 inductor would be applicable to the entire cuboid power converter. Vicor-1003, ¶205. Moreover, if a skilled artisan would combine the references as Dr. Phinney suggests, and keep the lead frame wrapped only around the "component" (e.g., the inductive component 62 in Zeng-014 Fig. 6B of any other component or combination of components as also disclosed in Zeng-014 (e.g., Figs. 8B, 9B, and 10)), the combination **still** renders the claims unpatentable.

13. I'll follow Dr. Phinney's analysis to its logical conclusion to show why. According to Dr. Phinney, a skilled artisan starting with Zeng-014 who modifies Zeng-014 to create a power converter with symmetrical placement of components relative to the PCB, as taught by Vinciarelli-218, would not modify the component-wrapping teaching of Zeng-014, but would instead keep the

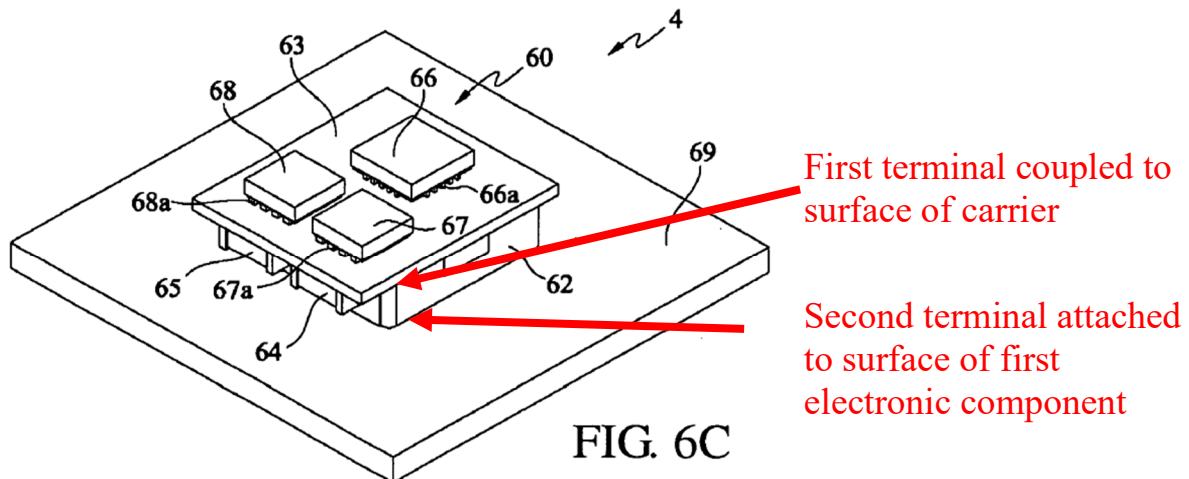
component wrapping of Zeng-014 in the combination. Even if the combination stopped there, it would still meet all the claim limitations of claim 1:

14. [1pre] “A power converter, comprising:”—The combination with component wrapping would still be a power converter.

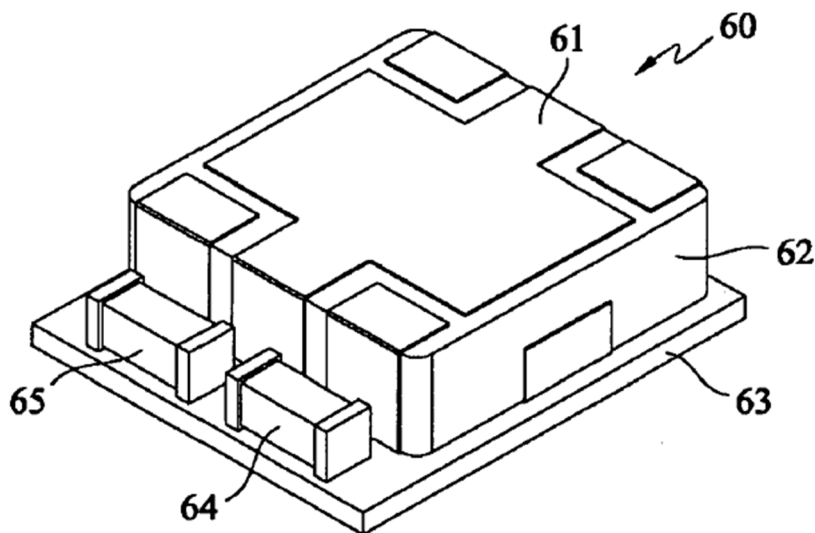
15. [1a] “a carrier, comprising: an upper surface; and a lower surface”—The combination with component wrapping would still have the carrier with an upper and lower surface.

16. [1b] “a first electronic component disposed at the lower surface of the carrier; a second electronic component disposed at the upper surface of the carrier; and”—The combination with component wrapping would still have components disposed on both surfaces of the carrier.

17. [1c] “a first connection part, comprising:”—The combination with component wrapping would still have a first connection part, but instead of wrapping the entire device, the conductors would wrap one or more individual components. Thus, for example, if one imagines that the power converter in Figure 6C of Zeng-014 was modified to provide symmetrical components, the resulting product would still meet the connection part and terminal limitations of claim 1.



Because the wrapping is not visible in Figure 6C, I include Fig. 6A, which shows the bottom view of the power converter 60 where the top components are not visible. The large conductor labeled 61 has a first terminal (not shown) that contacts the PCB and a second terminal (visible on the “top” of the device in this inverted power converter) that would connect to the customer board in Fig. 6C:



18. [1d] “a first terminal electrically coupled to the upper surface or the lower surface of the carrier; and”—The combination with component wrapping would have a first terminal, which would be the portion of the wrapped conductor on the top surface of the lower component (which might be the inductor disclosed, but repackaged to be shorter to provide desired symmetry, or, for example, a core half of a planar inductor which would provide the desired symmetry). That top surface would be directly connected (and thus coupled) to the lower surface of the carrier of the power converter.

19. [1e] “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;”—The combination with component wrapping would have the second terminal. The portion of the wrapped conductor on the lower component that connects to the customer board (item 69 in FIG. 6C) is the second terminal. This terminal, the claimed bonding pad, is attached to a surface of the lower component, which is a first electronic component as seen above in annotated FIG. 6C. The encapsulant would be such that the conductor is accessible from outside the power converter as it is used to electrically connect to the customer board.

20. [1f] “wherein the carrier is disposed at $\frac{1}{3}$ to $\frac{2}{3}$ of a height of the power converter;”—The combination with wrapped components would have

components that are symmetrically arranged on opposing surfaces of the PCB, as taught by Vinciarelli-218 at [0143], which would result in a printed circuit board that is centered relative to the height of the converter, and which would place the carrier within the claimed range. A skilled artisan would know that in a typical power converter, the printed circuit board is generally significantly thinner than a portion of the components mounted on the board and thus when centered, the entire board would be within the middle third of the power converter. It is apparent in the Zeng-014 figures (such as Fig. 6C) that the printed circuit board is thin compared to various components.

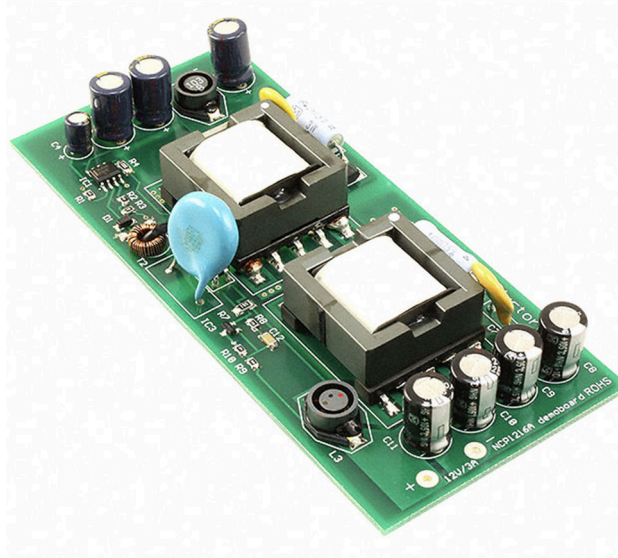
21. [1g] “and wherein the first connection part is fabricated by mechanical support of the first electronic component.”—The combination with wrapped components uses the same wrapping technique as that disclosed in the ’263 patent and thus the Zeng-014 connection part is equally fabricated by mechanical support of the first electronic component. It is readily apparent that the wrapped conductor is attached to and supported by the lower component in Figs. 5C-5E, Figs. 6A-6C, and 7B. Additional examples of wrapped components mounted to a relatively thin PCB are provided in Figs. 8A-Fig. 10.

22. In general, as of the invention date of 2015, a skilled artisan would have expected printed circuit boards to be relatively thin compared to power converter components and would thus be aware that a centered printed circuit

board would be entirely within the range of 1/3 to 2/3 of the height of a power converter. For example, the following pictures show examples of actual power converters from the prior art:

NCP1216AFORWGEVB
(evaluation DC/DC
converter board for On
Semiconductor controller
chip)

Supporting application note
available in 2012:
https://mm.digikey.com/Volume0/opasdata/d220001/medias/docus/411/NCP1216AFORWGEVB_Man.pdf



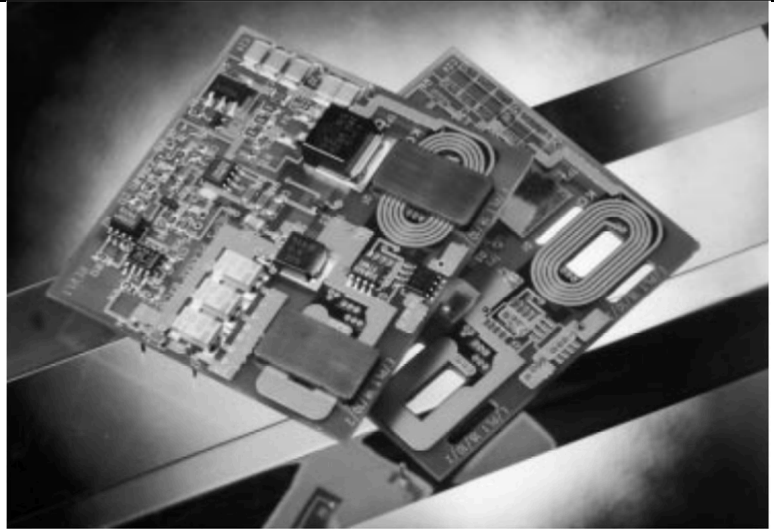
Exemplary power converter
using the LM2596, a
controller chip released in
1999.

This particular board was
first posted to Amazon on
March 21, 2017, but is
exemplary of the size of
components available prior
to 2015 as well.



Exemplary power converter
with planar inductor

From Technical Note
released in 1996

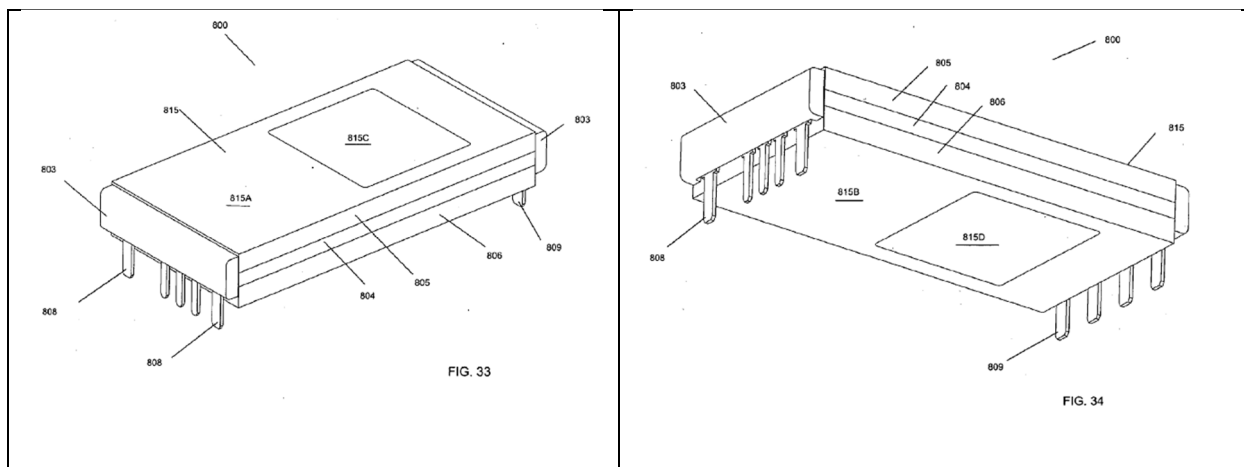


*25 Watt DC/DC converter using integrated Planar Magnetics
(designed in cooperation with PEI Technologies, Ireland)*

D. Encapsulated Power Converters of Vinciarelli-218

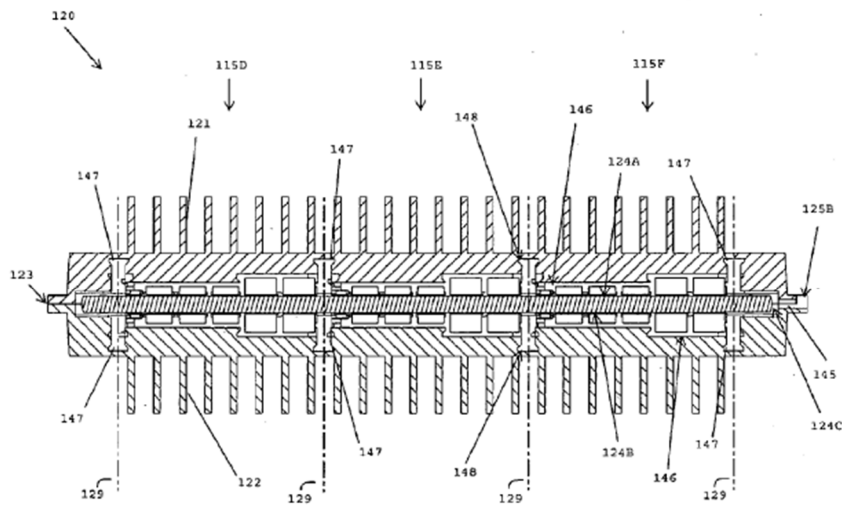
23. Dr. Phinney criticizes my reliance on Figures 6 and 33 in Vinciarelli-218, asserting that Figure 33 has “an entirely different form factor” than that described in Figure 6. Dr. Phinney misunderstands what “form factor” I was referring to. There is no inconsistency, and **both** figures disclose a cuboid form factor with a centered PCB.

24. The external form factor is shown in Figs. 33 and 34 of Vinciarelli-218. These figures depict a cuboid power converter made using a centered printed circuit board with an exposed core half on each of the top and bottom, as described in Vinciarelli-218 at [0159]:



There is no heatsink in this embodiment, and the cuboid body needs additional contact adapters mounted to it to make external connections. When I referred to the form factor, I was referring to the cuboid shape **before** the addition of any contact adapters, which are added after panel molding and after singulation (which separates all the modules in a panel from each other).

25. As seen above, the figures 33 and 34 show exposed symmetrical cores, but do not otherwise depict the (non-exposed) internal components under the encapsulant. For this reason, I rely on another figure to depict the internal structure in more detail. A POSITA would understand that the arrangement of components on the PCB in Figs. 33 and 34, although not shown (except for the exposed cores), would be similar to the symmetrical arrangement in the other embodiments disclosed in Vinciarelli-218. A good representation is Figure 6, which shows an internal profile view of a panel of three power converters:



26. Fig. 6 depicts a power converter using heatsinks, but as I explained in my original declaration, the heatsink would not be used in the combination. Vicor-1003, ¶168. I rely on Figure 6 for its internal representation of the symmetrical components that would likewise exist in the power converter depicted in Figs. 33 and 34. The relevant teachings are the same: symmetry of components and encapsulation. Vinciarelli-218 expressly states that the same panel molding process used to make devices with heat sinks can be used to create the depicted devices without heat sinks. Vicor-1009, ¶162. Thus, it is appropriate to cite to Figure 6 to show the arrangement of internal components in the embodiment of Figs. 33 and 34.

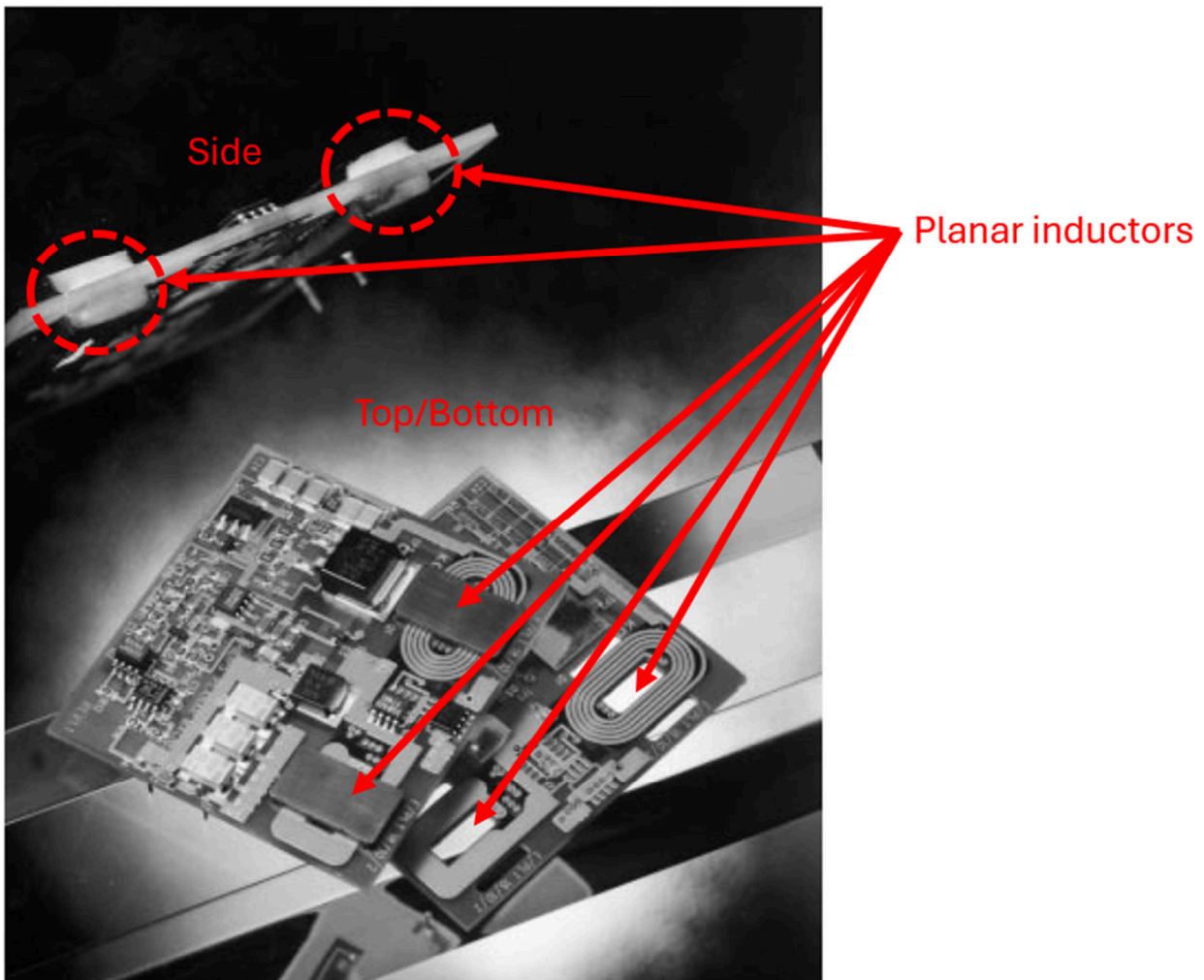
27. Vinciarelli-218 teaches that when heatsinks are used, they may form part of the mold and also remain as a part of the finished product. Vinciarelli-218

further teaches that when it is desirable to make power converters without heatsinks, then encapsulant would be injected against a reusable mold that would provide the flat surfaces shown in Figs. 33 and 34 (with the encapsulant at the level of the exposed core). Vicor-1009, [0159]. Because encapsulant fills the space between the components and the flat mold wall, the encapsulant will follow the uneven contour of the components on the inside and form a flat smooth surface on the outside at the level of the exposed core. As seen in Figure 33, the “exposed core” 815C is shown. Shorter components are hidden under the encapsulant. Vicor-1009, [0159], see also [0177]. Given that it was common that a portion of the power converter components would be taller than the thickness of the printed circuit board (as depicted in the photographs of actual power supply printed circuit boards above in paragraph 22), a skilled artisan would have understood that the Vinciarelli-218 printed circuit boards are placed within the middle third of the power converter, as depicted in Figs. 33 and 34.

E. Planar Magnetics

28. In my first declaration, I referenced Vinciarelli-664’s and Vinciarelli-218’s disclosure of planar transformers. A planar transformer comprises two coupled planar inductors. A skilled artisan would have known that single inductors may likewise be implemented as a planar inductor to obtain the benefits of planar magnetics, including high efficiency, low profile, and better thermal management.

For example, a power converter using planar inductors from 1996 is discussed in the Philips Tech Note. Vicor-1018. An annotated image of the buck converter discussed in this article showing planar inductors (there is one planar output inductor and two planar transformers, each of which have at least a pair of planar inductors) is seen below.



*25 Watt DC/DC converter using integrated Planar Magnetics
(designed in cooperation with PEI Technologies, Ireland)*

A skilled artisan would have been motivated to use a planar inductor in the Zeng-

014 / Vinciarelli-218 combination for the symmetry and low profile that a planar inductor with matching core halves can provide.

29. Whether the inductor is made with a lower profile, or whether the inductor is implemented as a planar inductor with matching core halves, the result would be a shorter height component (whole inductor or a core half) that would still fulfill the purpose of providing a surface area to mount the power converter to a customer's printed circuit board. Moreover, in the combination, the power converter is encapsulated and thus the surface area available for mounting the power converter would be increased. Thus, a skilled artisan would have had this additional reason to encapsulate the power converter—to increase the mountability of the power converter to a customer's printed circuit board. A skilled artisan would have the choice of mounting the power converter using the core half or optionally increasing the mounting area to include areas beyond the exposed core of the inductor created by the encapsulation.

F. A Comment About the Exposed Cores

30. Various Vicor patents discuss “exposed cores,” including Vinciarelli-664 and Vinciarelli-218. The cores are called “exposed” cores because they are not covered by encapsulant and therefore they are literally “exposed” prior to the addition of shielding, if any. Thus, the exposed cores are at the level of the encapsulant such that the top and bottom surfaces are smooth with the encapsulant

surrounding the exposed core. Vicor-1005, 6:46-49; Vicor-1009, [0004], [0159]. The exposed cores are ferrite and therefore non-conductive. Accordingly, the plating of a shield and/or contact may be applied directly to the exposed core, as described in Vinciarelli-664. Vicor-1005, 10:12-37. Vinciarelli-664 specifically notes that the ferrite cores may be sensitive and therefore a protective layer of copper is first plated onto the surfaces before additional plating steps are applied. *Id.*

31. I recall being asked questions at my deposition about the cores and I provided an answer assuming the cores were conductive. I had answered from memory and without reviewing the patent, and I had guessed that they could be conductive. My guess was incorrect. Vinciarelli-664 is 100% clear that the cores are ferrite (e.g., at 10:16) and ferrite is non-conductive. Specifically, I understand that the following question and answer are in the transcript of my deposition on page 27:

Q. Would the coating that may be on the surface, top surface, of 815C make direct physical contact with a plated conductor such as the one described by 122-2 of Figure 1?

A. What's causing me pause is what you're suggesting is shorting a metal to the core of the --

core of the transformer, and it doesn't make sense.

So I'm having a hard time answering if that's possible. If that's the way it's designed, it's possible but, I mean, putting a metal directly on an iron core, for example, that's problematic.

As clear from this colloquy, I assumed that the core was a conductive iron, rather than ferrite as clearly disclosed in column 10 of Vinciarelli-664. I answered this question from memory and without reviewing Vinciarelli-664 for any disclosure regarding the material used for the core. My answer was incorrect as Vinciarelli-664 discloses attaching the contact via plating directly to the exposed core.

32. Also, at my deposition, I was asked about a photograph of the accused product taken from Delta's infringement contentions. I stated (at page 20, lines 9-14) that I was answering "from the limited amount I read in the infringement contentions." I was asked about the "top most portion of the metal which has the Vicor labelling on it" (p. 20, lines 20-21) and I answered based upon the picture and I stated that "all I can see is a piece of metal on top of the package. So I didn't put a lot of thought into that piece of metal, but it looks like just a piece of metal that's epoxied onto the package. I don't know if there's an upper surface or lower surface. It could just go beyond the top or wrap around the side. I don't know specifically what that piece of metal is doing." I understand that the Patent Owner

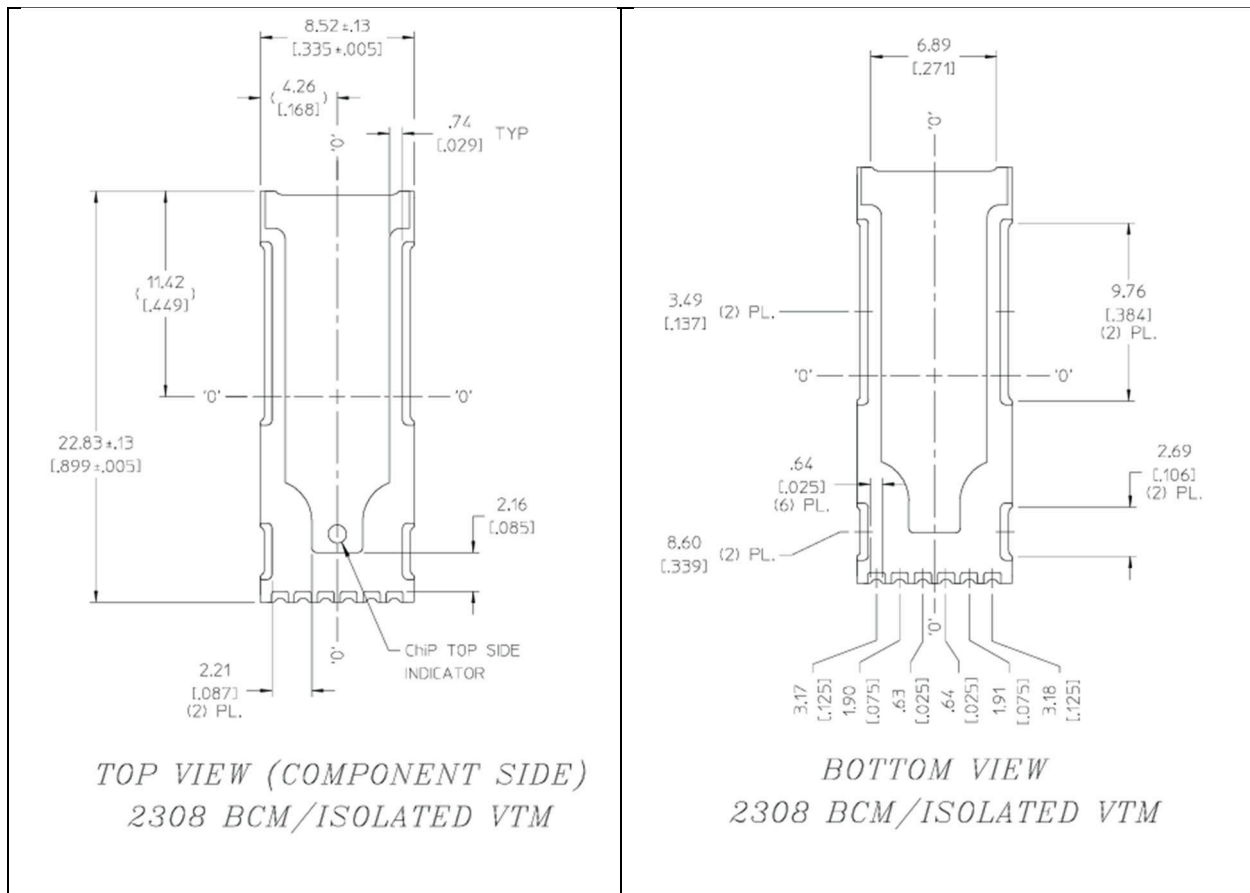
has cited this testimony in the Patent Owner Response, suggesting I was referring to prior art. That is incorrect. I was commenting on a photograph of an accused product. I could not see the bottom of the device in the photograph, which I reproduce here:



33. However, after I was deposed I went to the Vicor website for the VTM2308 series of parts seen in the above photograph. That website has additional pictures showing the bottom of the device and it has a shield on the bottom similar to the one on the top. See <https://www.vicorpower.com/products?productType=cfg&productKey=VTM2308S60Z1513T00>:



34. I also obtained a datasheet from that website and the datasheet likewise shows that the device has both top and bottom shields, similar to what is taught in Vinciarelli-664:



Vicor-1017 (Datasheet: ds-VTM2308S60Z1513T00-Vicor.pdf).

35. A skilled artisan reading Vinciarelli-664 would understand that there is symmetric shielding on the top and bottom of the device that would cover the exposed cores, given the figures and given Vinciarelli-664 states that “[t]he first contact surface can extend over 50% of the top surface of the top encapsulant. The second contact surface can extend over 50% of the bottom surface of the bottom encapsulant. The first electrical contact can extend to both the top surface of the top encapsulant and the bottom surface of the bottom encapsulant,” Vicor-1005, 4:12-18. Vinciarelli-664 further states that “[a]s shown, the common connection

extends laterally along a substantial portion of one side of the module 100 forming contact 122-1 and also extends over much (e.g., 50% or more) of the top and bottom surfaces of the module forming shields 122-2 and 122-3 either or both of which may also be used to establish electrical connections thus increasing the surface area and current carrying capacity.” Vicor-1005, 6:3-9.

36. Vinciarelli-664 further states: “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.” Vicor-1005, 6:66-7:4. This passage confirms that the mating contact is only a “small portion” of the bottom shield. A skilled artisan would understand from this description that the bottom shield 122-3 was substantially larger than the contact 922, consistent with the teaching of Vinciarelli-664 that the shield 122 would extend over “50% or more” of the bottom surface of the converter. Vicor-1005, 6:3-9.

G. Vinciarelli-218 And Vinciarelli-747 Attach Adapters to the Power Converters After Singulation

37. Dr. Phinney suggests that modifying Vinciarelli-664 to apply the Zeng-014 wrapped conductors after singulation is inconsistent with bulk production using panel molding. Ex. 2005, ¶132. It is not inconsistent. In fact, both Vinciarelli-218 and Vinciarelli-747 disclose power converters that are made

using panel molding and where the contacts or pins used to connect the power converters to a customer board are added after singulation. Thus, while Vinciarelli-664 teaches an improved process whereby contacts are formed during panel molding, I explained in my first Declaration that a skilled artisan would have reason to use a different process if it lacked the equipment to add contacts prior to singulation as is taught in Vinciarelli-664. Such a process would still provide most of the bulk production benefits of panel molding, just like the processes disclosed in Vinciarelli-218 and Vinciarelli-747. *See, e.g.,* Vicor-1009, [0007]-[0009], [0086]-[0087]. I note that both Vinciarelli-218 and Vinciarelli-747 are incorporated into Vinciarelli-664 and thus are part of the disclosure of Vinciarelli-664.

H. For Ground 2, a Skilled Artisan Would Have Had a Reason to Use Zeng-014's Wrapped Conductive Layers Instead of The Adapters in Vinciarelli-218, and Would Have Successfully Applied Zeng-014 Wrapped Conductive Layers to Vinciarelli-218

38. In my prior Declaration, I explained why a skilled artisan starting with Vinciarelli-218 (in Ground 2) would have been motivated to use Zeng-014's wrapped conductors instead of the adapters disclosed in Vinciarelli-218 and would have succeeded in doing so. Dr. Phinney raised a number of issues that he contends would counsel against the combination. I disagree and respond here.

39. In paragraph 149 of Ex. 2005, Dr. Phinney states that Zeng-014's wrapped conductors are "inferior" to the adapters in Vinciarelli-218 and would be

“infeasible” for contacting the barcodes in Vinciarelli-218. These statements are incorrect for all the reasons I discuss in my first Declaration. The Zeng-014’s wrapped conductors offer a thinner alternative to the Vinciarelli-218 adapters and provide for stacking. They thus offer benefits over Vinciarelli-218 adapters and are not “inferior.” They would be feasible and it was well within the ordinary skill to connect contacts to interconnects, such as the “barcodes” (exposed interconnects at the edge of the module) of Vinciarelli-218. In fact, Vinciarelli-218 specifically discusses soldering contacts to those barcodes. There would be no additional challenge to soldering Zeng-014’s wrapped conductors.

40. In paragraph 150 of Ex. 2005, Dr. Phinney refers to “differences of materials” and notes that Zeng-014’s inductor has a “hard ceramic.” This is incorrect. Zeng-014 does not limit its wrapping to “hard ceramics,” but discloses that all different components can be wrapped—including traditionally encapsulated components. For example, Zeng-014 states that the wrapped electronic component body “is one of an inductor, a resistor, a capacitor, a field effect transistor, a control chip, and an integrated circuit.” Zeng-014, claim 24. The field effect transistors and control chip are depicted as encapsulated in FIGs. 8-10. Moreover, once cured, encapsulant becomes a hard material. I note that Dr. Phinney offers no evidence that the encapsulant is too soft for the Zeng-014 contacts, and Zeng-014

teaches otherwise—Zeng-014’s contacts are applied to more than ceramic inductors.

41. Dr. Phinney further notes that Zeng-014 discloses use of a “thermosetting adhesive” and suggests that it is incompatible with the barcodes. No support is provided and this statement is incorrect. The thermosetting adhesive could be used to set the contact in place and the contacts would be soldered to the barcodes as well. Vinciarelli-218 specifically describes an attachment process that uses both solder and an adhesive: “The interconnect portions 808A may be soldered to the exposed interconnects 811, 812 in the manner described above, and protective caps 818 may be attached, e.g. with epoxy, covering the interconnect portions 808A, to provide structural integrity, and exposing only the terminals 808.” Vicor-1009, [0160], Fig. 35:

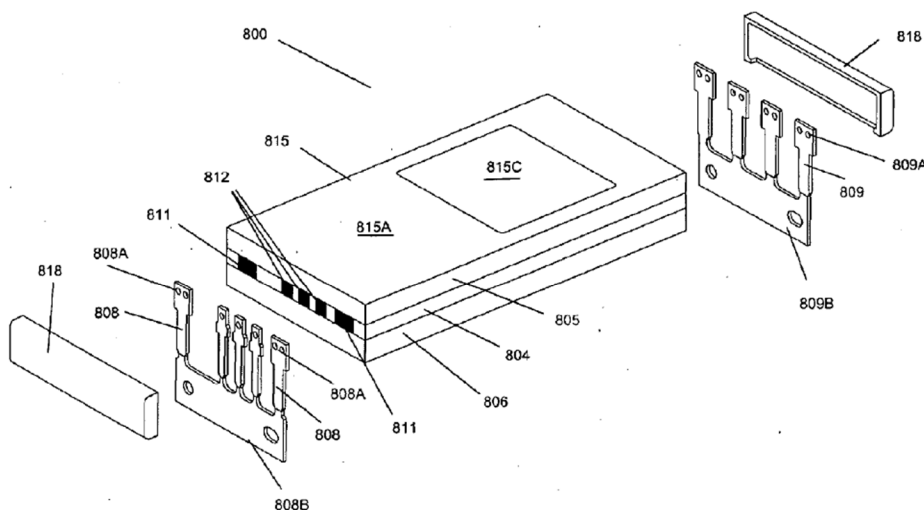


FIG. 35

42. In Paragraph 152 of Ex. 2005, Dr. Phinney states that a “POSITA would initially view the small footprint of these bar codes as a potential problem” and that the adapters in Vinciarelli-218 offers “the solutions.” This is incorrect. Nowhere does Vinciarelli-218 suggest that its barcodes present a “problem” or that there is anything unique to the adapters to “solve” this alleged problem. On the contrary, a skilled artisan would understand that very small circuits may be soldered and that Vinciarelli-218 teaches the ordinary soldering of a contact onto the barcode interconnect. For example, the photographs of actual power converters I include above demonstrate numerous very small solder joints that are well within the ordinary skill.

43. In paragraph 154 of Ex. 2005, Dr. Phinney states that the Vinciarelli-218 adapters are “well-suited for providing electrical contact to the small bar codes.” However, Vinciarelli-218 does not suggest that there is anything special about the adapters so that they may be soldered to the “small bar codes.” On the contrary, it is clear from Vinciarelli-218 that the adapters are connected to the bar codes using ordinary solder techniques. Dr. Phinney refers to “earlier concerns of small bar codes,” but provides no citation to support these alleged “concerns.”

44. In paragraph 157 of Ex. 2005, Dr. Phinney asserts that the wrapped conductors “would fail to reliably establish and maintain electrical contact with the bar code interconnects.” Dr. Phinney provides only speculation, Dr. Phinney’s

analysis is flawed, and Dr. Phinney's conclusions are not technically correct. Dr. Phinney first states that there will be a "significant gap" between the contact and the bar code. No citation is offered for this opinion, no evidence is cited for this opinion, and no indication is provided for the size of this alleged gap. Dr. Phinney appears to misunderstand how the combination works. He states that it would be difficult to establish electrical contact between a "curved contact and a bar code interconnect." By this statement, it appears that he believes the contact would be "curved" at the point where the contact meets the bar code interconnect. This is incorrect. The contact is "curved" or "bent" to wrap around the device, but the portion of the contact that meets the bar code would be straight. I illustrate this in the annotated figure from Zeng-014:

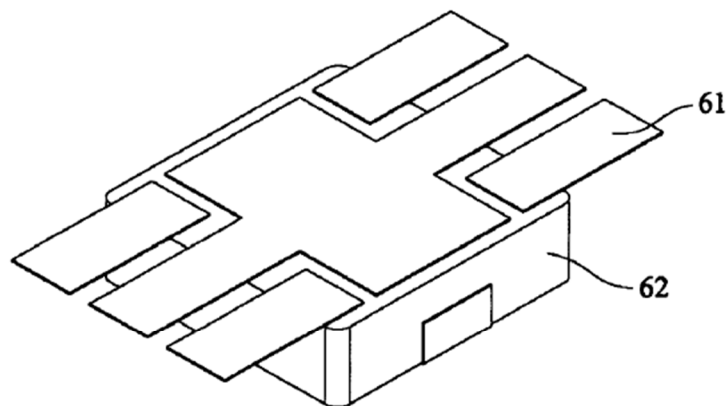


FIG. 5C

Straight portion
of contact where
bar codes would
be

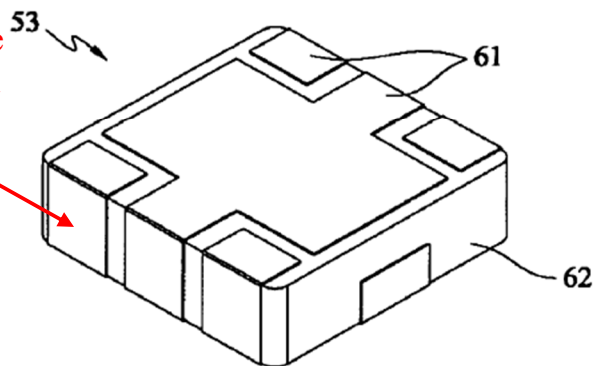
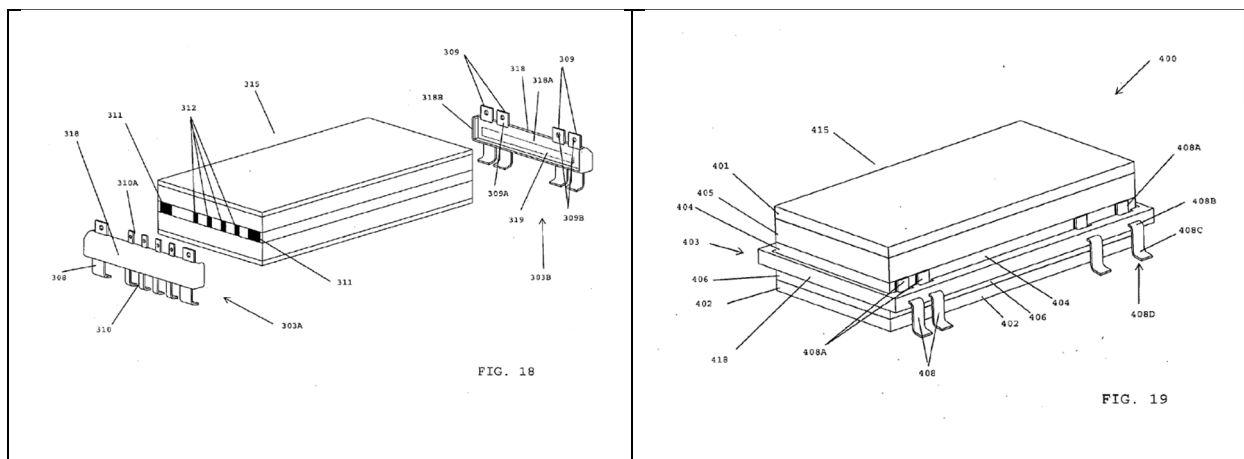


FIG. 5D

45. Moreover, Vinciarelli-218 clearly discloses the attachment of bent contacts to its barcodes and does not mention that there is any “problem” in doing so. As I explained at deposition, to the extent that bending in place posed issues, parts could be pre-bent or pre-creased. For example, Figures 18 and 19 of Vinciarelli-218 disclose bent contacts successfully soldered to barcodes.



46. In paragraph 159 of Ex. 2005, Dr. Phinney discusses the how Vinciarelli-218 secures its adapters to the barcodes, and asserts that “the proposed combination eliminates or detracts from these features.” Dr. Phinney misunderstands the combination. As shown in, for example, Fig. 18 of Vinciarelli-218, bent contacts are soldered to the barcodes. In the combination, the disclosed bent contacts are replaced with Zeng’s wrapped contacts which extend from the bottom of the module along the side and over the top of the module. Thus, the contacts can be thought of as an extension of the contacts disclosed in Vinciarelli-218. Thus, in the combination, the contacts may still be soldered or secured with a conductive adhesive. Dr. Phinney does not explain why he believes solder or adhesive would be “eliminate[d].” In fact, he is incorrect. Securing contacts to the interconnects was well within the level of skill in the art.

47. To the extent that Dr. Phinney is focusing on the holes in Vinciarelli-218’s contacts, the holes are not described as necessary, but rather are described as

enhancing the solder joints. Of course, to the extent helpful, a skilled artisan would likewise include holes in the wrapped contacts. After all, Vinciarelli-218 specifically teaches that holes provide better solder joints and thus this “feature” is available to the skilled artisan in the combination. Nothing in Zeng-014 precludes the addition of holes to provide better solder joints, if that is the direction a skilled artisan selects (out of all possible ways to attach contacts to circuits).

48. In paragraph 161 of Ex. 2005, Dr. Phinney states that thicker contacts may handle more current. I generally agree. Dr. Phinney then states that thicker contacts may “cause damage to the body.” I disagree. Dr. Phinney offers no evidence to support this speculation and Zeng-014 specifically discloses the bending of relatively thick contacts. Nor does Dr. Phinney provide any quantitative measures on the alleged thickness required for the combination or the bending force needed for bending a contact of such a thickness. Thus, his allegation of a fear of damage is unsubstantiated. Moreover, as I explained at deposition, if there were concerns about the force need to bend a contact (and there is no evidence in Zeng-014 that such concerns exist) then a skilled artisan would take steps to reduce the bending force, such as pre-creasing the metal at the bend locations to make bending easier. Or, the contact could be pre-bent, just like the pre-bent contacts disclosed in Vinciarelli-218. Thus, I disagree that a skilled artisan would have understood that the Zeng-014 wrapped conductor process

presents “risks of damage.” There is no indication in Zeng-014 of this alleged “risk.” Dr. Phinney provides no citations to evidence to back up his assertion. Rather, Zeng-014 provides various ways to apply its wrapped contacts to a variety of products. For example, Zeng-014 states: “the connecting conductor wraps the electronic component body by one of a deposition process, a compression process, a lamination process, and an adhesion process.” Zeng-014, claim 25. Zeng-014 does not discuss any “risk” of “damage.”

49. In paragraph 162 of Ex. 2005, Dr. Phinney asserts that Vinciarelli-218’s adapters do not “rely upon wrapping, curving, or bending and can be directly applied onto the side edge bar codes.” But the adapters of course rely on curving and bending, but (and I think this is what Dr. Phinney meant) they are pre-bent before attachment to the modules. Again, if bending against the module (or components) presented any issue (and there is no evidence that the Zeng-014 process would not work as I describe) then either steps could be taken to reduce the bending force or the contacts could be pre-bent. A skilled artisan would know how to address these routine engineering issues.

50. Finally in paragraph 163 of Ex. 2005, Dr. Phinney recaps his previous arguments and states that soldering (as taught by Vinciarelli-218) would be “impractical” and that there is no motivation to use conductive adhesives (even though Zeng-014 teaches adhesives and conductive adhesives were known in the

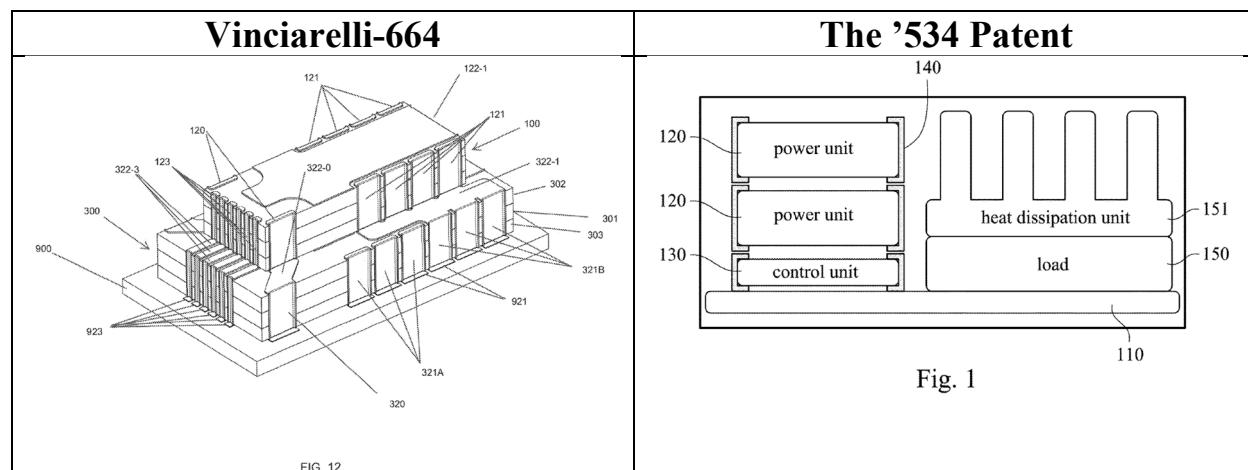
art). These statements contradict the objective evidence in the prior art. Dr. Phinney further opines that there could be “damage” caused by bending after soldering, but in the combination soldering (if needed at all) would be performed after bending, and not before. Dr. Phinney then argues that soldering after bending causes alleged issues, but none are explained. In the combination, the bent contacts would be attached in any number of ways, including the way that contacts are attached to the modules in Vinciarelli-218. Dr. Phinney does not explain why the Vinciarelli-218 attachment techniques would allegedly not work with the Zeng-014 conductors.

I. “Heat Considerations” Would Not Dissuade a Skilled Artisan From Stacking Power Converters

51. Vinciarelli-218 describes a cuboid form factor for a power converter and discloses embodiments of power converters that have heatsinks and embodiments of power converters that do not have heatsinks. A heatsink is helpful if a power converter generates more heat that it can adequately dissipate on its own. However, the amount of heat a power converter generates and the amount of heat the power converter can dissipate varies from design to design and environment to environment. The heat generated by a power converter, for example, is a function of the wattage of the power converter and its efficiency. A skilled artisan would consider the heat generation and the heat dissipation in deciding whether power converters could be stacked in a particular application.

Thus, “heat considerations” would not, as Dr. Phinney suggests, lead a skilled artisan to abandon the idea of stacking power converters.

52. In fact, there is objective evidence establishing that heat considerations **did not dissuade** those in the field from stacking power converters. First, Vinciarelli-664 specifically discloses stacked power converters. Second, one of the inventors of the '263 Patent is named on another patent, U.S. Patent No. 10,877,534 (Vicor-1022), that was originally filed in China on September 2, 2014, more than a year before October 9, 2015, which is the earliest priority date for the '263 patent. The '534 patent also discloses stacked power converters:



53. In the '534 patent, three components are stacked. A “control unit 130” and two “power unit[s] 120.” Each power unit is the heat generating portion of a power converter and yet the patent proposes stacking them. The '534 patent notes that heat dissipation is an issue to consider (and proposes optionally adding a heatsink to the top-most power module in the stack), but proposes stacking the

power modules anyway. Vicor-1022, 20:11-37, FIGs. 1, 26. Notably, the '534 patent does not suggest that its power modules have any unique features to make them stackable—other than the use of wrapped conductors. The disclosures in the '534 patent and Vinciarelli-664 thus confirm that a skilled artisan would have likewise expected to succeed in stacking Vinciarelli-218's power converters.

54. Dr. Phiney's statement (Ex. 2005, ¶172) that Vinciarelli-218's power converters "would have a problem with heat dissipation" is not supported by any record evidence. On the contrary, heat dissipation would be considered and managed as a part of routine engineering as evidenced by the lack of any noted difficulty or challenge in the description of stacking in the contemporaneous '534 patent and the prior art '664 patent.

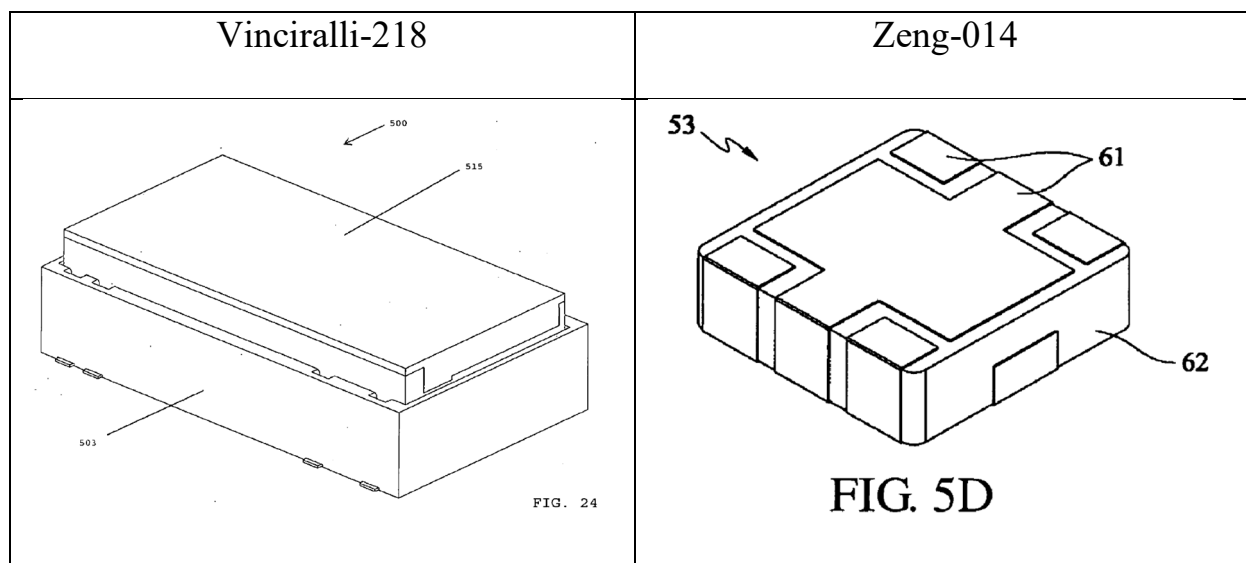
55. In fact, Vinciarelli-218 specifically discloses that heat generation and dissipation can be managed such that heatsinks are not needed: "In some applications it may be desirable to use the panel-molding process to produce components, such as power converters, without the flat heat sink surfaces (FIGS. 17-24, 25, 26), finned heat sinks (FIGS. 1, 10, 12, 15-16, 25, 26), or pinned heat sink (FIG. 25A) features described in the above embodiments." Vicor-1009, [0159]. Dr. Phinney states that "nearly the entirety of the specification [of Vinciarelli-218] is dedicated to heat dissipating devices." Ex. 2005, ¶172. All practical electrical devices have some "heat dissipation" and the question is how

much. Vinciarelli-218 teaches that heat sinks may or may not be needed depending on the application. Any suggestion by Dr. Phinney that the power converters in Vinciarelli-218 **require** heatsinks would be false (and I believe he is careful not to state this false fact) and contradicted by Vinciarelli-218's express disclosure of heatsink-less embodiments. Nothing in Vinciarelli-218 suggests that its power converters would run too hot to stack—particularly the embodiments that do not have heatsinks, which presumably dissipate less heat than those where heatsinks would be advisable.

56. Dr. Phinney also criticizes the stacking motivation on the basis that it allegedly “conflicts” with the motivation to decrease height. Ex. 2005, ¶172. There is no conflict. Using the wrapped conductors of Zeng-014 **reduces** the height of each individual power converter compared to using Vinciarelli-218 adapters. Moreover, while stacking devices obviously increases height relative to not stacking, it also substantially reduces another dimension, overall horizontal width, which in turn reduces how much board space will be occupied by circuit components. Minimizing board space is, and was at the time the ‘263 patent was filed, a well understood design goal in many electronic circuits, including power converters. Thus, a skilled artisan designing a circuit would weigh the competing benefits of stacking versus not stacking. In applications in which board space is

more of a concern than component height, a skilled artisan would be motivated to stack components rather than place them side by side.

57. In paragraph 173 of Ex. 2005, Dr. Phinney asserts that “providing a conductor atop (and below) Vinciarelli-218’s encapsulated device increases size and makes the device less flush.” This statement is incorrect. Dr. Phinney compares a module without adapters to a module with Zeng-014’s contact wrapping. This is the wrong comparison because to be usable, the Vinciarelli-218’s modules need contacts. Thus, the proper height comparison is between a module with a flush mount adapter and a module with Zeng-014’s wrapped conductor. The proposed combination actually **reduces** the height of a module when compared to a module with Vinciarelli-218’s adapters. This is because the flush mount adapters have height and width beyond the thickness of the metal contacts. Thus, in the combination this height and width are removed allowing the wrapped module to be reduced in height and width as compared to the Vinciarelli-218 modules with adapters.



58. In paragraph 176 of Ex. 2005, Dr. Phinney asserts that I do not “address why a POSITA would make a device that increases height through extra lead-frames atop and the bottom of the structure.” First, I am not proposing “extra” lead-frames. As noted above, Vinciarelli-218 requires some type of external connection structure to allow it to make external electrical connections. A skilled artisan considering ways to improve Vinciarelli-218 would have reason to replace Vinciarelli-218’s relatively thick single-sided connection adapters with the relatively thin double-sided contact wrapping of Zeng-014 to reduce module height. The skilled artisan would also have been motivated by the added benefit of making a device capable of stacking, which may substantially reduce board space, which is desirable in many applications. (Note that the device stacked on top of the modified Vinciarelli-218 device need not be identical to the lower device in the stack. For example, the upper device could be substantially shorter than the

modified Vinciarelli-218 device, and thus contribute relatively little additional height while saving substantial board space).

59. In paragraph 176 of Ex. 2005, Dr. Phinney asserts that a skilled artisan would not stack because stacking “would cause heat to get trapped on the lower devices.” This statement is not supported by any analysis or explanation and is a blanket statement without technical merit. Heat would not get “trapped.” On the contrary, heat would continue to dissipate through air conduction along the sides of the unit and heat would continue to dissipate through the bottom of the device into a lower device or into the printed circuit board. For example, Vinciarelli-218 states:

A thermally conductive material **901**, e.g. thermal adhesive, may be applied between the PCB **900** and the module heat sink **602** to facilitate removal of heat through the PCB **900**. Additionally, the PCB surface may include thermally conductive features to conduct heat away from the module **615**.

Vicor-1009, [0132]. Thus, just as the PCB 900 may conduct heat away from the module, so may the outer wrapping on the wrapped upper stacked module (which would, like most electrical conductors such as copper, also be thermally conductive) act to conduct heat away from the lower module.

60. In fact, the thermal conductivity of the wrapped contacts on the upper unit would be greater than the air. The heat generation of each of the stacked units would have to be taken into account and managed such that the thermal

conductivity of the stacked units could help dissipate the heat generated by adjoining units, but it is not true that heat would get “trapped” in the lower units in a properly designed system. Such design considerations were well within the level of ordinary skill in the art. This fact is confirmed by the disclosure of power converter stacking in both Vinciarelli-664 and the '534 patent.

J. No “Extra” Manufacturing Steps

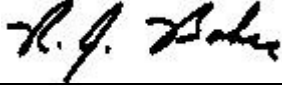
61. In paragraph 199 of Ex. 2005, Dr. Phinney asserts that “Petitioner’s combination requires added connective adaptors (and manufacturing steps).” In the combinations of Grounds 2 and 3 I am not aware of any additional manufacturing steps. The adapters of Vinciarelli-218 are not used in the combination and the Zeng-014 wrapped conductors require fewer manufacturing steps than the more complex adapters shown in Vinciarelli-218 (which involve manufacture of more than just bent contacts).

III. ADDITIONAL REMARKS

I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false

statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code.

Dated: March 24, 2025 By: 
R. Jacob Baker, Ph.D., P.E.