UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VICOR CORPORATION,

Petitioner,

v.

DELTA ELECTRONICS, INC.,

Patent Owner.

PTAB Case No. IPR2024-00715

U.S. Patent No. 10,877,534

PATENT OWNER'S PRELIMINARY RESPONSE

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EXHIBIT LIST

Exhibit No.	Description
2001	Declaration of Dr. Joshua Phinney ("Phinney")
2002	Curriculum Vitae of Dr. Joshua Phinney
2003	U.S. Pat. App. Pub. No. 2012/0014069 to Zeng et al.
2004	U.S. Pat. App. Pub. No. 2012/0327604 to Yang et al.
2005	Excerpts from the prosecution history of U.S. Pat. App. No. 14/840,063 to Zeng ("'063 Application")
2006	English translation of Chinese Pat. App. No. CN201410442972 ("CN972")
2007	J. Phinney, *Multi-resonant Passive Components for Power Conversion* (Doctoral Thesis, Massachusetts Institute of Technology, Oct. 2005) ("Phinney Thesis")

I. INTRODUCTION

Vicor Corp. ("Vicor" or "Petitioner") challenges claims 13-19 (the "Challenged Claims") of U.S. Patent No. 10,877,534 ("the '534 Patent") (VICOR-1001) under six grounds in its petition for *inter partes* review ("Petition"). Delta Electronics, Inc. ("Delta" or "Patent Owner") hereby submits its preliminary response to the Petition.

Ground	Claims	Statutory Basis	Applied References
1	13-19	Obvious	Vinciarelli-218 and Zeng-014
2	13-15, 17, 19	Anticipation	Park
3	13-15, 17, 19	Obvious	Park and Jun
4	13-15, 17, 19	Obvious	Vinciarelli-218 and Park
5	13-19	Anticipation	Vinciarelli-664
6	13-19	Obvious	Vinciarelli-664

Petitioner has presented an excessive number of grounds against the '534 Patent's claims across two petitions using the same art, warranting discretionary denial under 35 USC §§ 314(a) and 316(b). In total, there are 14 separate grounds, each challenging substantively similar independent claims using the same art. When there is new art, Petitioner presents a weak priority argument that attempts to give the '534 Patent a later priority date. But this is defeated by a figure of the '534 Patent that Petitioner overlooked. Moreover, many of Petitioner's grounds rely on a discrete component of an inductor (Park) that are objectively baseless.

Discretionary denial is appropriate.

Petitioner's grounds fail on the merits.

For Ground 1, Petitioner provides no motivation to combine Vinciarelli-218[1] and Zeng-014[2]. First, there is no motivation to combine Vinciarelli-218's device with Zeng-014's pin connectors because they are incompatible with Vinciarelli-218's encapsulated device. Second, a POSITA would not have been motivated to modify Vinciarelli-218's encapsulated modules to become stacked modules because doing so would go against Vinciarelli-218's teachings. Third, a POSITA would not have been motivated to use Zeng-014's pin connectors instead of Vinciarelli-218's because a POSITA would have been motivated to use Vinciarelli-218's connectors instead. Finally, all of Petitioner's motivations are superficial and ring hallow. Ground 1 thusly fails.

Ground 2 presents Park (a reference that teaches an inductor) in a maze of alternative (and failed) reads. Principally, Park is just an inductor, so it fails to teach a "power supply apparatus," "bearing plate," and "insulation material."

[1] United States Patent Application Publication No. 2014/0355218 to Vinciarelli et al. ("Vinciarelli-218") (VICOR-1006).

[2] United States Patent Application Publication No. 2009/0175014 to Zeng et al. ("Zeng-014") (VICOR-1007).

Petitioner argues that Park's inductor (or its internal substrate) is a "bearing plate," but this fails because the bearing plate bears components (it is not the component itself). Moreover, Petitioner argues that the inductor's magnet is an insulation material, but this does not comport with the claims which require that the insulation material is formed on the substrate. Park does not anticipate the claims and Ground 4 fails.

For Ground 3, Petitioner relies on obvious of Park[3] but Park alone or in combination with the other prior art reference (Jun[4]) does not cure any deficiencies in Ground 2. Rather, its reliance on Jun goes to secondary limitations.

For Ground 4, Petitioner recycles references from Grounds 1-3 and relies on the combination of Vinciarelli-218 and Park. There is, however, no motivation to combine. They have entirely different manufacturing processes that are incompatible with each other given that one is a panel-molded power-converter assembly and another is a component. In Park, paste is used for its conductor that must undergo a sintering or curing process. Sintering would melt Vinciarelli-218,

[3] United States Patent Application Publication No. 2015/0116891 to Park et al. ("Park") (VICOR-1009).

[4] United States Patent Application Publication No. US2005/0098874 to Jun et al. ("Jun") (VICOR-1012).

while curing would lessen Vinciarelli-218's conductivity. Further, like Ground 1, Petitioner modifies Vinciarelli-218 to be a stacked device. A POSITA would not have made this combination.

For Grounds 5-6, Petitioner relies on Vinciarelli-664 [5] as prior art. Vinciarelli-664, however, is not prior art. Petitioner argues that the claims are unsupported because a conductive pin is not described in the specification as touching both sides of a bearing plate. Petitioner, however, overlooked the disclosure of the '534 Patent that depicts this claim feature (e.g. Fig. 26 of the '534 Patent and Figs. 37-40 of CN972.

Provided below is further detail.

II. The '534 Patent

The '534 Patent is directed to improvements to the design and manufacture of internal structures of a power supply apparatus. *See generally* '534 Patent. At the time of the invention, long-felt need existed for improving data processing performance by higher power pressure and efficiency. '534 Patent, 3:15-23.[6] In

[5] United States Patent No. 10,264,664 to Vinciarelli et al. ("Vinciarelli-664") (VICOR-1010).

[6] "The power pressure (Pp) equals to PO/S" where Po is the power supplies power and S is the horizontal area. '534 Patent at 1:63-2:2.

light of this need, the Inventor developed a cost-effective solution - by increasing the number of power units that can fit in the power supply apparatus. *Id.*, 3:15-23. This inventive stack structure ensures high power pressure and efficiency, thereby enhancing data processing performance. Phinney, ¶40.

The ’534 Patent recognized the growing need of data processing that relies on the support of large-scale data centers. ’534 Patent, 1:21-28. A key component of the data center is the server, which includes data processing chips and power supply mounted on the same main board. *Id*., 1:29-43. Along with the ever-improving processing capability of the data processing chips, their power consumption and footprint within the server also increase. *Id*. As a result, the main board power supplies are “expected to exhibit greater efficiency, higher power density and more compact volume, so as to realize the energy-saving of the whole server.” *Id*. Power density is quantified as “power pressure,” which is the power provided by power supply over unit horizontal area. *Id*., 1:60-62. In other words, power density is directly proportional to the amount of power provided and inversely proportional to the area occupied by the power supply. Phinney, ¶41.

“The following relationship between the power pressure (Pp) and the height (H) could be derived: the greater the H, the greater the Pp.” *Id*., 2:4-7. It was noted that “the space above the main board power supply” for certain servers “is not adequately utilized.” *Id*., 19-22. Conventionally there were two general ways of

manufacturing main board power supplies but both present difficulties of utilizing the full height. Phinney, ¶¶42-45; *see* '534 Patent, 2:23-32 (implementing individual power supply components with uneven heights on main board degrades heat handling), 2:33-47 (implementing packaging technique that improves power density but requires the lowering the height of the main board).

The '534 Patent addresses the deficiencies of existing power supplies and presents a solution that "deals with both the power pressure and the efficiency" by developing "a stacked structure so that the height of the power supply can be properly utilize[d]." '534 Patent, 3:10-23. As shown in Fig. 1 of the '534 Patent, the stacked power supply includes multiple power units and a control unit stacked on a main board. '534 Patent, 4:8-36. Each power unit includes pins for electrically coupling to an adjacent power and/or control unit. Specifically, as shown in annotated Fig. 1 of the '534 Patent reproduced below, a control unit 130 is mounted on mainboard 110, and two power units 120 are stacked and mounted on the top surface of control unit 130. The height of the package is fully or optimally utilized, as indicated by the respective heights H and h of the stacked power supply and the power supply package. *See* '534 Patent, 4:1-7, 4:66-5:5, 17:63-67, Figs. 1, 4, 7-10, 17-20, 23-24, 26-27. Phinney, ¶46.

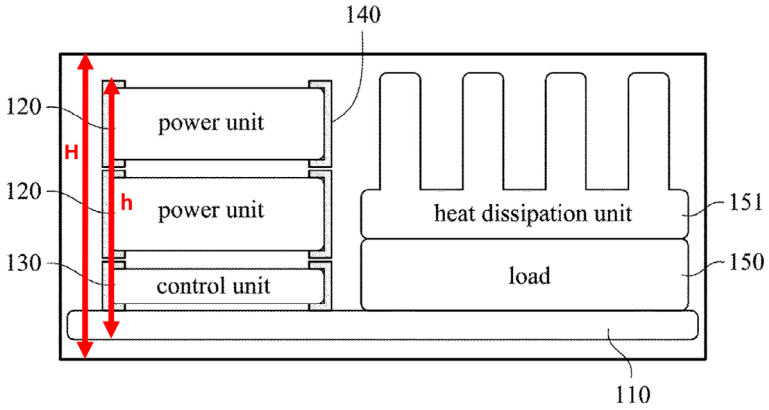


Fig. 1

Annotated ’534 Patent Fig. 1

The novel stacked structure in the ’534 Patent “accomplishes both the high power pressure and high efficiency” and advances the field of power supply design and manufacture. Phinney, ¶47. The ’534 invention demonstrated that “the height of the power supply can be properly utilized so that a smaller floor space can be realized when the volume is fixed.” ’534 Patent, 4:1-7.

As discussed below in §V, Petitioner’s proposed invalidity grounds failed to appreciate these aspects of the claimed solutions in the ’534 Patent. The structural features of the above designs are recited in the exemplary claims and figures (e.g., Fig. 25 with annotations). Phinney, ¶48-52.

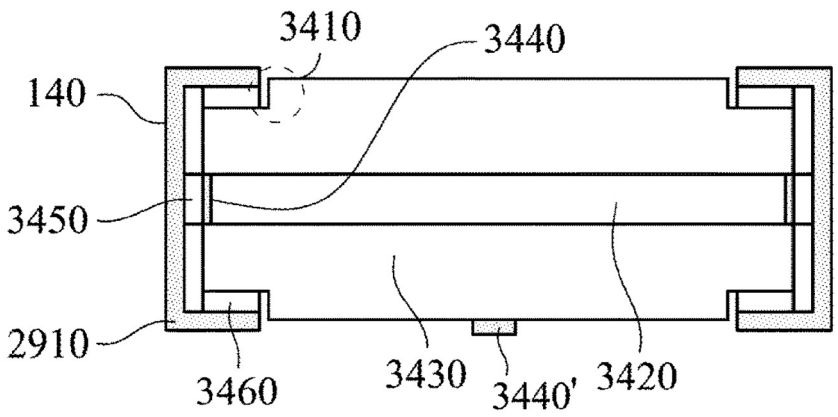


Fig. 25

Annotated ’534 Patent Fig. 25

Claim 13 is provided below, with Vicor’s organization of clauses, i.e., [13pre]-[13c]:

> [13pre] A power supply apparatus, comprising:
>
> [13a] a bearing plate;
>
> [13b] insulation material formed on two opposite surfaces of the bearing plate; and
>
> [13c] at least one pin electrically connected to the bearing plate and contacting at least part of the insulation material, wherein the pin covers at least part of a lower surface, at least part of an upper surface of the insulation material and at least part of two lateral sides of the bearing plate.

Claim 17 is also provided below, with Vicor’s organization of clauses, i.e., [17pre]-[17c]:

> [17pre] A power supply apparatus, comprising:
>
> [17a] a bearing plate;
>
> [17b] insulation material formed on two opposite

surfaces of the bearing plate; and

> [17c] at least one pin electrically connected to the bearing plate and contacting at least part of the insulation material, wherein the bearing plate is embedded in the insulation material to form a cuboid body, and the pin covers at least part of a lower surface, at least part of an upper surface and at least part of two lateral sides of the cuboid body.

III. Claim Construction

In IPR proceedings, the Board construes claims in accordance with their ordinary and customary meaning as understood by one of ordinary skill in the art. 37 C.F.R. § 42.100; *see also Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). At this preliminary stage and because inadequacies of the Petition can be described without construction, Patent Owner offers no construction. Patent Owner reserves the right to offer construction should the Board institute review.

A person of ordinary skill in the art ("POSITA") in September 2014 would have had Bachelor's degree in electrical engineering or a related field, and two or more years of work experience or research related to power engineering, 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.

Dr. Phinney was at least a POSITA in the field of technology of the '534 Patent, is familiar with U.S. patent law, and is therefore qualified to opine on what

POSITAs would have known and understood as of September 2014 to form the basis of his analysis and opinions. Phinney, ¶¶1-16, 35-39, 53-55.

IV. The Board Should Exercise Its Discretion To Deny The Petition.

The Board should exercise its discretion to deny the Petition under 35 USC §§ 314(a) and 316(b).

Petitioner has presented an excessive number of cumulative grounds against the '534 Patent's claims (which are fairly short in length). IPR2024-00706 provides 8 separate grounds against the independent claims (with 6 grounds attacking independent claim 1). IPR2024-00715 provides 6 separate grounds against substantially identical independent claim 13. In both Petitions, Petitioner presented substantially the same art.

Petitioner rationalized the need for further grounds and a separate petition stating that a different priority date was being used. Petitioner, however, only identifies a single piece of prior art being used in IPR2024-00715 (Vinciarelli-664) that relies on a different priority date. Nonetheless, this ground lacks merit as the allegedly missing feature is present in the figures.

Everything else from Petitioner is redundant or cumulative. Indeed, the analysis for IPR2024-00706 and IPR2024-00715 appears substantively copy / pasted on claims that are substantively similar (and short in length).

Finally, a larger percentage of Petitioner's grounds objectively lack merit

and should not have been brought in the first instance. For instance, Grounds 4-8 of IPR2024-00706 and Grounds 2-4 of IPR2024-00715 rely on Park, which is an inductor reference. As described herein, Petitioner identifies Park's inductor as being the power supply apparatus, the bearing plate, and the inductor's magnet which is an internal component as the insulating material for the inductor. Petitioner's Park-based grounds are objectively weak and confusing; they waste the Board's resources.

A large portion of grounds lack merit, and this warrants denial as to the whole of IPR2024-00706 and IPR2024-00715. *See, e.g., Adaptics Ltd. v. Perfect Co.,* Case IPR2018-01596, Paper 20 (March 6, 2019) (stating that the Board can deny rather than institute the entire petition under *SAS Institute* when there are a significant number of excessive grounds that lack merit).

V. The Challenged Claims Are Patentable

A. Ground 1 Fails to Present a Reasonable Likelihood of Success

As described below, Petitioner fails to present a reasonable likelihood of success in its Vinciarelli-218 and Zeng-014 combination. Phinney, ¶186.

Petitioner provides no motivation to combine these references. First, a POSITA would not have been motivated to modify Vinciarelli-218's encapsulated modules to become stacked modules. Second, there is no motivation to combine with any of Zeng-014's embodiments because the pin connection of Zeng-014's

embodiments are incompatible with Vinciarelli-218's encapsulated device. Third, a POSITA would not have been motivated to use Zeng-014's pin connectors instead of Vinciarelli-218's; a POSITA would have been motivated to use Vinciarelli-218's connectors instead. Finally, all of Petitioner's motivations are superficial and ring hallow. Phinney, ¶186.

1. Petitioner's Combination of Vinciarelli-218 and Zeng-014 Does Not Result in Limitations [13c] and [17c] Being Met

Petitioner's combination of Vinciarelli-218 and Zeng-014 fails to meet at least the limitations of [13c] (and substantively similar [17c]) for the following reasons. Phinney, ¶187. [13c] (and substantively similar [17c]) requires that "the pin covers at least part of a lower surface, at least part of an upper surface of the insulation material." As shown, for example in Fig. 11B and Fig. 12B of Zeng-014 below, the conductive layer 112/123 (red) does not extend over or onto a lower surface (purple) of the magnetic material substrate 111/125. For similar reasons, conductive layers 113, 117, and 118 do not extend over or onto a top surface of the substrates. Therefore, the combination of Vinciarelli-218 and Zeng-014 cannot teach or suggest "the pin covers at least part of a lower surface, at least part of an upper surface of the insulation material" (even if present). *Id*.

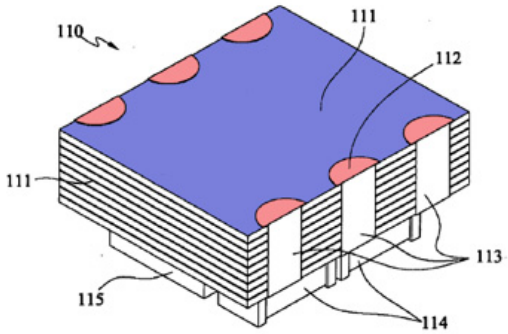


FIG. 11B

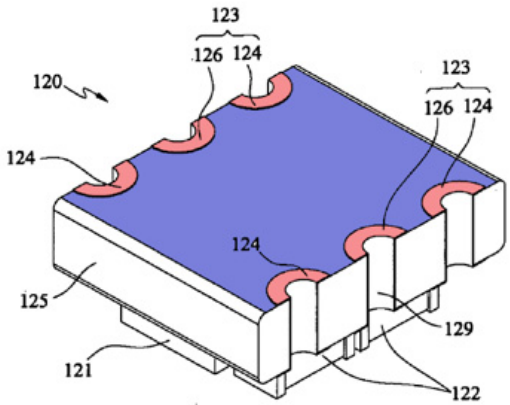


FIG. 12B

Annotated Zeng-014 Fig. 11B and Fig. 12B

As such, both [13c] and [17c] are not taught by Petitioner's combinations. Ground 1 fails to present a reasonable likelihood of success.

2. A POSITA Would Not Have Been Motivated to Stack Modules in Vinciarelli-218

A POSITA would not have been motivated to make Vinciarelli-218 a stacked module (with connectors on the upper/lower surface) as opposed to a device as only having downward terminals. Petitioner presents no valid rationale to change the entire nature of Vinciarelli-218's device (and ignores the drawbacks of such a device). Petitioner's modification is hindsight bias. Phinney, ¶188.

Petitioner contends that a POSITA would have been motivated to modify Vinciarelli-218 to use Zeng-014's conductor scheme for "enabling additional electronic components to be stacked on." Petition at 16. Not all electronic components are suitable for being stacked for reasons such as package height

constraints and poor heat dissipation. Phinney, ¶¶58, 189. Indeed, Vinciarelli-218's modules are restricted by these factors as directed to singular module having heatsinks on its top and bottom and a POSITA would not have been motivated to stack electronic components on Vinciarelli-218's encapsulated power converter or module. Petitioner did not provide a plausible rationale (other than using the claims as a guide). Phinney, ¶¶59, 189.

Vinciarelli-218 dissuades a POSITA to look at Petitioner's proposed combination as Vinciarelli-218's embodiments require heat sink panels, such as flat heat sink surfaces, finned heat sinks, or pinned heat sink. Vinciarelli-218, ¶¶82-83, 87-105, 119-123, 128, 131-139, 153-157, Figs. 1, 10, 12, 15-16, 17-26; Phinney, ¶¶60-61, 189. Having heat-sinks on the upper surface makes it so that the devices cannot be stacked.

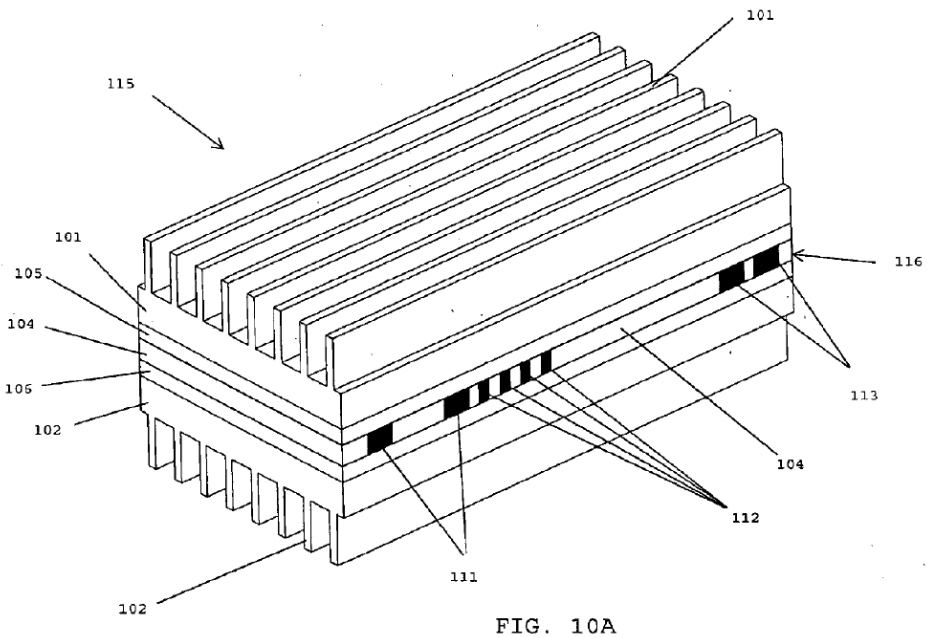


FIG. 10A

Vinciarelli-218 Fig. 10A

Vinciarelli-218 does teach heatsink-less modules, but their purpose was to reduce height (while Petitioner's stacking combination increases height). Vinciarelli-218, ¶159 ("[i]n 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."); Vinciarelli-218, ¶135 ("[a]s internal components are reduced in height, e.g. reducing the thickness of the magnetic core, the depth of the interior cavity may be decreased bringing the heat sink panels closer together, reducing the encapsulant thickness and the resulting module thickness."). Phinney, ¶¶62-63, 189. Petitioner's suggestion to stack the heatsink-less modules increases their height, defeating the purpose of providing the heatsink-less modules. Again, a POSITA would not have done this.

In addition, stacking singular modules 815 would have exacerbated heat dissipation, demonstrating further lack of motivation to arrive at a stacked module. Vinciarelli-218 does not state that its heat-sinkless singulated module 815 is modified to produce less heat than the other modules in the heat-sink embodiments. Phinney, ¶¶64, 189. Rather, removing the heat-sink from singulated module 815 makes it more susceptible to problems caused by poor heat dissipation. Phinney, ¶¶65, 189. Stacking additional electronic components, or even singular modules 815 on top of a singulated module 815 would further block

air flow (e.g., hot air will be trapped between opposing surfaces of two stacked modules), reduce thermal transmittance, and exacerbate the heat dissipation problem, which in turn leads to poor device performance and even hazardous conditions. *Id*. A POSITA would not have provided this stacking modification which exacerbates heat problems when Vinciarelli-218's disclosure is focused on heat dissipation with heat sinks.

Petitioner's rationale for having stacked modules falls short. The Petition alleges that "[s]ince Vinciarelli-218 discloses a component that is a DC-DC power converter module," "a skilled artisan would have been motivated to stack input or output capacitors onto the power converter module to save space." Petition at 21-22. Simply having more electronic components instead of a singular package does not increase power density as more elements could be fitted into a singular package (as opposed to stacked package). Phinney, ¶¶66, 189. The purpose of putting electronic elements into one package to form a power module is to improve integration and power density, and reduce device footprint. Vinciarelli-218 already discloses putting input and output capacitors ***inside*** the module. Vinciarelli-218, ¶¶82, 143, 145, 148, 150, 153. Phinney, ¶¶66, 189. These input/output capacitors are the exact same "input or output capacitors" the Petitioner suggested to stack on top of Vinciarelli-218's module. A POSITA would not put some elements in the package but leave some outside when

Vinciarelli-218 teaches placing and encapsulating them within the package. A POSITA would not have stacked capacitors on Vinciarelli-218's modules because doing so would decrease the power density and increase the overall dimensions of an apparatus. Phinney, ¶¶66, 189.

In contrast to Vinciarelli-218, a stacked device is required by the challenged claims because they require an SMD pad on both the bottom and top surfaces. '534 Patent at 21:28-29, 22:12-14. If a POSITA had no motivation to make a stackable device (which it does not as described above), there would be no reason to add an SMD pad on both the top and bottom surfaces of Vinciarelli-218. Phinney, ¶¶67, 189. This is moreover true when providing a stacked device requires difficult manufacturing processes that result in errors and lower yields, as described in the sections that follow.

Petitioner fails to demonstrate that a POSITA would have been motivated to combine the teachings of Vinciarelli-218 and Zeng-014 to realize a device that achieved all of the features of independent claims 13 and 17. Petitioner's disregard of fundamental differences between Vinciarelli-218 and Zeng-014's devices render Ground 1 fatally deficient, and institution should be denied. Phinney, ¶190.

3. A POSITA Would Not Have Been Motivated to Combine Vinciarelli-218 and Zeng-014's Pins to Arrive at [13c] and [17c]

Petitioner has not presented a viable motivation to combine Vinciarelli-218

and Zeng-014. Petitioner relies on 3 separate embodiments of Zeng-014 in attempts to arrive at [13c] (and substantively similar [17c]). Petition at 16; Phinney, ¶191.

There is no motivation to combine using any of Zeng-014's embodiments because the pin connection of Zeng-014's embodiments are incompatible with Vinciarelli-218's encapsulated device. The Petition unreasonably proposes incorporating Zeng-014's teachings as an inferior alternative to solutions already discussed 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. Phinney, ¶192. Moreover, several other embodiments (e.g., Figs. 11A-G, 12A-D) bear zero resemblance to the claims. Petitioner's attempt to recreate the claims of the '534 Patent uses the claims as a guide which is impermissible hindsight bias; no reasonable motivation for making Petitioner's combination is presented in Zeng-014 (or Vinciarelli-218). Each of the embodiments Petitioner relies upon (Figs. 11, 12, and 4) are described in turn below. Phinney, ¶192.

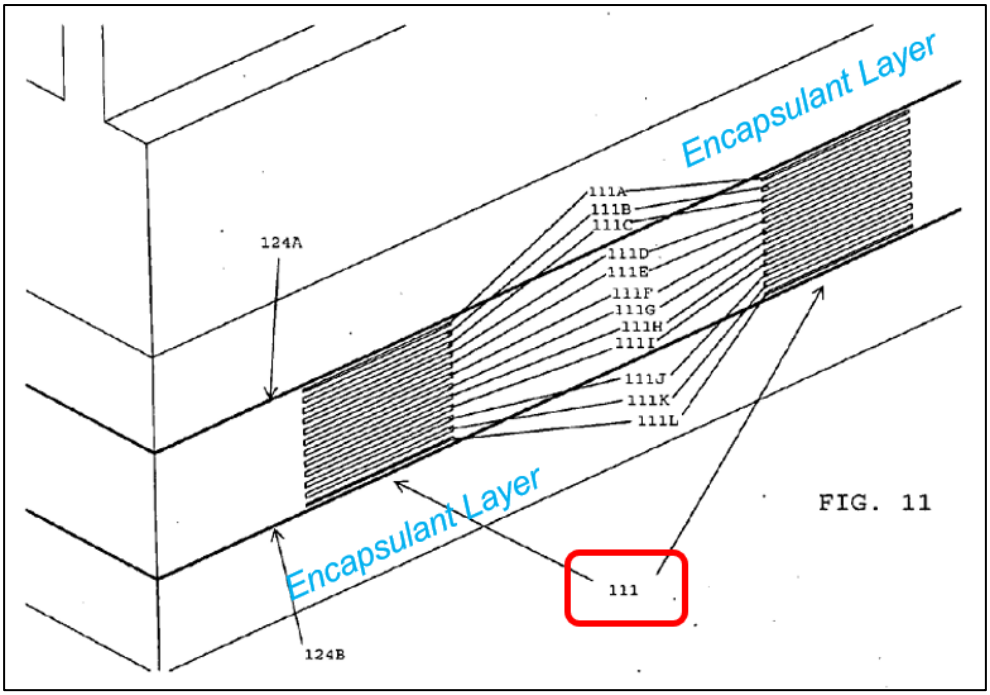
a. Zeng-014's Lead Frame Wrapping is Not Suitable for Vinciarelli-218's Modules

A POSITA would not have combined Vinciarelli-218 and Zeng-014 because their techniques are incompatible. Phinney, ¶193.

Vinciarelli-218 discloses interconnection features that are disposed on the

side edges of its encapsulated module's PCB ("bar codes") and exposed through panel singulation. The idea of Vinciarelli-218's disclosure exists in a molding process that starts with a panel of un-singulated power converters, later singulated to produce many individual power converter modules. *See* Vinciarelli-218 at Title ("PANEL-MOLDED ELECTRONIC ASSEMBLIES"), Abstract, [0085]-[0087] ("The panel molding process may be used to produce a multiplicity of modules at a time."). Phinney, ¶¶194-195.

Vinciarelli-218's molding process covers the top and bottom surfaces of the panel (and its modules) with encapsulant. Vinciarelli-218 at ¶87 (describing a mold cavity that "may be filled at least in part by an encapsulant encapsulating the surfaces of the PCB panel 124 and the electronic components on the PCB panel 124."). As a result of this molded encapsulant, the interconnection features for each individual module are necessarily located along the side edges of its PCB. Phinney, ¶¶195-196. 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, ¶107. Specifically, these interconnection features are described as "bar codes", with multiple conductive strips arranged vertically along the edge of the PCB. *Id.*, ¶108, Fig. 11 (annotated and reproduced below).



Annotated Vinciarelli-218 Fig. 11

Vinciarelli-218 provides solutions to the need to connect to the bar codes' small footprint. Within its own four corners, 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, ¶160; *see also id.*, ¶¶112-133, Figs. 13-26, 35 (selectively reproduced below). Phinney, ¶197.

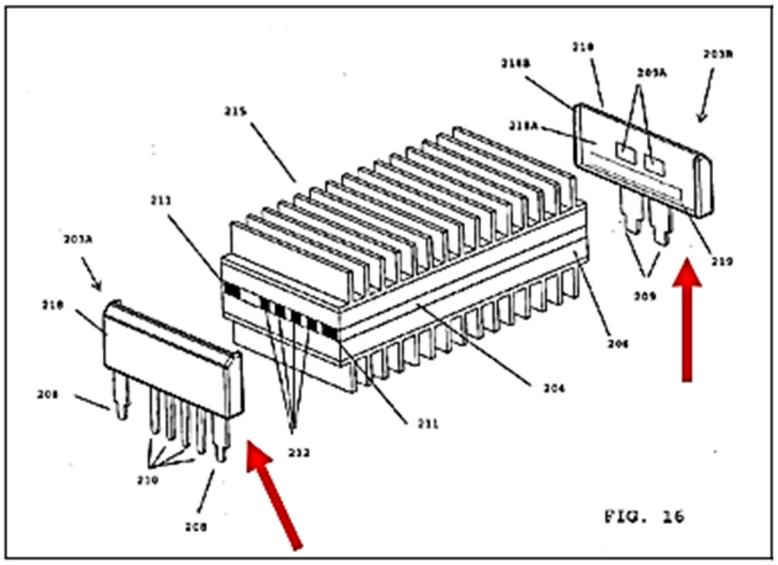


FIG. 16

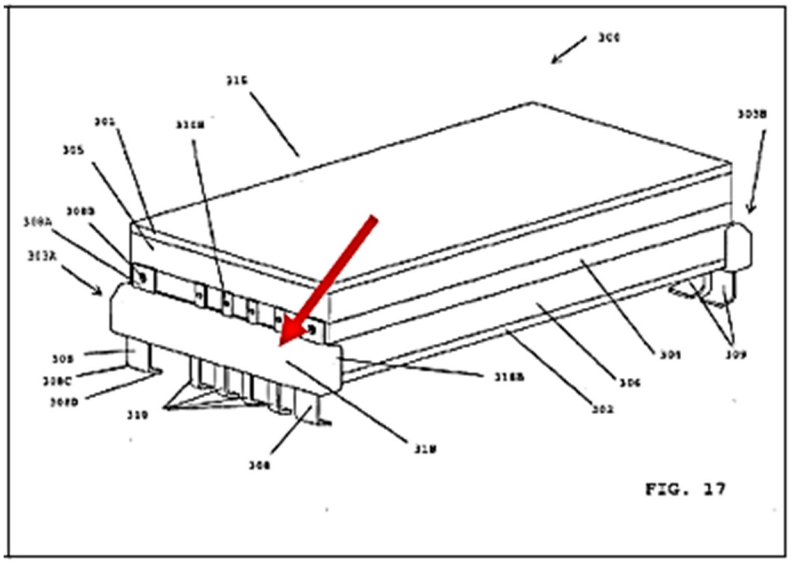


FIG. 17

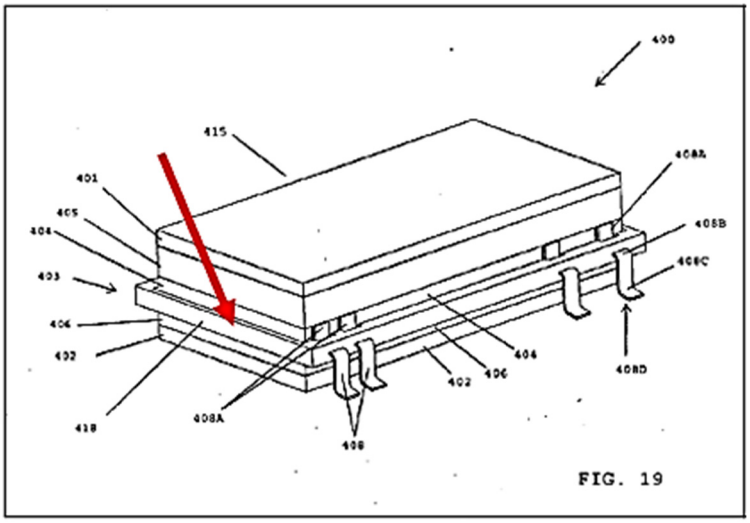

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FIG. 19

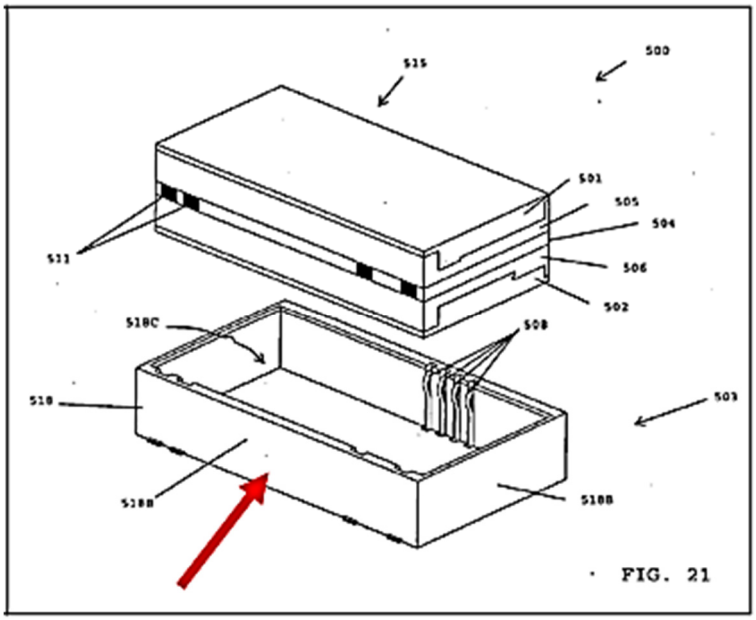
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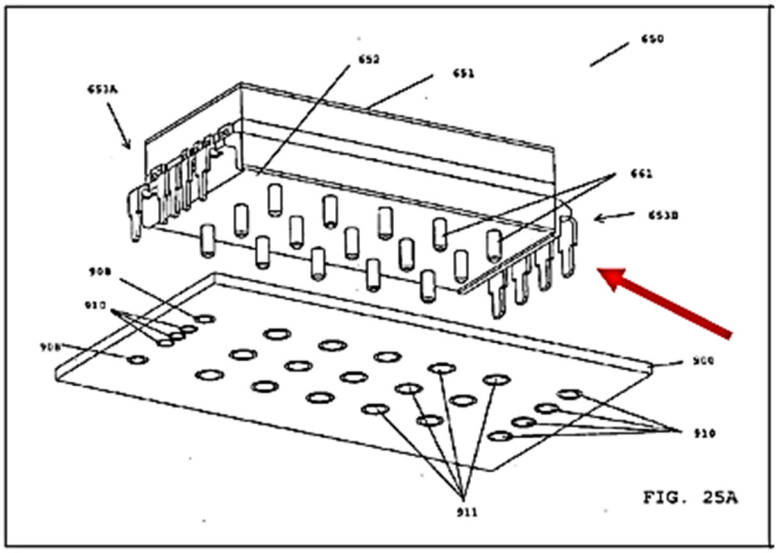
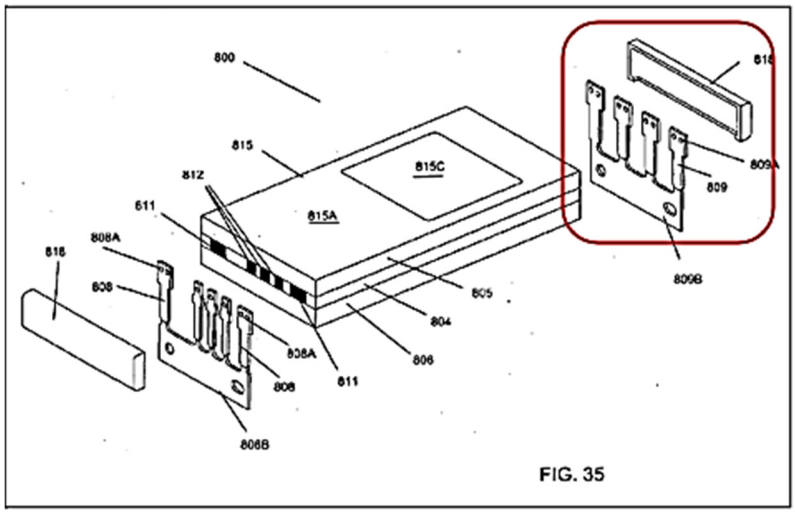
FIG. 21





Annotated Vinciarelli-218 Figs. 16, 17, 19, 21, 25A, and 35

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." Vinciarelli-218, ¶116. 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." Vinciarelli-218, ¶124. 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. Vinciarelli-218, ¶158160, Figs. 33-35. Vinicarelli-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.*; Phinney, ¶¶198-199.

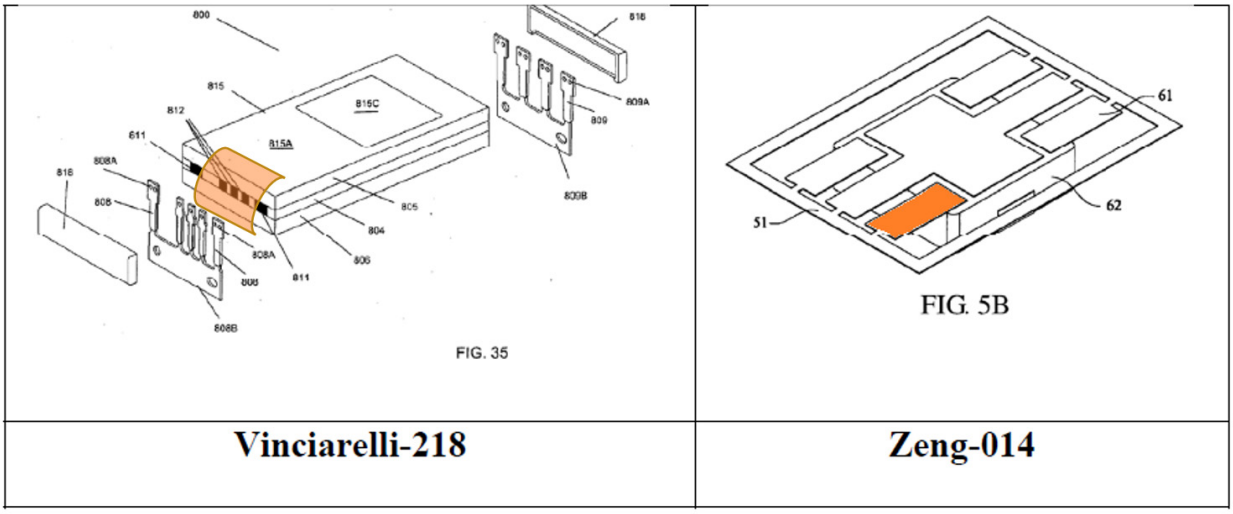
A POSITA would readily appreciate that the wide variety of these adapters are well-suited for providing electrical contact to the small bar codes, while also providing versatility to different customer needs. Phinney, ¶¶200-201; *see, e.g.*, *id.*, ¶132. Importantly, the POSITA would also have their concerns regarding the usability of the small bar codes, introduced in the first portion of Vinciarelli-218, assuaged by these adapter solutions, disclosed in the second portion of Vinciarelli-218. Phinney, ¶¶200-201.

Given this, Petitioner's argument that Zeng-014's lead frame wrapping should be incorporated into Vinciarelli-218 to electrically connect to the bar codes is unreasonable. Phinney, ¶202.

Specifically, Petitioner's imagined 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 at 73 (emphasis added). Petitioner further explains that "the lead frame in Zeng-014 . . . would be ***curved over module 800 from the bottom to the top***" to replace Vinicarelli-218's adapters. Petition at 73-74. Petitioner justifies this imagined combination based upon Vinciarelli-218's general disclosure of press-fit and flush-mount adapters. *See id.* at 71-72. Petitioner concludes that this exercise would be "a simple mechanical modification." *Id*. at 74; Phinney, ¶203.

To the contrary, a POSITA would immediately recognize that curving and wrapping a lead frame like Zeng-014 would fail to reliably establish and maintain electrical contact with the PCB side edge bar codes of Vinciarelli-218. Phinney, ¶204. The portions of the lead frame bent from the bottom (or top) onto Vinciarelli-218's module's side surface would retain a degree of bow and bend, never perfectly flush. Phinney, ¶¶205-206. From this bowing and bending, there would be a sizable gap between the lead frame contact and the side edge bar codes of Vinciarelli-218. *Id.* Further, a POSITA would have understood that the most bend or bowing in the contact of Vinciarelli-218 would occur close to the middle portion of the lead frame, where the exposed interconnects are located between the encapsulant layers. This gap would cause faulty electrical connections because electrical connections require direct metal-to-metal contact. *Id*.



Annotated Vinciarelli-218 Fig. 35 and Zeng-014 Fig. 5B

Therefore, a reasonable POSITA would also recognize that Zeng-014's lead frame wrapping is not well-suited for targeting Vinciarelli-218's bar codes. Phinney, ¶207.

Furthermore, curving and wrapping a lead frame like Zeng-014 would also lead to yield issues due to the dimension differences between Vinciarelli-218's exposed interconnects. Phinney, ¶208. In the Petitioner's combination, contacts with different widths would have to be used for Zeng-014's lead frame 61 to accommodate the different sizes of Vinciarelli-218's exposed interconnects 811 and 812. A POSITA would have known that narrower metal sheets are easier to bend than wider metal sheets, simply because less material needs to be deformed for the narrower metal sheets. *Id.* When bending metal sheets with different widths, the same exerted force could have fully deformed the narrower metal

sheets whereas the wider metal sheets are likely not yet fully deformed.

This would not be an issue for Zeng-014, because its contacts share similar widths, and therefore would experience similar deformation progress. *See* Zeng-014, Figs. 4B and 4C. However, this becomes an issue for Vinciarelli-218 because its exposed interconnects have different widths. *See* Vinciarelli-218, Figs. 10A, 10B, 16, 18, and 35. Applying the process of curving and wrapping a lead frame like Zeng-014 in Vinciarelli-218 would have caused yield issues in Vinciarelli-218's device because of the different degrees of formation between conductors of different widths, resulting in yield issues. Phinney, ¶¶209-210.

In contrast, Vinciarelli-218's own adapters/connecters do not suffer from such bowing and imprecision as Zeng-014's lead frame wrapping would if it were applied to Vinciarelli-218. Phinney, ¶¶211-213. None of Vinciarelli-218's adapter/connecters rely upon wrapping, curving, or bending, and can be directly applied onto the side edge bar codes. *Id*. For instance, terminal portions formed from a lead frame are directly soldered to a heat-sink-less module's side edge bar codes. Vinciarelli-218, ¶160, Fig. 35; Phinney, ¶¶211-213. By being attachable directly at the location of side edge bar codes, Vinicarelli-218's own adapters/connecters are superior in establishing and maintaining electrical connection. Phinney, ¶¶211-213.

b. Zeng-014's Figs. 11 and 12 Embodiments Bear No Resemblance to the Claims and Provide No Motivation

Furthermore, Petitioner's reliance on Zeng-014's Figs. 11 and 12 embodiments fails because they bear no resemblance to the claims, and even if motivation were assumed to exist (which it does not) they do not arrive at the claims. Phinney, ¶214.

Claim's [13c] limitations require that the pin covers "at least part of two lateral sides of the bearing plate." Phinney, ¶215.

In attempts to arrive at the claimed configuration, Petitioner takes Vinciarelli-218's device and applies Zeng-014's pins from Figs. 4A-4D and 11-12. Petition at 16. However, neither embodiments described in these figures meet all of limitation [13c]. Phinney, ¶¶216-225. Zeng-014's embodiment of Figs. 4A-4D failed to disclose "one pin electrically connected to the bearing plate" whereas the embodiment depicted in Figs. 11-12 fails to disclose the pin covering "at least part of two lateral sides of the bearing plate." There is no disclosure in Zeng-014 that teaches or suggests these two embodiments are interchangeable or combinable. In fact, the conductors in these two embodiments are formed using completely different fabrication methods. *Id*. Figs. 4A-4D and 11-12 thusly lack the requisite limitations and do not provide a combination that arrives at the claims. Petitioner's attempt to rely on these teachings fails.

The relied-upon embodiment of Vinciarelli-218 is a device having encapsulants 805 and 806 (yellow) surrounding its layer 804 (green) along with a singulated module 815. Vinciarelli-218, ¶159-160; Fig. 35. Vinciarelli-218 provides exposed interconnects 811/812 that interconnect portions 808A are connected to. *Id.* As can be seen from the below, the terminals do not cover "at least part of two lateral sides of the bearing plate" as required by [13c]. Phinney, ¶217.

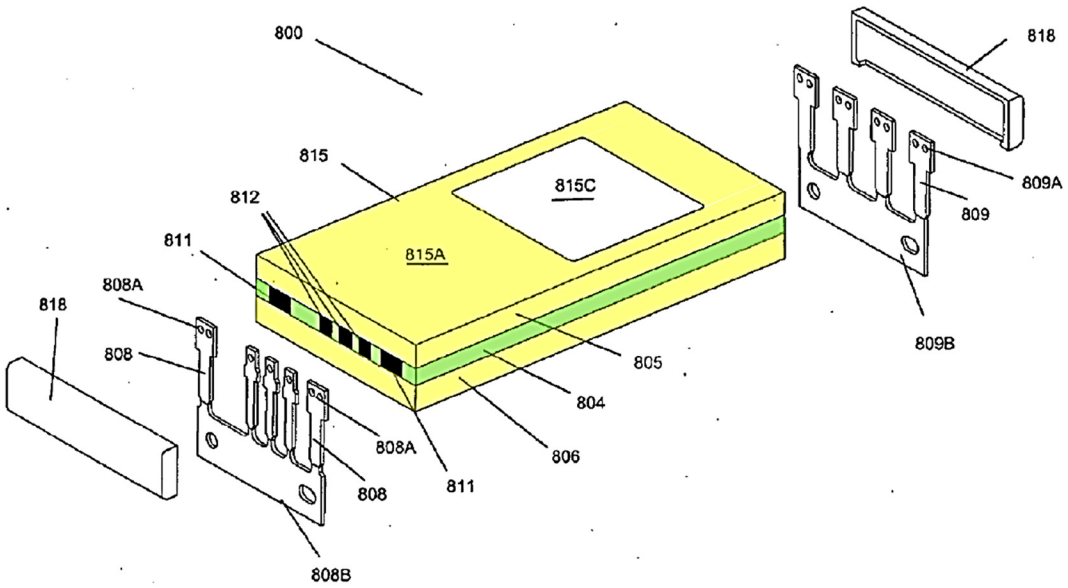


FIG. 35

Annotated Vinciarelli-218 Fig. 35

Another view of Fig. 35 is shown in Fig. 34 below. As can be seen in the figure, interconnect portions 808A are attached to the side of the layer 804 (green) and extend downwards for connection and do not extend to any other sides of singulated module 815. Phinney, ¶218.

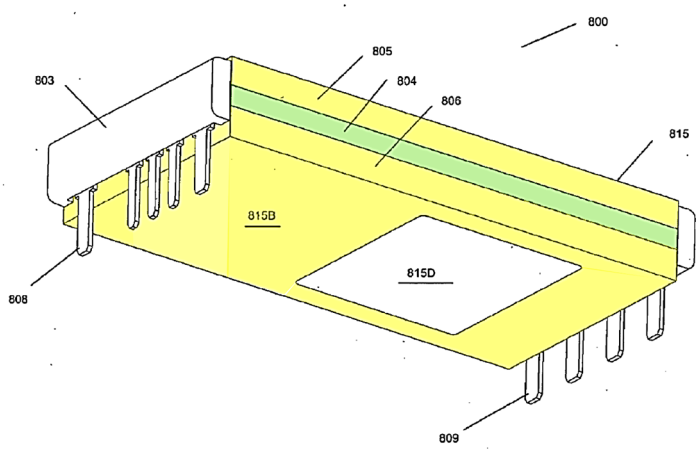


FIG. 34

Annotated Vinciarelli-218 Fig. 34

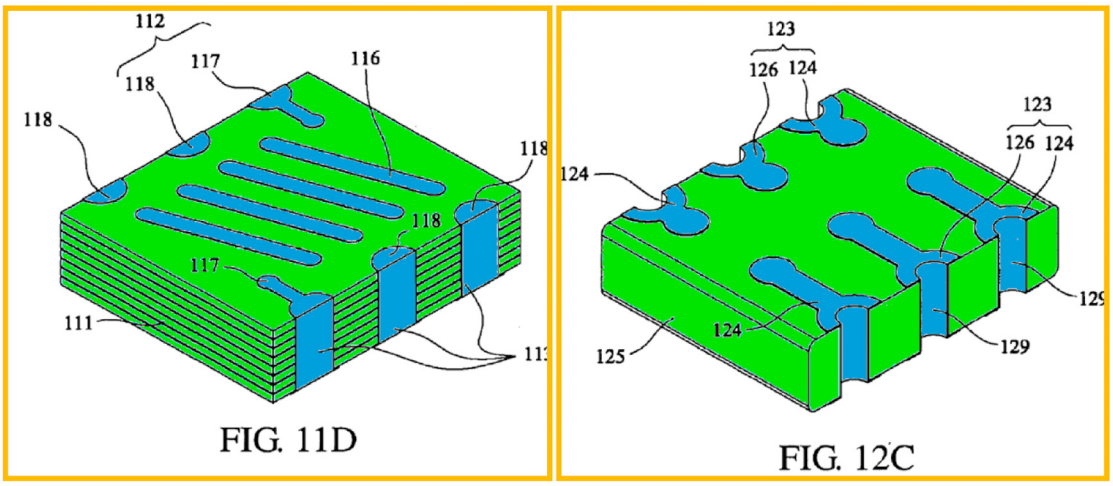
Vinciarelli-218's terminals are different than the claimed configuration. Acknowledging that and to cure Vinciarelli-218's deficiency, Petitioner takes Zeng-014's pin structure teachings in Figs. 4A-4D and 11-12. *See* Petition at 18-19; Phinney, ¶219.

However, Zeng-014's embodiment of Figs. 11-12 fails to disclose the pin covering "at least part of two lateral sides of the bearing plate." There is no disclosure in Zeng-014 that teaches or suggests embodiments in Figs. 4A-4D and Figs. 11-12 are interchangeable or combinable. In fact, the embodiments described in Figs. 4A-4D and 11-12 are formed using totally different fabrication methods, shown below. Phinney, ¶220.

Pins depicted in Figs. 4A-4D of Zeng-014 are formed by wrapping and compressing the lead frame, as shown in Figs. 5A and 5B. *See* Zeng-014, ¶¶62-64.

Phinney, ¶221. Zeng-014 discloses that the lead frame that is wrapped is not soldered at any location; instead, adhesives are used to attach the lead frame to the wrapped body. *See* Zeng-014, ¶63. Zeng-014 also discloses that the wrapped body is covered by an insulating material. *See* Zeng-014, ¶75.

Zeng-014 teaches inductors (within orange boxes) that have magnetic substrates 111 forming a magnetic material substrate 125 (both shown in green in Fig. 11D and 12C below). As shown in the figures below, conductors 113 and 129 are formed on only one side of substrates 111 and 125, respectively, and cannot teach covering "at least part of two lateral sides of the bearing plate" as required by [13c]. Phinney, ¶¶222-223.



Annotated Zeng-014 Figs. 11D and 12C

Petitioner takes these teachings and argues that a POSITA would have arrived at the claimed pin structure by "hav[ing] a plurality of pins as disclosed in Vinciarelli-218 … and Zeng-014 (VICOR-1007, Figs. 4A-D, 11A-G, 12A-D)."

Petition at 16. Petitioner's combination would result in pins being connected to only a singular side of the layer, which is not what is claimed by [13c]. Phinney, ¶224. In addition, [13c] requires that "the pin covers at least part of a lower surface, at least part of an upper surface of the insulation material." A POSITA would have understood that the top and bottom surfaces of pins 117, 118, and top bottom surfaces of each layer of conductors 113, are coplanar with top and bottom surfaces of their respective magnetic material substrate 111. This is because if pins 117, 118, or conductors 113 protrude from top and bottom surfaces of magnetic material substrate 111, gaps would form between substrates 111 during lamination which in turn leads to mechanical failure. Phinney, ¶224. Therefore, after lamination, bottom surfaces of pins 117, 118 and conductors 113 are coplanar with bottom surfaces of substrate 111. In other words, bottom surfaces of the pins, conductors, and substrate 111 are on the same plane. *Id*. As such, there is no disclosure or motivation in Zeng-014 that teaches [13c]. *Id*.

Zeng-014's Figs. 4A-4D and 11-12 thusly do not provide any motivation to arrive at [13c] and its substantively similar limitation of [17c]. Phinney, ¶225.

4. A POSITA Would Not Have Been Motivated to Combine Zeng-014 and Vinciarelli-218

Petitioner's motivations fall short and its purported combination is based on textbook hindsight bias. Petitioner takes Vinciarelli-218's encapsulated embodiment and states that a POSITA would have placed conductors atop it. *See*

Petition at 19-24. Petitioner has no valid motivation, and attempts to hide this through a long enumerated list of motivations. Inspection into each of Petitioner's motivations reveals that they ring hollow. Phinney, ¶¶226-234.

Petitioner ***first*** argues that variants exist, and a POSITA would have been motivated to decrease the mounting area on a motherboard. Petition at 20. That the references teach that there-exist variants does not present a motivation to modify certain embodiments with features of others. To state that it does, renders the requirement for a motivation superfluous because all patents are not limited to their disclosed embodiments. Furthermore, Petitioner does not appropriately analyze the sizing requirements. Its combination, however, would lead to devices that are increased in size. Placing lead frames atop (and below) Vinciarelli-218's embodiment ***increases*** size, not decreases it. Moreover, the only reason to have conductors both on at least the top surface is to allow stacked modules. Phinney, ¶227. Stacked modules (i.e., one Vinciarelli-218 module on top of another) also increases overall vertical size. Petitioner's first reason for combination rings hollow.

Petitioner's ***second*** reason is self-contradictory. Petitioner states that its combination provides space savings (Petition at 20) but at the same time argues for stacking. Stacking components increases height and conflicts with the immediately preceding motivation of decreasing height. Phinney, ¶228.

Petitioner's ***third*** reason that the connection part provides flush mounting lacks evidentiary support. Petition at 20. Providing a conductor atop (and below) Vinciarelli-218's encapsulated device increases size and makes the device less flush. Phinney, ¶229.

Petitioner's ***fourth*** reason is simply a broad-stroke statement that a POSITA would have been combined because Zeng-014 states it applies to other electronic components. Petition at 20. A broad statement like this does not mean that Zeng-014's teachings can simply be combined with anything. Phinney, ¶230.

Petitioner's ***fifth*** reason which refers to increased power density and decreasing area is generic and hallow. Petitioner provides no reason ***why*** its combination achieves this. Petitioner does appeal to space savings, but it does not reason why a position would have made a device that ***increases*** vertical footprint through extra lead-frames atop and on the bottom of the structure, and made the device used in stacking. Phinney, ¶231.

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. Vinciarelli-218 describes making its devices compatible with heating dissipation, i.e., via heatsinks. Phinney, ¶232. Vinciarelli-218 appears to have a singular embodiment without a heatsink (Vinciarelli-218, ¶159-160) but a POSITA would not have read it outside of the

context of the rest of the patent which is directed to heat dissipation. Phinney, ¶232. A POSITA would not have viewed an embodiment of Vinciarelli-218 lacking a heatsink as being one that does not need heat dissipation. Every other embodiments are directed to heat dissipation, and making one of those devices stackable via conductors on top, would cause heat to be trapped between the stacked or adjoining devices. A POSITA would not have made that combination. Phinney, ¶232.

Every single one of Petitioner's motivations rings hallow. Therefore, no valid reason for ***why*** a POSITA would have made the combination has been presented. Phinney, ¶¶233-234.

B. Ground 2: Petitioner Failed to Establish a Reasonable Likelihood that Park Anticipates Claims 13-15, 17, and 19

Park fails to anticipate several claim limitations, as described below. Phinney, ¶235.

1. Park Fails to Teach [13pre], [17pre], "a power supply apparatus"

As an initial matter, Petitioner has failed to show that Park teaches a power supply apparatus. Phinney, ¶236. The petition points to a composite electronic component 100 that is a combined inductor 120 (red) and capacitor 110 (blue) to satisfy [13pre]. Petition at 32 (citing to Park, ¶68). An inductor and capacitor are passive components, and alone are not a power supply apparatus. (Phinney, ¶¶142-

143, 236-238; Park, ¶¶34, 55, 61, 68.)

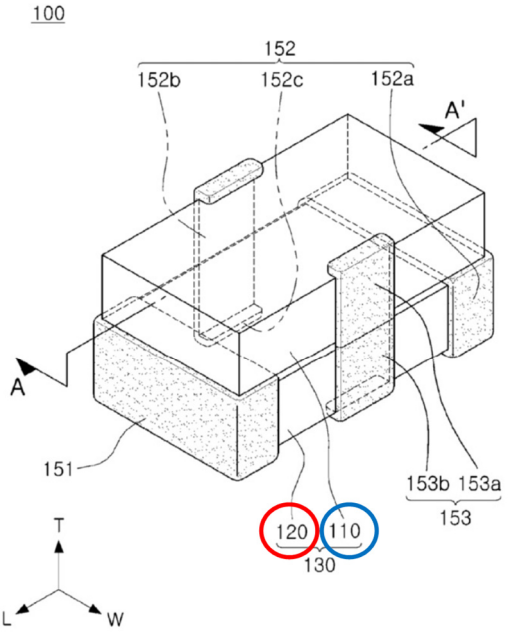


FIG. 1

Annotated Park Fig. 1

Petitioner's other citations to a PMIC (power management integrated circuit) appear to be directed to general background. Petition at 32 (citing Park, ¶5, Fig. 1). Petitioner did not identify any PMIC as satisfying the claims, and only identified the inductor/capacitor pair. This fails to teach [13pre] and [17pre]. Phinney, ¶¶144, 236-238.

2. Park Fails to Teach [13a], [17a], "a bearing plate"

Park does not teach a bearing plate. Phinney, ¶239.

Petitioner presents alternatives 1-3 for satisfying this limitation (1) Inductor 120, (2) combination of substrate 123 and coil 140, and (3) substrate 123.) Each

fails. Phinney, ¶¶146, 239-241.

1: Petitioner contends that an inductor is a bearing plate. Petition at 33-35. This is incorrect. An inductor is a component; and components are placed onto bearing plates. Phinney, ¶¶147, 239-241. To state that any component can be a bearing plate because it can connect to another component, effectively erases any meaning from "bearing plate." A term cannot be rendered wholly superfluous. *See Stumbo v. Eastman Outdoors, Inc*., 508 F.3d 1358, 1362 (Fed. Cir. 2007) (denouncing claim constructions which render terms or phrases in claims superfluous)

2: Petitioner's argument that the substrate 123 and coil 140 together are a bearing plate also fail. A bearing plate needs to be mountable by components (e.g., a PCB). A substrate surrounded by an insulated coil, which is what Park teaches, cannot have any additional components mounted on it. This thusly fails to satisfy [13a] and [17a]. Phinney, ¶¶148, 239-241.

3: Alternatively, Petitioner argues that the substrate 123 is a bearing plate. Petition at 34-35. The substrate 123 houses the conductor within the inductor (and within components Petitioner describes as the insulating material. *See* Park, ¶86. Nonetheless, Petitioner's argument that the substrate 123 is a bearing plate has further deficiencies with other limitations, because it breaks down when (i) [13b] and [13c] and (ii) [17b] and [17c] are analyzed, respectively. Phinney, ¶¶149, 239-

241.

Again, an inductor is not a "bearing plate" and to argue it is renders the term "bearing plate" effectively meaningless. Phinney, ¶¶149, 239-241.

As such, Park fails to teach [13a] and [17a] and Ground 2 fails. Phinney, ¶242.

3. Park Fails to Teach [13b], [17b], "insulation material formed on two opposite surfaces of the bearing plate"

Petitioner's analysis here fails for many reasons. Phinney, ¶243.

First, the claims require that the "insulation material" be "formed" on opposite surfaces of the bearing plate. Petitioner's identification of the magnet as an insulator and the substrate 123 (or substrate with coil) as the bearing plate (in its alternative read) is inconsistent with the claim language. Here, the magnet 122 is a device that has the coil wrapped around it (i.e., the substrate 123 with coil); magnet 122 is consequently not formed onto the substrate 123 (or onto the substrate 123 with the coil). Thusly, Petitioner's alternative read of the substrate 123 / substrate 123 + coil 140 as the bearing plate fails with respect to [13b] and [17b]. Phinney, ¶¶152, 243-245.

Second, Petitioner's mapping between [13a] (and similar for[17a]) and [13b] (and similar for [17b]) cannot be reconciled with the claim language "formed on two opposite surfaces of the bearing plate" and the specification. In [13a] / [17a], Petitioner argues that the inductor 120 is a "bearing plate." And, for [13b] / [17b],

Petitioner argues that the magnet is the insulating material. As a consequence, Petitioner argues that the magnet (an internal component of the inductor) is a separate insulating material in addition to that inductor. Phinney, ¶153, 243-245.

Park teaches that magnet 122 is an internal component of inductor 120 and even points to the same structure in Fig. 3 below. Park states that an inductor is created by wrapping a coil around a magnetic core. Shown below, the coil 140 (orange) is wrapped around a magnet 122 (blue). *See* Park, ¶90. The coil is on substrate 123 (green). By wrapping a coil around a magnet, an inductor is formed. Therefore, magnet 122 is a device that has the coil wrapped around it (i.e., the substrate 123 with coil); magnet 122 is consequently not formed onto the substrate 123 (or onto the substrate 123 with the coil). Phinney, ¶¶154, 243-245.

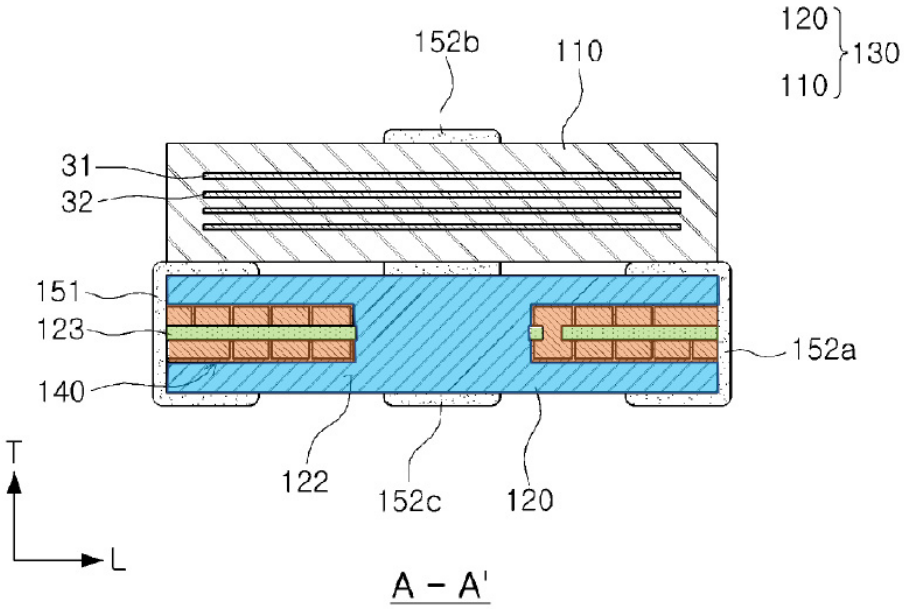


FIG. 3

Annotated Park Fig. 3

Moreover, Petitioner's analysis also fails to consider that the inductor already has an insulator. This can be seen below, where the insulator is in purple. Phinney, ¶¶155, 243-245. A POSITA would understand that the insulator is provided so that conduction does not occur in other parts (i.e., the magnet). Petitioner relies on the magnet being wholly non-conductive, but fails to consider that Park's existing placement of an insulator between the coil and magnet already provides insulating properties. *Id*.

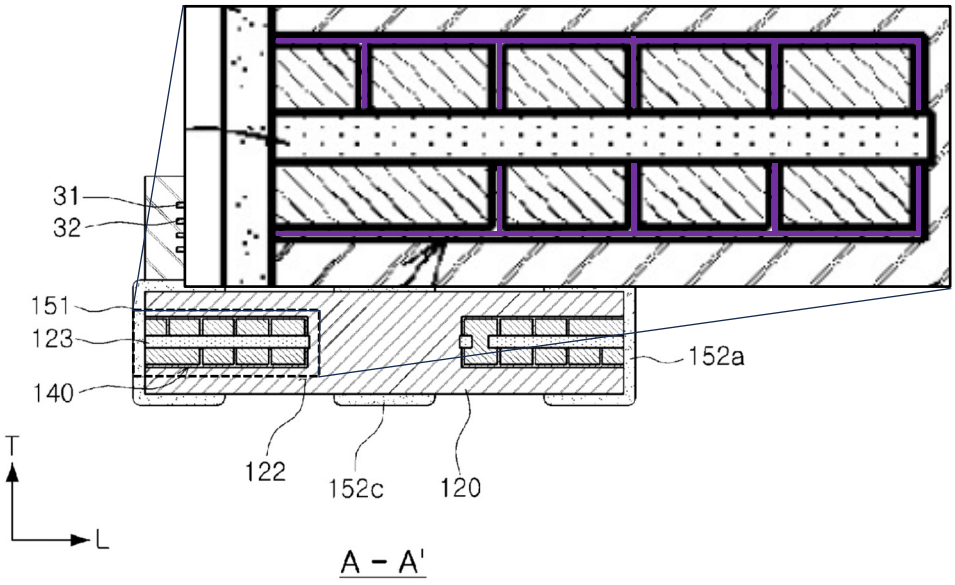


FIG. 3

Annotated and enlarged Park Fig. 3

Ground 4 accordingly fails because Park further fails to teach [13b] / [17b]. Phinney, ¶245.

4. Park Fails to Teach [13c], [17c]

As described in [13a] analysis, Petitioner presents the substrate 123 as the bearing plate. This reading does not comport with the requirements of [13c] / [17c]. [13c] / [17c] requires that "a plurality of pins electrically connected to the bearing plate." Park's substrate is an insulating substrate (i.e., non-conductive). *See* Park, ¶ 86. A POSITA would understand that pins cannot electrically connect to an insulator. Petitioner's read involving the substrate 123 thusly fails. Phinney, ¶¶246-247.

C. Ground 3 Fails to Present a Reasonable Likelihood of Success

Petitioner relies on Park and Jun to remedy perceived deficiencies of Ground 2. Petitioner, however, does not address any of the deficiencies addressed above with respect to each of [13pre], [13a], [13b].[7] For the same reasons discussed with respect to Park, Ground 3 fails. Phinney, ¶248.

In addition, Ground 3 does not purport to cure any claim 13 deficiencies with Jun. It only addresses dependent claims. This ground's failure however leads

[7] Petitioner appears to discuss the deficiency of [13c], but its rationale on how [13a] and [13b] are met at a level to understand [13c] is too ambiguous and uncertain to address in this preliminary response, especially when other limitations are plainly absent.

towards non-institution because of the numerosity of failed grounds, as explained below. Phinney, ¶¶162, 248-250.

Petitioner argues that a POSITA would have found it obvious to make ferrite magnet 122 to be an insulating material. This, however, fails to cure the deficiencies of Park. Phinney, ¶163, 248-250. Park fails because the magnet 122, even assuming it is insulation material is not "formed on two opposite surfaces of the bearing plate." Magnet 122 has the coil 140 and substrate 123 wrapped around it instead of being formed on the combination of substrate 123 and coil 140 as described in Ground 4, [1b]. It moreover fails when considering the inductor itself as the bearing plate (which Petitioner does in element [13a]) because the magnet 122 is a component of the inductor (and not its insulator).

Finally, Ground 3 fails to present the requisite clarity required. Phinney, ¶¶164, 248-250. Petitioner is simply picking-and-choosing random elements, while making only a high-level tie to specific claim language. The lack of clarity here is compounded by the lack of clarity in Ground 2, which this ground inherits most of its arguments from. This is a threshold issue warranting denial of Ground 3. Phinney, ¶¶165, 248-250.

Ground 3 fails for the reasons described above. Phinney, ¶250.

D. Ground 4 Fails to Present a Reasonable Likelihood of Success

Petitioner relies on Park and Vinciarelli-218, and relies on Vinciarelli-218's

discussion in Ground 1. The Park and Vincirelli-218 combination fails for similar reasons. Phinney, ¶251.

Here, there is further no motivation to make the suggested combination. Petitioner presumes that a POSITA would have been motivated, looking at Park, to apply entirely different connection structures than those discussed in Vinciarelli-218. Petitioner's combination, however, does not lead to the result it seeks, and is hindsight bias. Park plainly teaches a component, (e.g., a capacitor 110/inductor 120) with separate electrodes. *See* Park, Abstract, Fig. 1. Vinciarelli-218, on the other hand, encapsulates all its components within the encapsulant materials. In a power converter example, the "electronic components may include power transistors, control ICs, and discrete resistors and capacitors." Vinciarelli-218, ¶82, 143, Fig. 27. These components are mounted on a board and encapsulated. *Id*. Petitioner presents no reasonable motivation to take a component teaching to modify the device. Phinney, ¶¶172, 251-253.

A POSITA would not have been motivated to take a component level teaching (of the inductor) and applied it to an entire device, and done so to have an intermediate PCB connection and have an encapsulant conductor wrap-around as Petitioner argues. Petitioner is applying hindsight bias. Phinney, ¶¶173, 251-253.

Furthermore, Vinciarelli-218 and Park have entirely different manufacturing processes that are incompatible with each other given that one is a device panel-

molded power-converter assembly and another is a component. A POSITA would not apply Park's electrodes to Vinciarelli-218. Phinney, ¶¶174, 251-253. Park teaches that its terminals are formed of conductive paste, including conductive metal. *Id*. In Park, the paste must undergo a sintering or curing process to evaporate the solvent and harden the binder. Phinney, ¶¶175, 251-253.

Both these processes are incompatible with Vinciarelli-218. Phinney, ¶¶175-177, 251-253. Sintering is a high heat process, and it would cause Vinciarelli-218's encapsulant to potentially melt and would most certainly cause any solder connections within the Vinciarelli-218 device to melt. Phinney, ¶¶176, 251-253. A POSITA would not have exposed the Vinciarelli-218 device to high heat to attach pins because it would cause significant damage. *Id*. Curing, on the other hand, is a lower temperature process. *Id*. Curing, however, causes a significant amount of insulating material to remain in the joint between device and the conductors. *Id*. A POSITA would not have added this process to Vinciarelli-218 because it would lessen conductivity. *Id*. Vinciarelli-218 provides soldering metal to metal, which is a high conductive device or connection. As a result, a POSITA would not have modified or substituted the device of Vinciarelli-218 with low conductive material when high conductivity is required. *Id*.

Park also discloses that pins can be formed via electroplating. Park, ¶138. Phinney, ¶¶177, 251-253. Plating is suitable for smaller scale components with a

few surfaces that require metal deposition, such as Park's inductor, because a larger device like those described in Vinciarelli-218 contains many exposed metal surfaces could include a high number of exposed metal surfaces where plating is not desired. *Id*. The manual application of "stop-offs" is required on every metal surface where plating is not desired. *Id*. Vinciarelli-218 discloses modules that can contain as high as more than 20 exposed interconnects per module. Vinciarelli-218, Fig. 10B; Phinney, ¶¶177, 251-253. Therefore, a POSITA would not have been motivated, and in some cases not feasible, to apply electroplating in Vinciarelli-218. Phinney, ¶¶177, 251-253.

Moreover, Petitioner contends that a POSITA would have been motivated to modify Vinciarelli-218 to use Park's electrodes with Vinciarelli-218. Not all electronic components are suitable for being stacked for reasons such as package height constraints and poor heat dissipation. Phinney, ¶¶178, 251-253. Indeed, Vinciarelli-218's modules are restricted by these factors as directed to singular module having heatsinks on its top and bottom and a POSITA would not have been motivated to stack Vinciarelli-218's modules. Neither did Petitioner and its expert provide any reason to. Phinney, ¶¶178-179, 251-253.

Vinciarelli-218's other embodiments dissuade a POSITA from looking at Petitioner's proposed combination as Vinciarelli-218's embodiments require heat sink panels, such as flat heat sink surfaces, finned heat sinks, or pinned heat sink.

Vinciarelli-218, ¶¶82-83, 87-105, 119-123, 128, 131-139, 153-157, Figs. 1, 10, 12, 15-16, 17-26; Phinney, ¶¶179, 251-253. Vinciarelli-218 states that "[i]n 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." *Vinciarelli-218*, ¶159. As explained by Dr. Phinney, however, since heat sinks add considerable thickness to the power converter (e.g., finned heat sink illustrated in Fig. 10A, reproduced below) one of those applications would be reducing the height of the internal components to accommodate encapsulating the power converter in a package having a height restriction. Phinney, ¶¶179, 251-253.

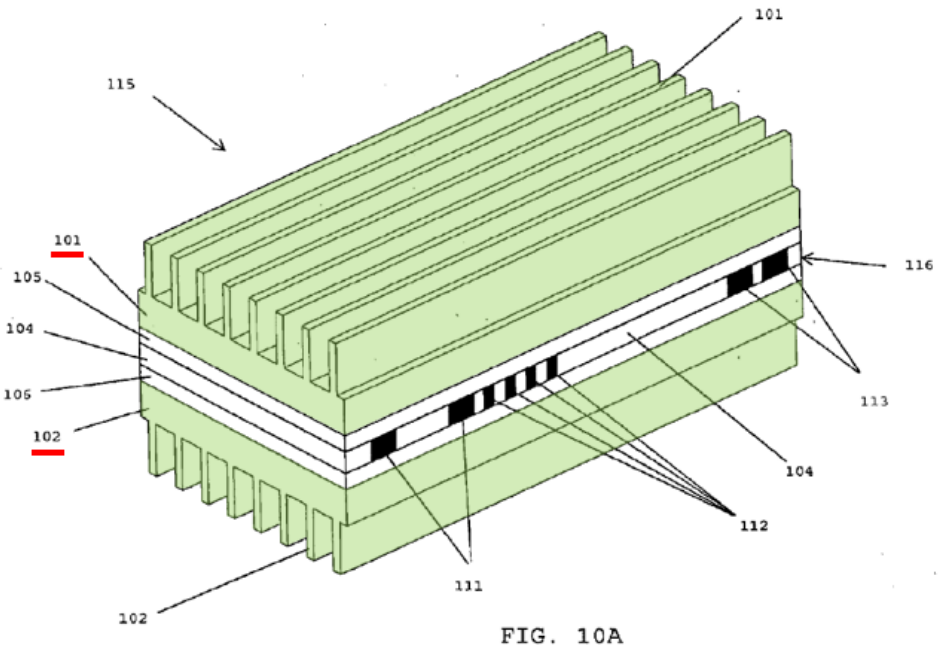


FIG. 10A

Annotated Vinciarelli-218 Fig. 10A

With respect to the heatsink-less modules, Petitioner's suggestion to stack

the heatsink-less modules actually defeats its purpose for the proposed combination. Indeed, Vinciarelli-218 discloses that "[a]s internal components are reduced in height, *e.g*. reducing the thickness of the magnetic core, the depth of the interior cavity may be decreased bringing the heat sink panels closer together, reducing the encapsulant thickness and the resulting module thickness." *Vinciarelli-218*, ¶135. Nowhere does Vinciarelli-218 teach or suggest that its power converters can be stacked. Phinney, ¶¶180, 251-253. Petitioner has provided no reason why a POSITA would have been motivated to stack two or more heat-sinkless modules 815 and increase the device height. Doing so would be in direct contradiction to the original purpose of reducing device height by removing the heat sink. *Id*.

In addition, Dr. Phinney explains that stacking singular modules 815 would have exacerbated heat dissipation and a POSITA would not have been motivated to do so. Vinciarelli-218 does not state that its heat-sinkless singulated module 815 is modified to produce less heat than the other modules in the heat-sink embodiments. Phinney, ¶¶181, 251-253. Rather, removing the heat-sink from singulated module 815 makes it more susceptible to problems caused by poor heat dissipation. *Id*. Stacking additional singular modules 815 on the existing singulated module 815 would further block air flow (e.g., hot air will be trapped between opposing surfaces of two stacked modules), reduce thermal transmittance,

and exacerbate the heat dissipation problem, which in turn leads to poor device performance and even hazardous conditions. *Id*. Therefore, for at least the above reasons, a POSITA would not have been motivated to stack Vinciarelli-218's singulated module 815.

On the other hand, making a stacking device is required by the claims as they recite "two SMD pads of each of the pins are extending to an upper surface and a lower surface of the insulating material, respectively." '534 Patent at 22:47-49, 22:61-63. If a POSITA had no motivation to make a stacked device (which it does not as described above), there would be no reason to add an SMD pad on both the top and bottom surfaces of Vinciarelli-218. Phinney, ¶¶182, 251-253. Because connections to Vinciarelli-218's device is through its downward terminals, there is no reason to provide a connection point to the top of Vinciarelli-218's device; to state that there would have been motivation is pure hindsight bias. *See Metalcraft*, 848 F.3d at 1367; Phinney, ¶¶182, 251-253.

Petitioner fails to demonstrate that a POSITA would have been prompted to combine the teachings of Vinciarelli-218 and Park to realize a device that achieved all of the features of independent claims 13 and 17. Petitioner's disregard of fundamental differences between Vinciarelli-218 and Park's devices render Ground 4 fatally deficient. For these additional reasons, the Board should find that Petitioner has not demonstrated a reasonable likelihood of prevailing on at least

one claim in Ground 4 and institution should be denied. Phinney, ¶253.

E. Grounds 5 and 6: Vinciarelli-664 is Not Prior Art Because the '534 Patent is Entitled to its September 2, 2014 Priority Date

Grounds 5 relies upon Vinciarelli-664 as a sole anticipatory reference and Ground 6 relies upon Vinciarelli-664 as sole obviousness type reference. At the outset, Grounds 5-6 fail because the '534 Patent is entitled to the September 2, 2014 priority date which predates the June 4, 2015 priority date of Vinciarelli-664.

The'534 Patent is entitled to the September 2, 2014, filing date of Chinese Patent Application No. 201410442972 ("CN972"). Petitioner acknowledges that Vinciarelli-664 has a priority date of June 4, 2015. Petition at 3. Because Vinciarelli-664 does not predate the priority date of the '534 Patent, both Grounds 5-6 fail.

There is no dispute that the '534 Patent claims priority to CN972, filed on September 2, 2014. As demonstrated on its face, the '534 Patent derives its September 2, 2014 priority date from its proper claim to U.S. Pat. App. No. 14/840,063, ("'063 Application") filed on August, 31, 2015, which in turn claims the benefit of the priority date of CN972, filed on September 2, 2014. '534 Patent, (62), (30). During prosecution of the '063 Application, Applicant properly claimed priority to CN972 and timely filed and made of record a certified copy of CN972 in the '063 Application. EX2005, 246-97, 307-12. In addition, the USPTO successfully retrieved a copy of CN972 on April 5, 2016 from the participating

foreign IP office (State Intellectual Property Office of the People's Republic of China). *Id*., 194-244. The electronically retrieved copy of CN972 was also made of record in the '063 Application. *Id*. As such, Applicant properly claimed priority under 35 U.S.C. §119(a)-(d). The Petitioner does not dispute that if CN972 provides adequate written description support for claims 13-19 of the '534 Patent, which it does. Therefore, Vinciarelli-664 is not prior art and Grounds 5-6 necessarily fails. As detailed below, at least the contents of the drawings disclosed in CN972 and the '063 Application both provide adequate written description support for claims 13-19 of the '534 Patent.

1. Legal Standards

To be afforded the filing date of an earlier application, the priority application need only "convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention." *In re Alton*, 76 F.3d 1168, 1172 (Fed. Cir. 1996); *see also Ariad Pharms., Inc. v. Eli Lilly& Co., 598 F.3d* at 1336. The Board has recognized that in determining whether a foreign application provides sufficient support for priority, "[t]he content of the drawings may also be considered in determining compliance with the written description requirement." *In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983). The Board also held that "the test for sufficiency of support in an application is not the presence or absence of literal support in the specification for the claim

language...instead, it is whether the disclosure of the application relied upon, including foreign applications, reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." *Supercell Oy v. Gree, Inc.*, PGR2018-00064, Paper 8 at 6 (PTAB, Oct. 18, 2018) (citing *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1560 (Fed. Cir. 1991)).

2. Claims 13-19 Were Disclosed in CN972

CN972 reasonably conveys to a POSITA that the inventors had possession of the entirety of claims 13-19 of the '534 Patent as of September 2, 2014, the filing date of CN972. Phinney, ¶¶254-269. Petitioner's sole argument on the legally unsupported premise is that the '063 Application does not disclose "a pin that covers both top and bottom and at least portions of ***two*** lateral sides of either a cuboid body or a bearing plate." Petition at 58, emphasis in original. Petitioner further argues that "the only pins that cover portions of exterior surfaces in the disclosed embodiments are described and shown as only covering portions of single lateral side surface, as can be seen in the following Figures." *Id*. In mischaracterizing CN972, the Petition cited to Figs. 19, 23, 24, and 25 of the '534 Patent and abruptly ceased its analysis there. *Id*.

The Petition turns a blind eye to the neighboring figure - Fig. 26 - of the '534 Patent (for example), which adequately discloses a pin covering top, bottom, and portions of ***two lateral sides*** of a cuboid body or a bearing plate. Phinney,

¶256.

The ’063 Application, whose specification and drawings are identical to the ’534 Patent, discloses a power unit 120 “disposed on the control unit 130” which is placed on “main board 110.” EX2005, 356. Fig. 26 of the ’063 Application and the ’534 Patent are identical and both illustrate this configuration. *Id*., 375; ’534 Patent, Fig. 26. As shown in Fig. 26, pins 140 are disposed on the top, bottom, and lateral surfaces of each of the power unit 120 and control unit 130. *Id*. Particularly, pins 140 of the bottom control unit 130 ***continuously*** cover the top and bottom surfaces as well as ***two*** opposing lateral surfaces of control unit 130. *Id*. Contrary to the Petition, this fully supports the limitation recited in claims 13-19, e.g., “the pin covers at least part of a lower surface, at least part of an upper surface of the insulation material and at least part of two lateral sides of the bearing plate.”

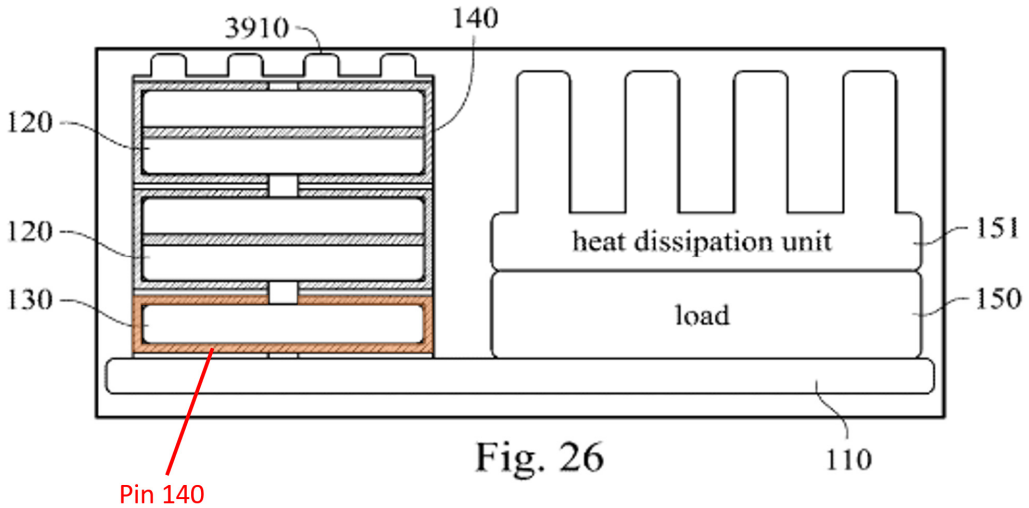


Fig. 26

EX2005, 375; ’534 Patent, Fig. 26, (annotated).

The ’063 Application and the ’534 Patent both claim priority to CN972, which contains a figure identical to Fig. 26, and more. Phinney, ¶257. For example, Fig. 39 of CN972 is identical to Fig. 26 of the ’063 Application and the ’534 Patent. *Compare CN972*, Fig. 39 *with ’063 Application and ’534 Patent*, Figs. 26. Phinney, ¶¶257-259.

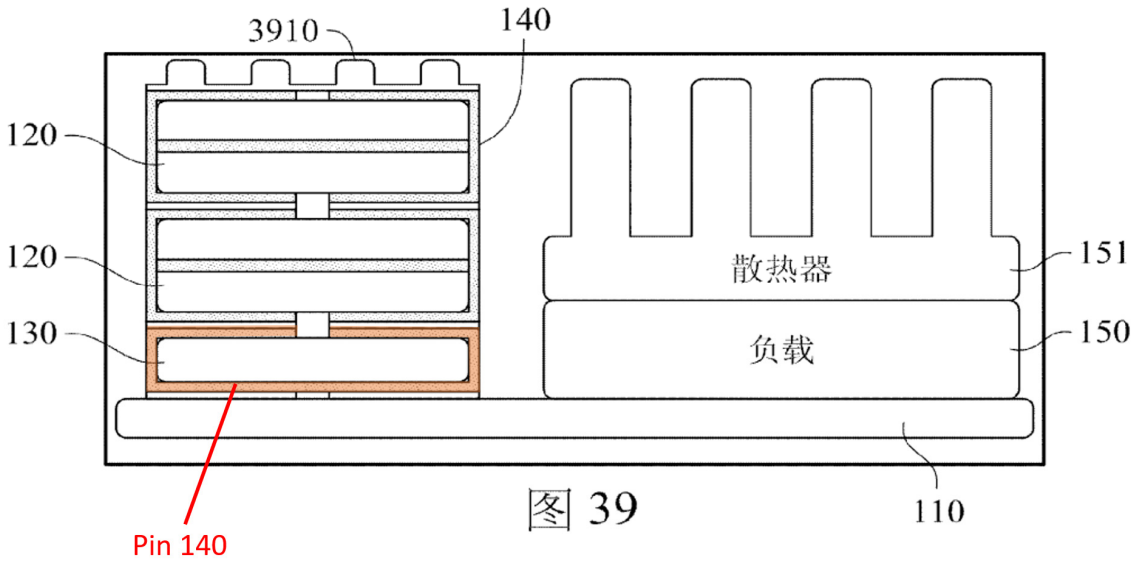


图 39

Annotated CN972 Fig. 39

In addition, Figs. 37-38, and 40 of CN972 all illustrated a control unit 130 having pins 140 that continuously cover top, bottom, and **two** opposing lateral surfaces, as annotated and reproduced below. Phinney, ¶260.

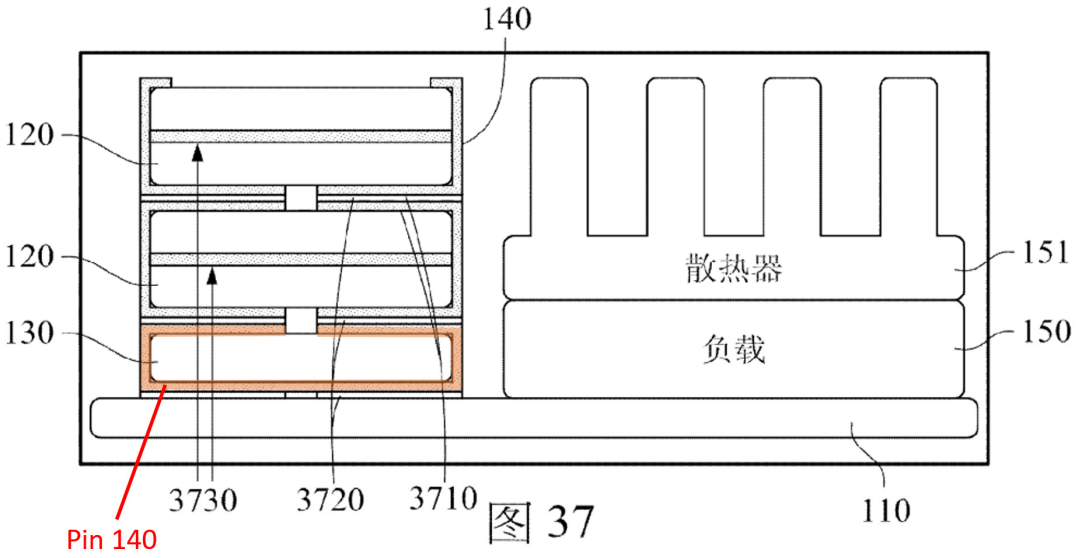

140
120
120
130
散热器
151
负载
150
3730
3720
3710
110
Pin 140

图 37

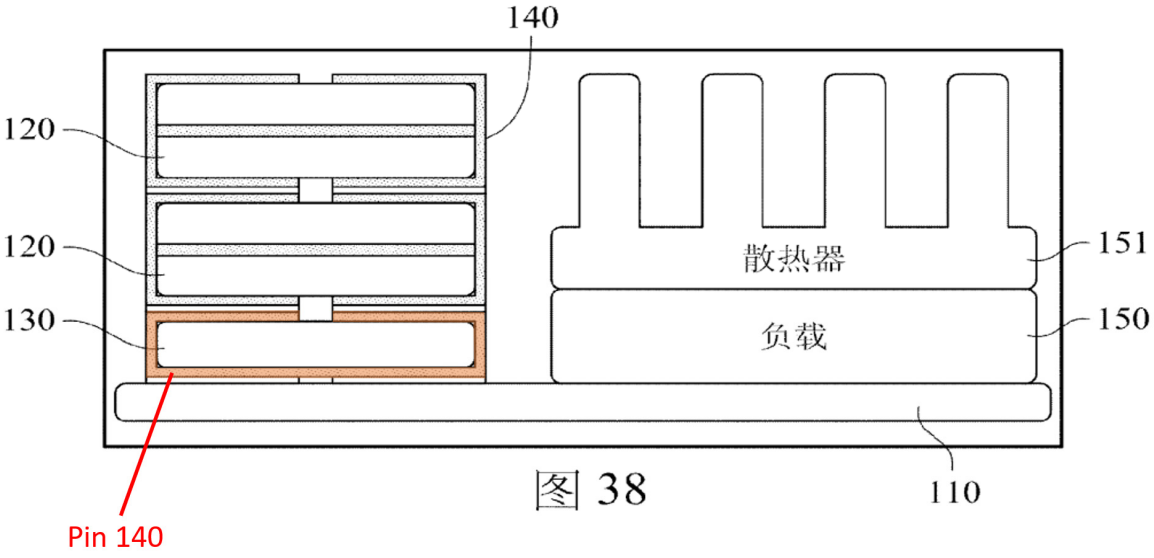
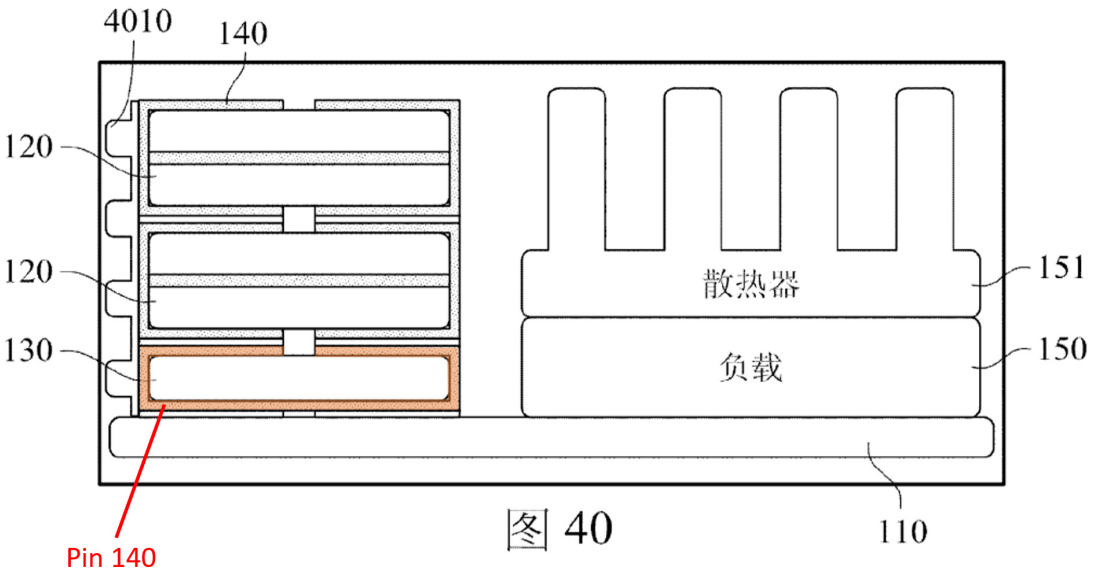

140
120
120
130
散热器
151
负载
150
110
Pin 140

图 38

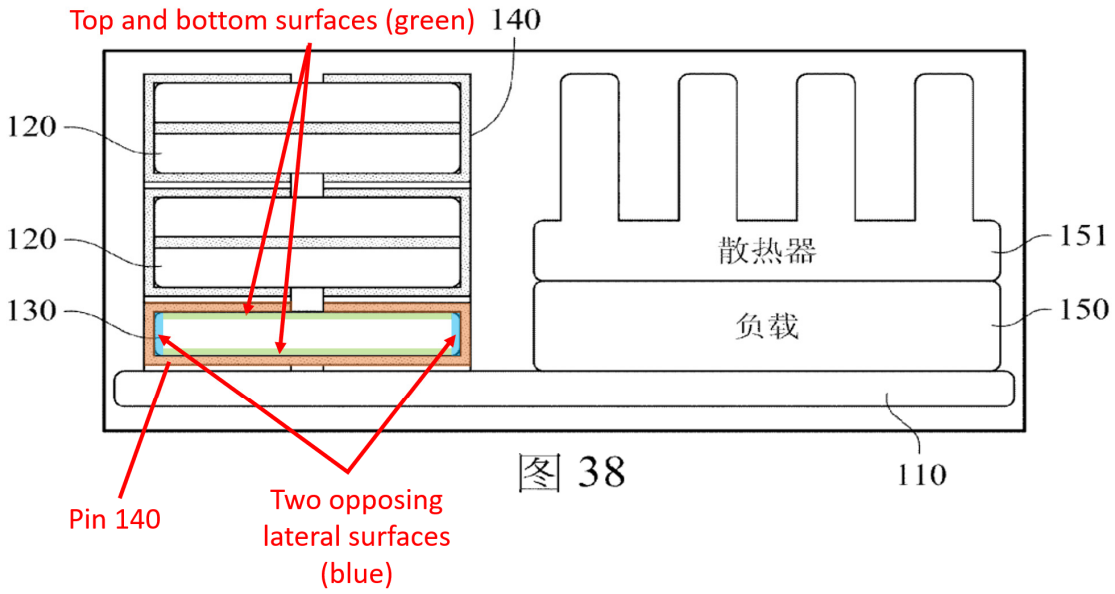


Annotated CN972 Figs. 37, 38, and 40

Particularly with respect to Fig. 38, CN972 further discloses that "better heat exchange capability can be achieved by placing each pin 140 on the ***side*** and top surfaces to expand the occupied area." EX2006, ¶156. Indeed, "[t]he coverage of the unit should have ***at least one side*** that accounts for more than 30% of the surface of the unit, preferably more than 50%." *Id*. Therefore, CN972 clearly conveys that the greater surface area of pin 140 the "better heat exchange capability" achieved. Phinney, ¶¶261-262. Indeed, POSITAs would have understood, based on CN972's teaching, that pin 140 continuously covering the top, bottom, and two lateral surfaces of control unit 130 would be desirable as achieving greater heat exchange capability, efficiency, and uniformity. *Id.*

As shown in annotated Fig. 38 of CN972 below, pin 140 (orange) continuously covers top and bottom surfaces (green) and two opposing lateral

surfaces (blue). In other words, portions of pin 140 that covers the two opposing lateral surfaces are connected by portion of pin 140 that extend across the bottom surface of control unit 130. Phinney, ¶263. It would be reasonably clear to those skilled in the art that the pin covers "two lateral sides of the bearing plate" recited in claims 13-19.



Annotated CN972 Fig. 38

While Fig. 38 does not specifically illustrate a bearing plate within the control unit 130, ***all*** CN972, the '063 Application, and the '534 Patent ***explicitly disclose*** that both units 120, 130 contain a bearing plate 3420 and insulation material 3430 formed on two opposite surfaces of bearing plate 3420. "Specifically, any one of the control unit and the power unit comprises a bearing plate 3420 and insulation material 3430." EX2005, 354; EX2006, 146; '534

Patent, 19:34-40. Indeed, these references convey with reasonable clarity to those skilled in the art that the power unit 120 and the control unit 130 can share similar structure comprising bearing plate, encapsulation materials, pins and electrical interconnections as well as structural interrelationships, as recited in claims 13-19. EX2006, 117-120, 123-130, Fig. 34; EX2005, 342-344, Fig. 25; '534 Patent, 13:29-14:62, Fig. 25; Phinney, ¶264.

For example, CN972 demonstrates the above as teaching that "[t]he unit shown in Figure 34 may be the above-mentioned power unit and/or ***control unit***." EX2006, ¶147. Pins 140 (orange) of control unit 130 are electrically connected to bearing plate 3420 (blue) through conductive pads 3440 (red) and soldering material 3450 (yellow). *See* EX2006, ¶122; 265.

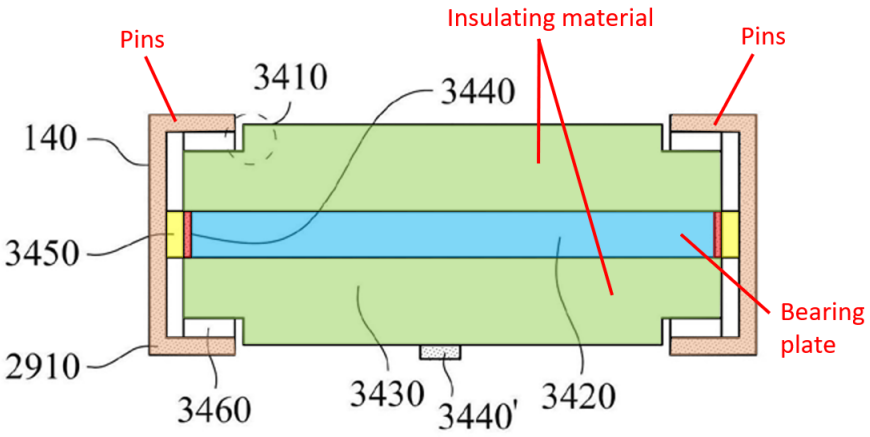


图34

Annotated CN972 Fig. 34

Fig. 25 of the '063 Application and the '534 Patent are identical to CN972's

Fig. 34. EX2005, 375, 355; '534 Patent, 19:47-48; Phinney, ¶266. As shown herein, CN972's Fig. 34 and Figs. 25 of the '063 Application and the '534 Patent both include bearing plate 3420 (blue), insulating materials 3430 (green) formed on two opposite surfaces of bearing plate 3420, and pins 140 (orange) electrically connected to bearing plate 3420 through conductive pads 3440 (red) and soldering material 3450 (yellow). *See* EX2006, ¶¶146-147, Fig. 34; EX2005, 43, 354-355, 375; '534 Patent, 19:26-20:10, Fig. 25; Phinney, ¶266.

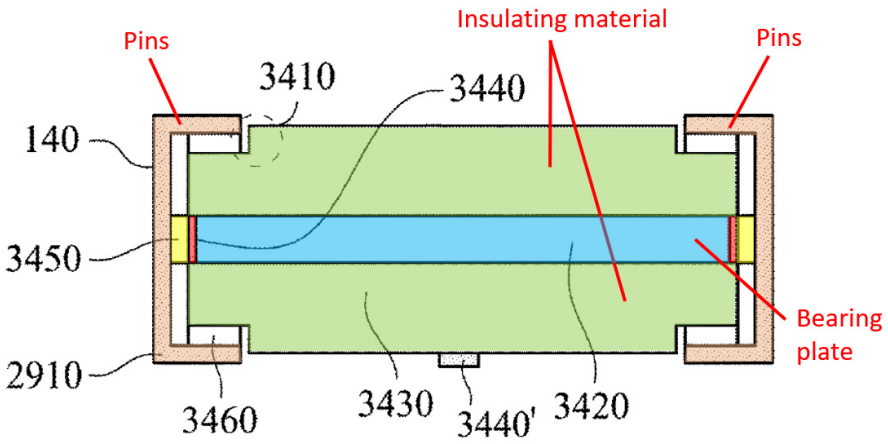


Fig. 25

Annotated'063 Application and the '534 Patent Fig. 25

In sum, the teachings of CN972 and the '063 Application have clearly conveyed to POSITAs that control unit 130 and power unit 120 contain these same components (*e.g.*, bearing plate, insulating materials, and pads). Phinney, ¶267.

In view of Fig. 26 of the '534 Patent and the '063 Application and Figs. 37-40 of CN972, the combination of Figs. 37-40 of CN972 and the associated texts

would have conveyed with reasonable clarity to a POSITA that the inventor was in possession of the invention on September 2, 2014. Phinney, ¶268. Specifically, as noted above, CN972 disclose pins 140 that continuously cover top, bottom, and ***two*** opposing lateral surfaces of the control unit (130), which according to the specification of CN972, to have same components and structural/electrical connections as the power unit (120). *See* EX2006, ¶147. Having pins 140 contacting lateral surfaces presents a clear advantage for heat dissipation and efficiency for power units, as recognized in CN972. Phinney, ¶268; EX2006, ¶156.

As CN972 provides adequate written description support for the claimed "power supply apparatus" of both the '063 Application and the '534 Patent, the '534 Patent is entitled to the CN972's filing date of September 2, 2014. Therefore, Vinciarelli-664 is disqualified as prior art and Grounds 5-6 fail for the reasons discussed. Phinney, ¶¶269-270.

VI. CONCLUSION

For the above described reasons, the Petition should be denied.

Dated: July 10, 2024

Respectfully submitted,

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CERTIFICATE OF WORD COUNT UNDER 37 CFR § 42.24(d)

Under 37 C.F.R. § 42.24(d), the undersigned certifies that the word count for this Patent Owner's Preliminary Response to the Petition for *inter partes* review totals 10,325, excluding the parts exempted by 37 C.F.R. § 42.24(a). The word count was made using the built-in word count function in the Microsoft® Word software used to prepare this document.

Dated: July 10, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I certify that I caused to be served a true and correct copy of the foregoing: PATENT OWNER'S PRELIMINARY RESPONSE and accompanying exhibits by email to the electronic service addresses for Petitioner on the date indicated below:

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