

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CANON U.S.A., INC. and CANON INC.,

Petitioners,

v.

SLINGSHOT PRINTING LLC,

Patent Owner.

Case No. IPR2023-00313

Patent No. 7,594,708

PETITIONER CANON'S REPLY TO PATENT OWNER'S RESPONSE

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I. INTRODUCTION

The '708 patent's challenged claims are unpatentable over the asserted prior art grounds.¹ The Patent Owner Response ("POR") fails to refute the Petition's compelling showing of unpatentability. Quite the opposite; the POR merely rehashes arguments that the Board rejected in its institution decision ("ID"). Nor does the declaration from PO's expert, Mr. Steven J. Dietl, offer anything new. Instead, it parrots the attorney arguments. Accordingly, the challenged claims must be cancelled as unpatentable.

II. GROUND 1: BENJAMIN-GIERE673 RENDERS OBVIOUS THE CHALLENGED CLAIMS

For the first ground (Benjamin-Giere673), the parties' sole dispute centers on whether sensing temperature on a per-color or per-region basis—positioning a sensor within each thermal region separated by insulating ink vias—would have been obvious to a PHOSITA. In the ID, the Board preliminarily found that a PHOSITA would not only "have been motivated to dispose a single TSR within each of Benjamin's regions," but would also "have had a reasonable expectation of success in combining Benjamin and Giere673's teachings" by "including TSRs in each of Benjamin's regions." ID 26:31.

¹ Capitalized terms not otherwise defined have the same meaning as set forth in the Petition.

Rather than squarely address these findings, the POR rehashes the same arguments that the Board already addressed in the ID, namely that neither Benjamin nor Giere673: (i) discloses or suggests a claimed single temperature sensing element in a region between vias, nor (ii) provides a motivation to combine these reference. POR:38-46. Neither is true.

A. Giere673 Disposes a Single TSR in a Thermal Region Between Two Heater Arrays

PO argues that “Ground 1 fails because neither Benjamin nor Giere673 suggest monitoring of temperatures in regions **between ink vias.**” POR:39-41. Petitioner is wrong for several reasons.

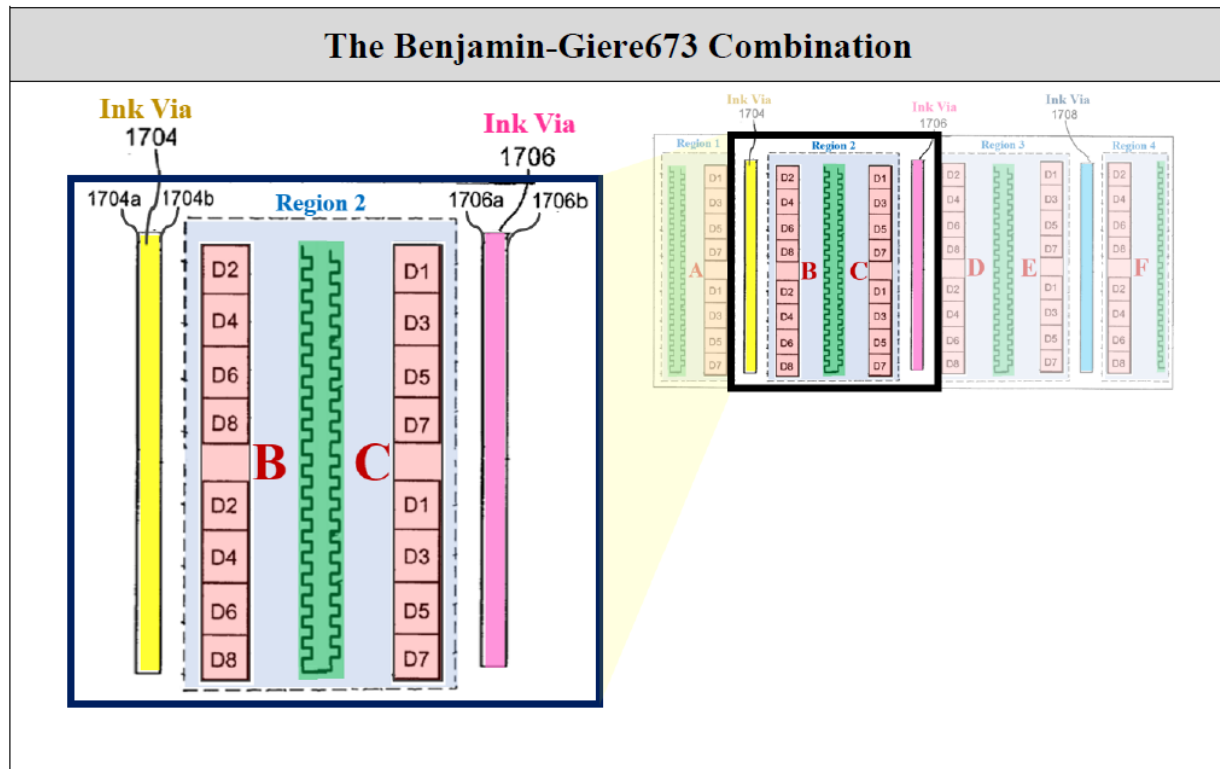
First, PO’s attempt to recast the claim language as disposing the temperature sensing element “*between ink vias,*” instead of heater arrays (*id.*), is classic misdirection. The claims require “a single temperature sensing element disposed within *each region,*” and the claims define a region as “disposed adjacent each heater array,” not between ink vias. Ex.1001(Claim1). The temperature sensing element’s sole purpose is to measure the temperature produced by the heater arrays (that also happens to “each b[e] associated with its respective ink via”). *Id.* PO

recasts the claim so that it can argue that each individual reference² does not have a temperature sensor between **ink vias**, rather than looking at the combination as a whole. POR:39-45. Of course, as established by the Petition and summarized below, (i) Giere673 teaches a single temperature sensor in a region between heater arrays, and (ii) the combination includes a temperature sensor in each of Benjamin's regions between its heater arrays (and also between its ink vias). Pet:9-27.

Second, despite Slingshot's contrary claims, Giere673 expressly discloses a TSR in a thermal region between two heater arrays (i.e., the claimed temperature sensing element). Pet:23–24; Ex.1002 ¶¶149–169; Ex.1005, 4:55–56. The Petition noted that, while Benjamin does not identify the location of its TSR (Pet:21), Giere673 clearly discloses a single TSR disposed in a region between two heater arrays, with “two legs that are approximately 680 um inboard from the center of the columns of ink ejection elements 416” (e.g., resistor heater elements). Ex1005:4:36–39, 4:55–56, 5:10–12; Fig. 5 (locating TSR 510 in a region between two columns of resistor heater elements). Benjamin uses its TSR to determine a temperature of a printhead die (Ex.1004,79:60–67, Fig. 25B), and Giere673 makes

² The Board has already admonished PO about analyzing references in isolation, as discussed further below. ID:23-25.

clear that its TSR 510 measured the temperature of the substrate 410 after heat has moved from the heating elements to the TSR 510. Ex.1005, 4:57–60.



Pet:23-25; Ex.1001:2:1–15, 2:28–29, 2:47–49; Ex.1005, Fig.5, 4:55–56.

Relying on these same disclosures from Giere673, the Board noted in the ID—viz., “Giere673 teaches that the TSR 510 is operable to sense a temperature representative of the adjacent heater arrays.” ID:22. And based on that finding, the Board reached the same conclusion as Petitioners that “one of ordinary skill in the art would have been motivated to apply Giere673’s teachings” by “locating a TSR in a thermal region defined *between two columns of resistor heater elements* [red, above]”—“to Benjamin by disposing Giere673’s TSR in a

[thermal] region of Benjamin’s printhead die”—that is, **between two columns of heater arrays** [red]. ID:22-25. The Benjamin+Giere673 combination therefore positions a temperature sensor in each region disposed between each set of Benjamin’s heater arrays, which are adjacent to the ink vias.

Third, PO’s argument—that neither Benjamin nor Giere673 teaches the requisite temperature sensor (POR:39)—also fails because it ignores black-letter law by incorrectly focusing on each reference’s individual teachings, rather than their combined teachings. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986); *see also* ID:29 (citing *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)). The Petition, supported by Dr. Pond, established that this is unequivocally the case (Pet:23–24; Ex.1002, ¶¶149–169), and the Board preliminarily agreed that “this limitation would have been obvious in light of the combined teachings” (ID 29). Ex.1005,2:57–62,3:3–6,4:55–56). Nothing in the POR warrants a different finding.

The only support PO can muster is an errant citation to *Par. Pharm.* for the proposition that “demonstrating that all claimed limitations are disclosed in the prior art is a threshold component of any obviousness challenge.” POR:40. But *Par. Pharm.* does not support that proposition. There, the Court reiterated that inherency is “a high standard” that requires “the limitation at issue necessarily must be present.” 773 F.3d 1186, 1196 (Fed. Cir. 2014). Obviousness is clearly

“separate and distinct” from inherency and anticipation. *Jones v. Hardy*, 727 F.2d 1524, 1529 (Fed. Cir. 1984).

B. Giere673 Provides Ample Motivation for the Benjamin+Giere673 Combination

PO next argues that “the proposed modifications to Benjamin are based on hindsight-driven cherry picking and reconstruction.” POR:43. Not so.

First, PO’s argument knocks down a straw man of its own creation. Ground 1 of the Petition never claimed that the “structural similarities” between Benjamin and Giere673 would have motivated a PHOSITA to “place a single temperature sense resistor in one region between heater arrays in Benjamin’s printhead based on Giere673’s teachings due to alleged ‘structural similarities’...between the references.” POR:42. Rather, the Petition, supported by Dr. Pond, established that Giere673’s “**improved optimization** of the print quality” obtained by using a TSR positioned between two heater arrays would have motivated one of ordinary skill in the art to modify Benjamin to include Giere673’s teachings of a single TSR between heater arrays. Pet:21; Ex.1002, ¶¶181–195; *KSR*, 550 at 417.

Second, despite PO’s contrary claim, a PHOSITA would be motivated to implement this improvement even if “Benjamin discloses an entirely suitable way of [detecting temperature of the printhead] using only a single temperature sensor on the printhead die.” POR:43. Giere673 need not present the globally best

temperature-sensing technique, or even the most efficient one; it need only present one that would improve Benjamin. *See In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004). The Petition established that Giere673 does just that by showing “the normal desire to improve upon what is already generally known.” *Jazz Pharmaceuticals, Inc. v. Amneal Pharmaceuticals, LLC*, 895 F.3d 1347, 1363 (Fed. Cir. 2018).

Tellingly, Slingshot never argues that the combination would no longer be able to sense the temperature of the entire printhead, as described in Benjamin. Nor could it, as the information necessary to determine the temperature of the printhead, i.e., the average temperature of all regions, is not somehow lost in the modification (*id.*), and a PHOSITA would continue to monitor the temperature of the entire printhead in addition to the regions between heater arrays for improved operation. Ex.2004,106:17-108:20; *Navico Inc. v. ITC*, Appeal No. 2016-1533, at *15-16 (Fed. Cir. June 2017).

The same is true even if the Benjamin+Giere673 combination “would unnecessarily add cost and take up space on the printhead die and/or flex circuit,” as PO speculates. POR:44-45 (citing Ex.2003 ¶86). PO insists that “if a PHOSITA were somehow driven to sample the temperature in areas between ink vias, the solution consistent with the single TSR contact pad of Benjamin’s flex circuit would have been to employ one continuous TSR that winds between the

vias, providing a single temperature value and requiring only a single temperature input and output.” POR:45. But PO’s proposed embodiment having a snaking TSR between different regions is found nowhere in either reference. Moreover, Dr. Pond explained during his deposition that a PHOSITA would not do this because “you can't control [or] modulate the drop size in as short of time intervals as if you had more sensors, particularly ones in each region.

Ex. 2004, 107:3-108:18. Giere673’s optimization of print quality justifies the moderate added cost of multiple sensors in the combination. *Id.* The Board likewise found that “regulating temperature to optimize print quality is such a problem.” ID:32.

C. Giere673’s Teachings Provide the Necessary Motivation to Dispose a TSR Within Each of Benjamin’s Thermal Regions

PO also claims that “[n]either Benjamin, Giere673, or any background art cited by Petitioners would have suggested to a PHOSITA that they should detect temperature on a region-by-region basis where regions are separated by ink vias having heater arrays on both sides of the via.” POR:43. This is not true.

First, per above, Giere673 provides the motivation needed to dispose a **single** TSR between a pair of heater arrays. Pet:23–24; Ex.1002, ¶¶149–169. In particular, Giere673 undeniably teaches that using “**one** or multiple TSRs 510 [between two heater arrays] can be used to provide an approximation of the mean

temperature of the substrate.” Ex.1005, 2:56-3:6. Giere673’s temperature controller then selectively fires particular heating elements based on thermal conditions that it measures. *Id.* at 3:3–6. To obtain **Giere673’s optimized performance**, a PHOSITA would know to place a single TSR between each pair of Benjamin’s heater arrays. Stated differently, it would make no sense to place a TSR only between one set of heater arrays, as that would not provide the optimized performance for the entire printhead. The Board preliminarily agreed that “these [same] teachings support disposing multiple TSRs across the substrate (e.g., one in each region) to measure the substrate’s temperature near each of the heater arrays for selectively firing particular heating elements for print quality optimization.” ID:28 (Ex.1005,2:57–62, 3:3–6).

Second, PO again improperly analyzes each reference individually instead of analyzing the Bengamin-Giere673 combination. When the combination is properly viewed as a whole, it is clear that PO’s argument that Giere673 only discloses temperature sensing for the entire board (*compare* POPR 45-46 *with* POR 40-41) and not for individual regions, is incorrect. A PHOSITA familiar with both references would have modified Benjamin’s device to include a TSR temperature sensor, as taught by Giere673, in each region between adjacent heater arrays to measure the temperature and optimize performance in each respective region. Ex.2004,106:17-108:20; Pet.29-33; Ex.1002 ¶¶179-198. The Board came to the

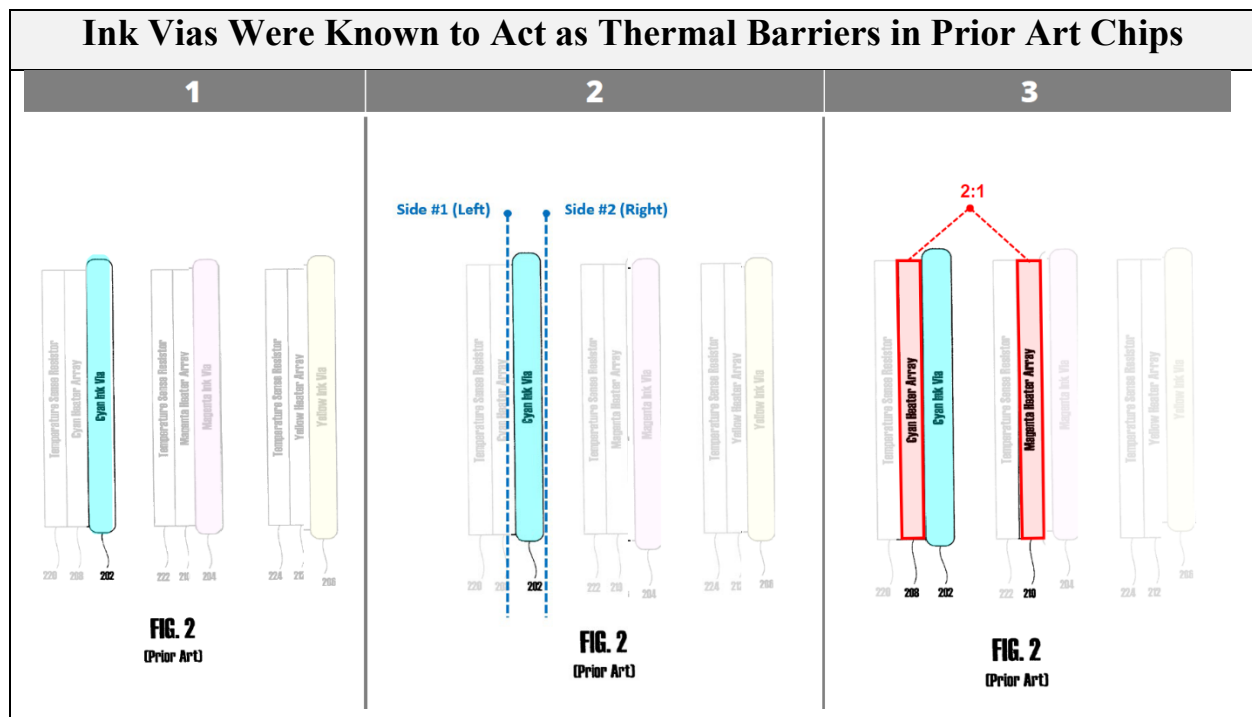
same conclusion stating that a PHOSITA would “sense a temperature representative of the adjacent heater arrays” by positioning “a single TSR on a substrate in a region (*e.g.*, *between heater arrays*),” ID:23.

D. The AAPA and Yabe Provide Independent Motivation to Dispose a Single TSR Within Each Region on Benjamin’s Chip

Even assuming *arguendo* that Giere673 failed to provide a motivation to place a TSR between each set of Benjamin’s heating elements, the applicant-admitted prior art (“AAPA”) and Yabe both provide “evidence of the knowledge that one of ordinary skill in the art would have had as part of [the] obviousness analysis.” *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362–63 (Fed. Cir. 2013); *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1374 (Fed. Cir. 2019).

PO next argues that the AAPA never discloses the particular temperature sensing technique claimed by the ’708 patent. PO misses the point. The AAPA and Yabe provide the *motivation*, not the claim limitation (which is undeniably taught by Giere673). The AAPA admits that it was known in the prior art (i) to sense temperature on a per-color basis, and (ii) that ink vias act as a thermal barriers between the colors. Pet.68; Ex.1002, ¶310. As such, a PHOSITA would have known to add Giere673’s TSR into each region to provide more accurate temperature measurement per color and avoid the issue of ink vias acting as thermal barriers. Pet.64-68; Ex.1002, ¶¶300-310.

Slingshot’s principal contention—that ink vias were not known to act as thermal barriers—is particularly specious given that the AAPA disposes a heater array on each longitudinal side of each ink via as “[t]he ink vias 202, 204, and 206 act as a **thermal barrier between the colors.**” Ex.1001, 2:11-15; Ex.2004, 107:3-108:18; Ex.1031; Ex.1032.



Moreover, PO’s contention is belied by “the ’708 patent’s discussion of temperature sensing on a per-color basis (illustrated by Figure 2) being known,” which the Board found “also admits that it was known that the ink vias act as thermal barriers and that the implications of such were appreciated for design purposes.” ID:30.

The POR next wrongly suggests that the AAPA is off-limits to the obviousness analysis. POR, 46-47. Quite the opposite; “admissions in the specification regarding the prior art are binding on the patentee for purposes of a later inquiry into obviousness.” *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1362 (Fed. Cir. 2007). Thus, the Board properly considered the AAPA when determining the common knowledge and creativity a PHOSITA would have exercised when making the Benjamin-Giere⁶⁷³ combinations. ID:28-32; *Sjolund v. Musland*, 847 F.2d 1573, 1577-79 (Fed. Cir. 1988).

Next, PO’s arguments that “Yabe relates to ink supply ports in ‘side Shooter’ printheads,”³ and that “Yabe does not disclose temperature sensors **between ink vias**—is once again misdirection. The Petition relied on Yabe to show that a PHOSITA would have known “that ink vias act as thermal insulators between other regions, limiting the TSR’s effective reading to the region,” (Pet. 23; Ex. 1008, 3:17–22) and the Board likewise “consider[ed] Yabe for that purpose,” DI 32. *Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1354 (Fed. Cir. 2012).

³ The POR appears to argue that Yabe’s “side shooter” design is not analogous to Benjamin’s “roof shooter” design. But “side-shooter” is simply the term Canon uses to describe a “roof shooter”—both configurations expel the ink *perpendicular* to the plane of the heater resistors. Ex.1005, 2:34-44.

The POR never addresses, let alone rebuts, the Board’s ID finding that Yabe “evidences that one of skill in the art would have known that ink vias act as thermal insulators between other regions, limiting the TSR’s effective reading to the region.” ID:24. Nor can it; the AAPA and Yabe each evidence not only that ink vias were known to act as thermal barriers, but also that sensing temperature on a per-color or region basis was also disclosed, each of which would have provided ample independent motivation to place a single TSR into each of Benjamin’s regions. (ID:26-29; Pet:23; EX1002:¶160; EX1001:2:1-15, 2:28-29, 2:47-49; EX1008:3:17-22).

Thus, the AAPA and Yabe provide additional motivation to dispose a TSR within each of Benjamin’s thermal regions between two heater arrays.

III. GROUND 2: BENJAMIN-GIERE673 IN VIEW OF PARISH RENDERS OBVIOUS DEPENDENT CLAIMS 4 AND 13

The POR presents no patentability argument unique to the “n-type implant donor thermal sense resistor” added by the dependent claims challenged in these grounds; it instead relies on the same meritless arguments against Giere673 raised in the prior grounds. The Board should reject these recycled arguments for the same reasons it did before.

IV. GROUND 3: GIERE178 RENDERS THE CLAIMS OBVIOUS

PO raises two challenges to Ground 3—namely, that (i) Giere178’s chip does not disclose a plurality of ink vias because it only discloses a “center feed” or “edge feed” slot substrate, and even if it did, (ii) Giere178 does not teach or suggest positioning a single temperature sensor within each thermal region of the chip. As shown below, PO is wrong.

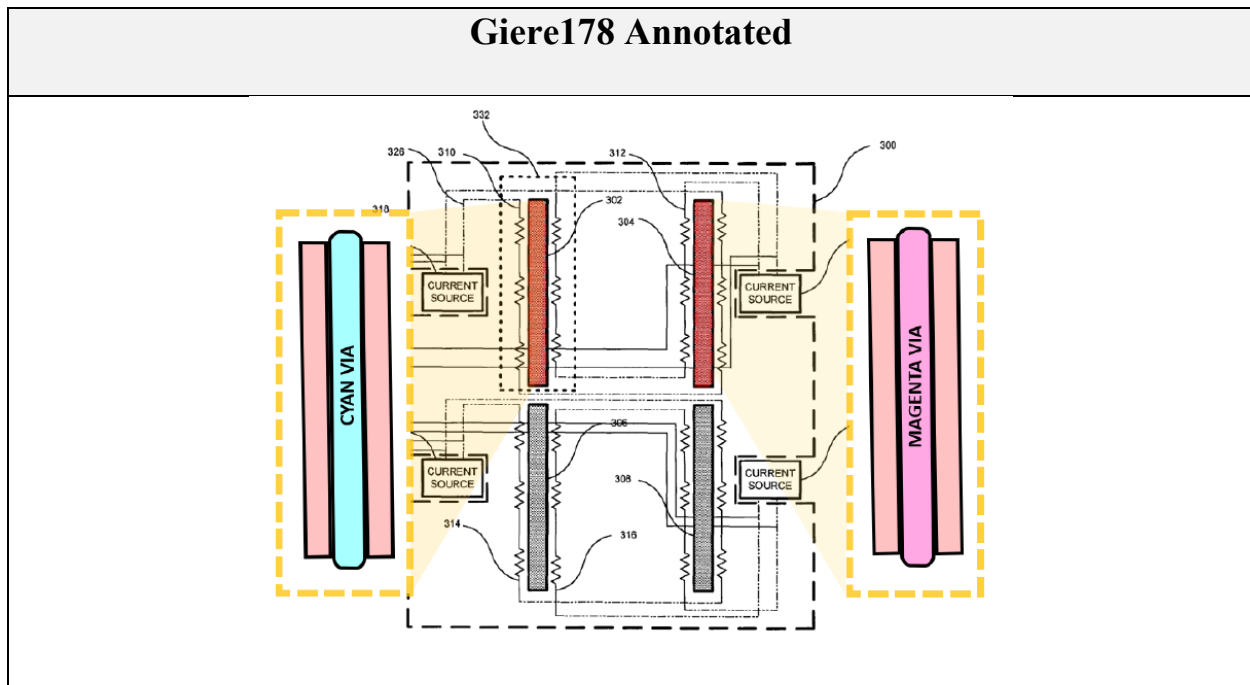
A. Giere178’s Chip Includes a Plurality of Ink Vias

PO argues that Petitioner “relies on the false premise that Giere178 discloses four ink feed slots/ink vias located in elongated regions 302, 304, 306, and 308 with heater arrays on both sides of each via.” POR:57. According to PO, “Giere178 indicates that the heaters and nozzels [sic] are arranged in the rectangular regions shown in Fig. 3 **without any mention of ink vias** in those regions.” *Id.* Not so.

First, Giere178’s written description expressly discloses that “substrate 300” in Fig. 3 includes “**ink feed slots**” (Pet:48-49; Ex.1007,8:45-47)—a term both parties’ experts agree is synonymous with the term “ink vias,” *compare* Ex.2004 (“ink feed slots” are “synonymous with ink vias” because “both are elongated holes formed in the substrate for allowing ink to pass from an ink reservoir to ink ejection chambers.”) *with* Ex.1031, 106:7-11 (“the term [ink feed slot] is “**synonymous**” because “in some patents they are called ink feed slot, and in some patents it's called via, and they **refer to the same thing** but different

terminology.”). As Dr. Pond explained at his deposition, “[i]nk Feed Slots is in plural, so we know there are multiple ink feed slots and that they were typical structures found in print heads.” Ex.2004.

Figure 3 of Giere178 makes this even more clear by depicting regions 302, 304, 306, and 308 of substrate 300 as elongated rectangles, which is the ordinary shape used by skilled artisans to typify nozzle arrays, their associated firing resistors for ejecting ink, **and their respective ink feed slots**. Pet.49-; Ex.1002:¶270; Ex.1007:8:45-47, 3:36-38; Ex.1008,2:59-3:4 (describing ink vias as “a plurality of elongated ink supply ports”). Because Giere178 describes these regions as including “nozzles and associated firing resistors” a PHOSITA would have understood that these regions must also include “ink ejection chambers” because, as Giere178 explains, the inkjet printhead has nozzles and firing resistors co-located with ink ejection chambers. Ex.1002 ¶270; Ex.1007, 2:59-3:4. This is also consistent with “typical inkjet printheads”—which is how Giere178 describes “the structures” of substrate 300. Ex.2004,74:11-75:21 (explaining that the nozzles and firing resistors of a “typical inkjet printhead” are co-located with ink ejection chambers adjacent an ink feed slot).



Dr. Pond confirmed that “a PHOSITA would look at this drawing and *see the long and skinny shapes* and *recognize them* to represent two drop generators on both sides of a via” based on “his *ordinary knowledge*” because “it’s an old but *ordinary layout* of a multicolor chip.” Ex.2004, 73:16-74:10. Dr. Pond even explained the reason *why* the elongated rectangle normally typifies the location of the ink vias. Ex.2004, 74:11-75:1; 138:19-139:18. Simply put, “it just falls out of the physics and engineering.” *Id.*, 75:1-2; Ex.1031:115:11-116:2 (“Q: the heater arrays are drawn as *long rectangles*, correct? A. Yes. If they used a different shape ... [a PHOSITA] would ask: Is the inventor trying to show me that there's a difference”).

Attempting to rebut Dr. Pond's opinion that Figure 3's rectangles depict the locations of four ink feed slots, PO relies on Giere178's description of a substrate having a "center feed" or "edge feed" slot design. POR:48. But Giere178's disclosure is not so limited. Only one embodiment has "a central *slot* in the substrate"—*singular* (Ex.1007,3:40-45), and it cannot be the one depicted in Figure 3 because that embodiment has "ink feed *slots*" —*plural* (Ex.1007:8:45-47); Ex.2004, 123:14-124:20 "Center feed" or "edge feed" slot designs (and Giere178's description) relate to a printhead substrate for printing a single color where ink is fed from a single compartment in the cartridge through a central channel (or over the edge) to each of the groups of heaters. Ex.1007,3:53-56.

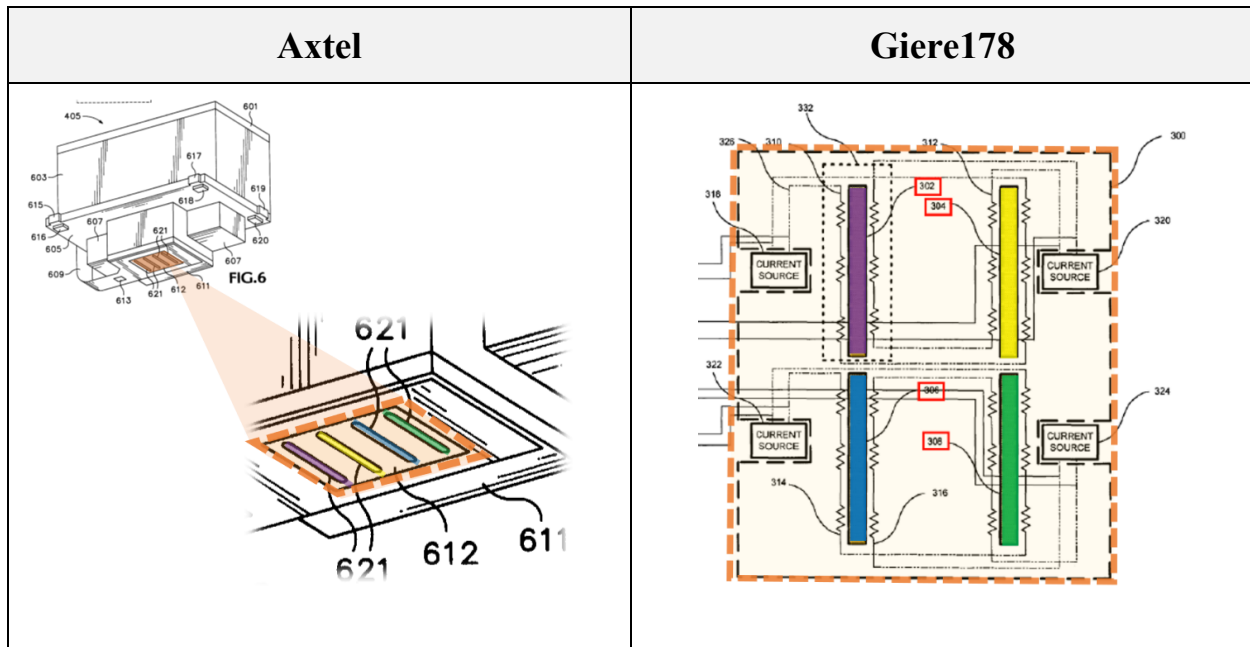
The POR fails to point out that Giere178 is not limited to "center feed" or "edge feed" slot design (for a single-color printhead), and, instead, expressly discloses a single ink cartridge capable of printing **multiple colors**:

alternatively, **two dual-compartment cartridges may be used to contain the four color inks**. In addition, two tri-compartment cartridges may be used to contain six base color inks, for example, black, cyan, magenta, yellow, light cyan and light magenta.

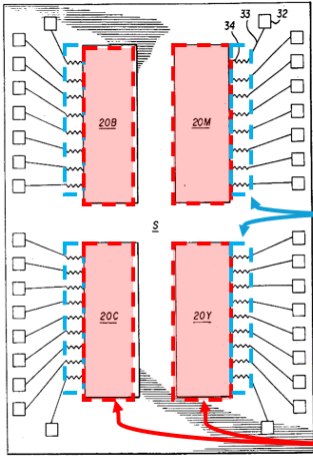
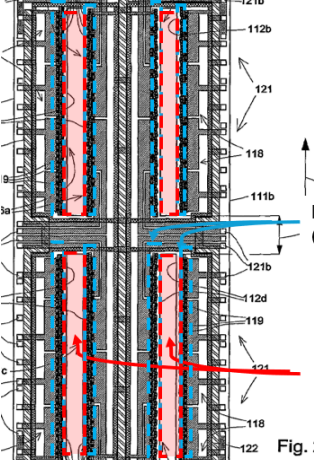
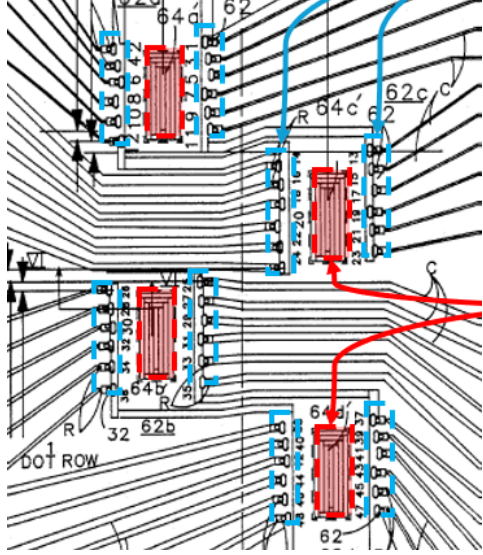
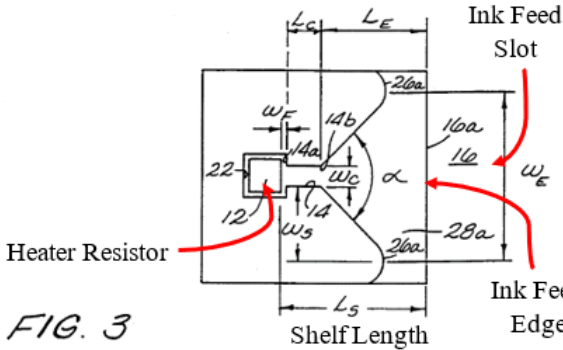
Ex.1007:3:55-65. While a center/edge feed slot designs make sense for a single-color print head, they are not useful in a multi-color printhead design which necessarily requires separation of the ink colors by having separate ink vias for each color. Dr. Pond explained during his deposition that Mr. Dietl's re-drawing of

Fig. 3 is not only “a very wasteful, extraordinary thing to do” because “no PHOSITA would do that” it is also inconsistent with a PHOSITA's understanding. As Dr. Pond put plainly: Ex.2004,75:9-14. Thus, Figure 3's depiction of four rectangles is consistent with Giere178's disclosure of a substrate for use with a multi-color ink cartridge, i.e., having four ink feed slots in the substrate.

Giere178 *incorporates by reference* a prior art patent, U.S. Patent No. 6,082,854 (“Axtel”), that discloses a multi-color printhead. *See* Ex.1011.8:30-40. Axtel's disclosure confirms a nozzle plate 612 (singular) shown below in Fig. 6 (left) that includes four sets of ink jet orifice arrays 621 [ink vias] for a “full, four color printing module.” Ex.1011.15:42-16:7.



Because Giere178 teaches that Fig. 3 includes a substrate with **ink feed slots that were typical at the time**, and it also discloses **multi-color printing**, a PHOSITA would have been familiar at the time with typical multi-color printheads having multiple ink feed slots. For example, Dr. Pond identified several prior art patent references during his deposition (e.g., Moritz, Keefe, Courian) that describe typical Hewlett-Packard multicolor printheads from the time. Ex.2004,Q:113:13-122:18. At the time of the Giere178 patent filing, it was typical and required that ink supply slots were located “very close, within a few 100 microns, of the heater arrays.” *Id.*,54:12-15; 120:11-125:6. As such, a PHOSITA reviewing Giere178 would have understood that for the multicolor design described in Giere178, the regions 302, 304, 306, 308 in Fig. 3 included different color ink fill slots close to their respective heater/nozzle arrays. Pet:69-70; Ex.1002, ¶¶312-315. The extrinsic evidence corroborating Dr. Pond’s opinion is provided below, and described in great detail by Dr. Pond during his deposition. Ex.2004, 113:11-125:6.

 Nozzle/Heater Columns (blue dotted outlines) Rear-Fed Ink Slots (red dotted outlines) FIG. 2 PRIOR ART	 Nozzle/Heater Columns (blue dotted outlines) Rear-Fed Ink Slots (red dotted outlines) FIG. 2
Ex.1034 (US5030971 to Drake) Fig. 2	Ex.1036 (US7008047 to Conta) Fig. 2
 FIG. 5	 FIG. 3
Ex.1035 (US4812859 to Chan), Fig. 5	Ex. 1027 (US5519423 to Moritz), Fig. 3

Dr. Pond’s opinions are further corroborated by a prior art inkjet textbook titled “Inkjet Technology and Product Development Strategies,” Torrey Pines Research (2000) (hereafter “Pond Textbook”). Dr. Pond’s prior art textbook

confirms that an ink feed slot needs to be “200 to 400 microns,” which was “just capturing this commonly acquired knowledge.”. Ex.2004,120:11-125:6 (“And when I put in my book in 2000 that region would be 200 to 400 microns, I was just capturing this commonly acquired knowledge.”). As Dr. Pond explained during his deposition, it was “general knowledge that in order to achieve acceptable drop repetition frequency, the supply of ink to refill after a drop is fired has to be within one or two jet spacings away from the heater resistor, so that for a 300-spot-per-inch device, the rule of thumb -- that's 85 microns of separation.” *Id.*113:21-126:2.

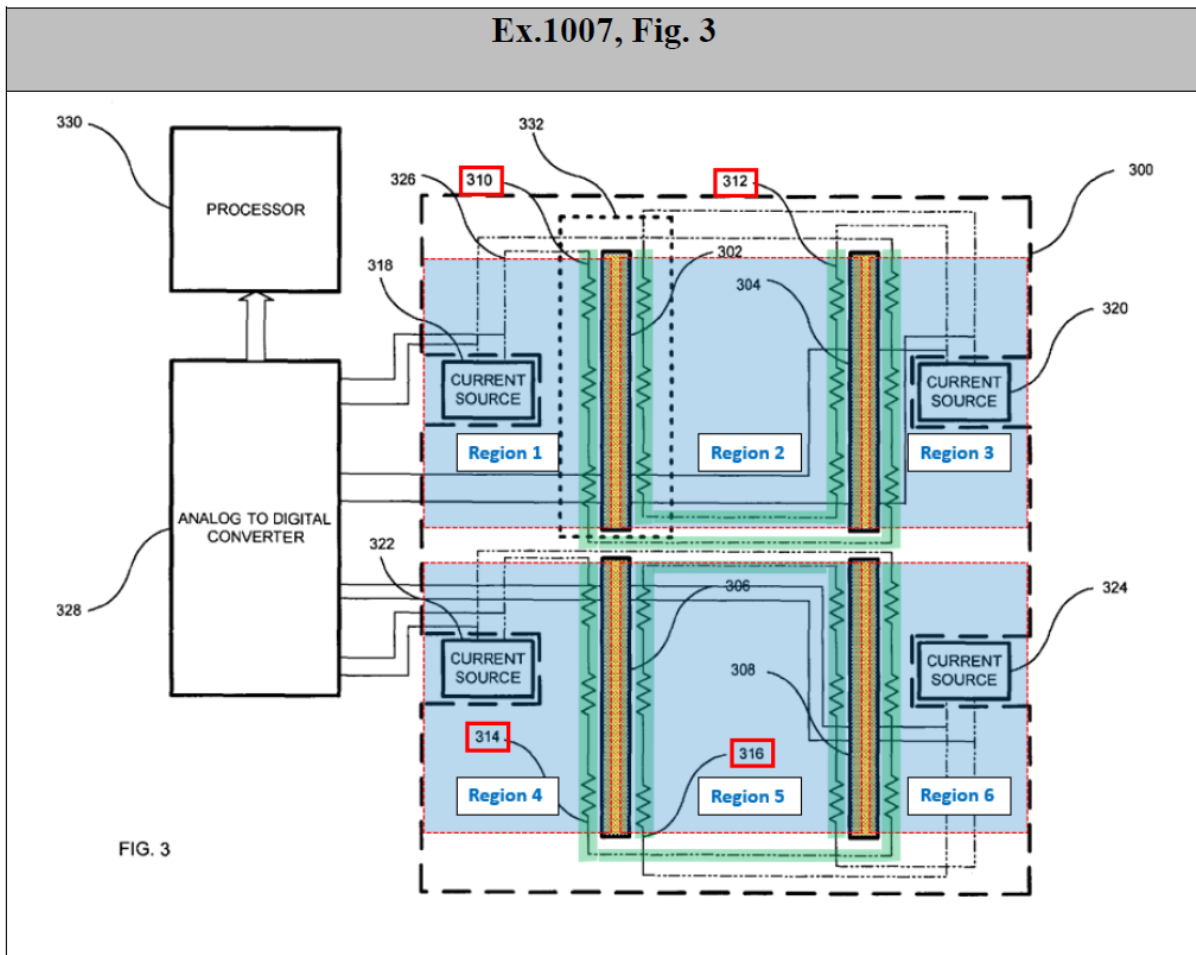
PO’s other arguments that Fig. 3 is a center-feed slot design lack merit. PO criticizes Dr. Pond’s interpretation of Fig. 3 because “connections from the analog to digital converter 328 are shown as traversing rectangular regions 302, 304, 306, and 308 where Dr. Pond asserts that vias would be located.” POR:26-27. But those are off-chip connections. Ex.2004,126:12-133:3. PO does not dispute that rectangular regions 302, 304, 306, and 308 also include nozzles and associated firing resistors (Ex.1007:8:47-49), so any contention that the yellow highlighted lines interferes with the contents of the region must be disregarded, Ex.2004.

B. The TSRs on Giere178’s Chip Sense the Temperature of the Heater Arrays Adjacent Each Region

PO argues that “[e]ven if the printhead of Giere ’178 had disclosed or was redesigned to include ink vias and two heater arrays in each region as Petitioners

argue, this would not meet the claims of the '708 patent.” POR 57. PO insists that “[Giere178’s TSR] would be incapable of distinguishing between the temperature of [different regions] because “TSR 310 would extend through both the region to the left and the region to the right . PO misses the point.

The '708 Patent claims do not require distinguishing between the temperature of Region 1 and Region 3. Instead, claim 1 requires “a single temperature sensing element disposed within each region, the **temperature sensing element operable to sense a temperature representative of the heater arrays adjacent to the region....**” Giere178 discloses this exact same thing, as (i) it only has a single temperature sensing element in each region (Regions 1 and 3 share the same single temperature sensing element), and Region 2 has its own single temperature sensing element, and (ii) each temperature sensing element in Giere178 is operable to sense a temperature representative of the heater arrays adjacent to the region. Pet:51-61; Ex.1002, ¶¶167-201.



Even Giere178's temperature sensing element that is shared between Regions 1 and 3, senses a temperature representative of the heater arrays adjacent its respective region, i.e., it measures a temperature of heater arrays in both Regions 1 and 3.

Furthermore, PO ignores that Giere178 teaches using a heating pulse history to sense a temperature representative of each heater array within these regions. In other words, while the shared temperature sensor for Region 1 and 3 can measure the temperature of the heater arrays adjacent Region 1 and 3, the heaters in those

regions are not firing at the same time, so the measured temperature is for whichever heater arrays happen to be firing. More specifically, Giere178 purposefully applies heating pulses to only one of the two heater arrays at a time to thereby sense a temperature representative of each. Ex.2004,28:1-14, 26:12-24

Dr. Pond further confirmed not only that temperature changes in Regions 1 and 3 depend on the firing pulse history of each of the heater arrays associated with Regions 1 and 3, but also that temperature changes could only be sensed by the Giere178 combined sensor 310 if the heaters adjacent to Region 1 were pulsed. *Id.*,25:21-28:9; 26:21-27:4 (confirming that one “could pulse heaters in different areas and watch it and learn about different regions from the single output.”). Additionally, Dr. Pond explained that a PHOSITA would be motivated to arrange Giere178’s sensors in Regions 1 and 3 in this fashion to save the cost of an additional current source and two additional bondpad and A/D unit connections. *Id.*,152:9-153:23; 106:3-107:5.

Accordingly, a PHOSITA would know to arrange the TSRs on Giere178’s chip to sense the temperature of the heater arrays adjacent to each region.

V. GROUND 4: GIERE+YABE RENDER THE CLAIMS OBVIOUS

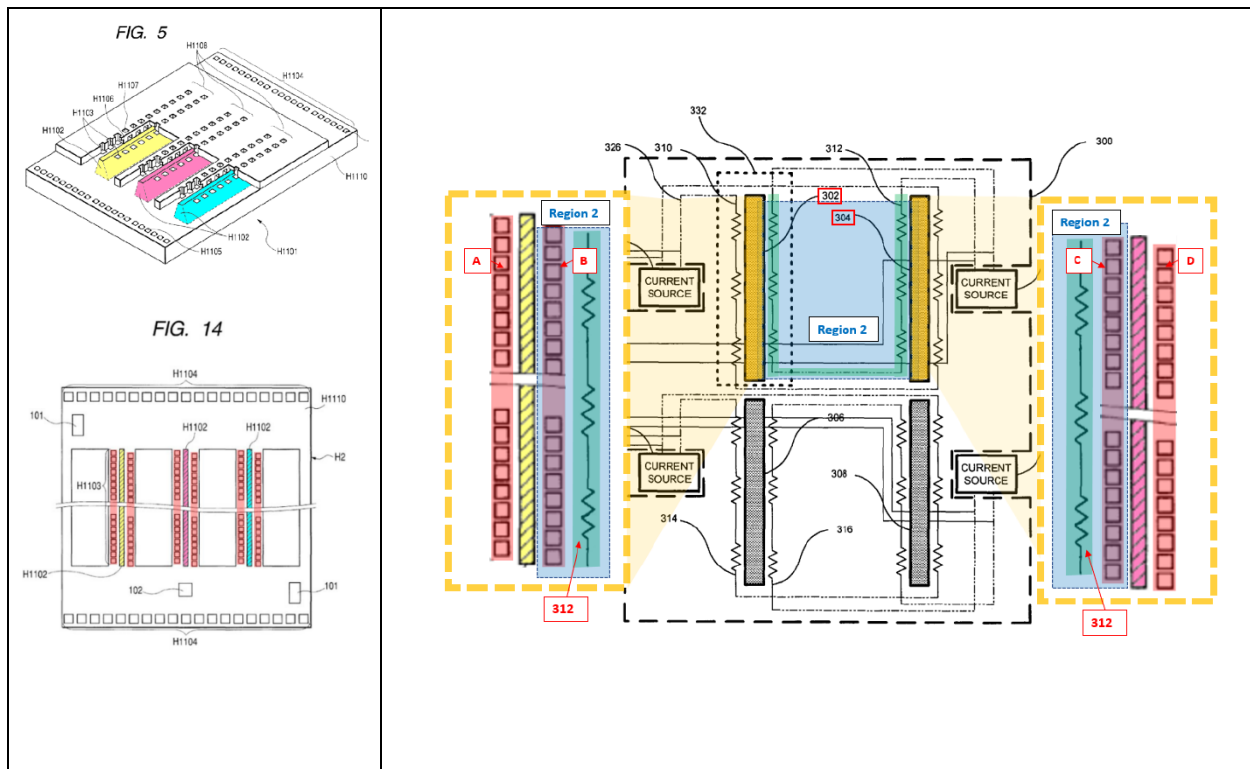
The POR presents two patentability arguments unique to the Giere178-Yabe combination. PO argues that Giere178-Yabe fails to render the challenged claims

obvious because (1) “a PHOSITA would not interpret Giere178 as disclosing the multiple ink via structure in the first place,” and (2) it would “involve extensive redesign.” POR:61. Both arguments fail.

A. Yabe Is Analogous Art and Its Substrate Includes a Plurality of Ink Vias

PO contends that a “PHOSITA would not interpret Giere178 as disclosing the multiple ink via structure in the first place, and would not have followed any of the obviousness rationales that start from the erroneous assumptions regarding the substrate structure disclosed in Giere178.” POR:60-61. This is wrong and entirely misses the point. Even if Giere178’s substrate lacked a plurality of ink vias (it does not; Pet.47-52), the Petition, supported by Dr. Pond’s opinion, demonstrated that the challenged claims would still be unpatentable because Yabe supplies that allegedly missing element by motivating a PHOSITA to implement Yabe’s multi-via substrate design (*below*) within Giere178. Pet.92-101; Ex.1002:¶¶415-445.

Yabe	Giery178+Yabe Combination
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The POR never addresses Dr. Pond’s opinion or any other evidence established on this point in the Petition. POR:58-60. Nor does it bother rebutting the numerous reasons that Dr. Pond provided why a PHOSITA would have been motivated to incorporate Yabe’s printhead die design into Giere178’s substrate 300 (*id.*)—namely, to achieve “higher image quality and faster printing capability” (Ex.1002:¶426).

B. Yabe Is Analogous Art Whose Teachings Would Have Been Implemented in Giere178 Without Undue Experimentation

The POR appears to argue that Giere178 and Yabe are not analogous and are in fact incompatible because the two “relate to an entirely different substrate

design”—the former is a center-feed (or edge-feed) substrate design while the latter is a roof-shooter substrate design. POR:59-62. Not true. As explained above, Giere178’s substrate incorporates a roof-shooter design with a plurality of ink vias, not an edge-feed design. Pet:93-100. Accordingly, Giere178 and Yabe are analogous even under PO’s strained reading of the law.

The POR next faults the Petition for failing to explain how a PHOSITA would “incorporat[e] the ink vias and heater arrays of Yabe into the four-quadrant design and temperature management system of Giere178.” POR:62. Even if that were true (it is not; Pet:95-100), the critical question is not “whether the references could be physically combined but [rather] whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.” *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (*en banc*). Nor is it “necessary that the inventions of the references be physically combinable to render obvious the invention under review,” as PO suggests. *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983). After establishing obviousness based on the Giere178-Yabe combination, the Petition does not need to “address any of the practical considerations associated with adding ink vias, heaters, nozzles, and all accompanying structures,” as the PO contends. POR:62-64.

Regardless, Dr. Pond testified that it would have been obvious to position a known element (sensor) in a conventional arrangement (within each thermal region of the chip) to achieve predictable results (monitor temperature of the entire board and/or measure temperature on a per-via basis). Ex.1002,¶¶411-421; Ex. 2004,152:9-153:23 (“I mean, it's obvious that if different regions are heated differently and you want to do a better job of temperature management, you need to know the temperature in the different places. That's common sense.”).

PO cites *In re Nuvasive*, but that case confirms the propriety of Dr. Pond’s analysis. There, the Federal Circuit vacated the Board’s obviousness finding because it “failed to articulate a reason why” a PHOSITA would have combined two references and did not address “the benefits that could have been obtained by combining the prior art references.” 842 F.3d 1376, 1384-85 (Fed. Cir. 2016). But Dr. Pond properly considered both. Ex.1002,¶¶415-445.

VI. GROUNDS 5 & 6: GIERE178 (ALONE OR WITH YABE) AND PARISH RENDERS OBVIOUS DEPENDENT CLAIMS 4 AND 13

The POR presents no patentability argument unique to the “n-type implant donor thermal sense resistor” added by the dependent claims challenged in these grounds; it instead relies on the same meritless arguments it raised in the prior Giere178 grounds (Grounds 3 and 4). POR:67. The Board should reject these recycled arguments for the same reasons it did before. ID:41.

VII. CONCLUSION

Canon requests that the Board cancel each challenged claim as unpatentable.

Dated: February 7, 2024

/ Dion M. Bregman /
Dion M. Bregman, Reg. No. 45,645

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(a), Petitioner hereby certifies that Petitioner's Reply to Patent Owner's Response contains 5,175 words according to the word count provided by the word processing program used to prepare this Reply (Microsoft Word). Pursuant to 37 C.F.R. §42.24(c), this word count is in compliance and excludes the table of contents, table of authorities, mandatory notices under §42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing.

Dated: February 7, 2024

/ Dion M. Bregman /
Dion M. Bregman, Reg. No. 45,645

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e)(4), it is hereby certified that on February 7, 2024 an electronic copy of this PETITIONER’S REPLY TO PATENT OWNER’S RESPONSE AND SUPPORTING EXHIBITS, were served via email to Patent Owner’s counsel of record in this proceeding:

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Dated: February 7, 2024

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