

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

PATENT OWNER SUR-REPLY

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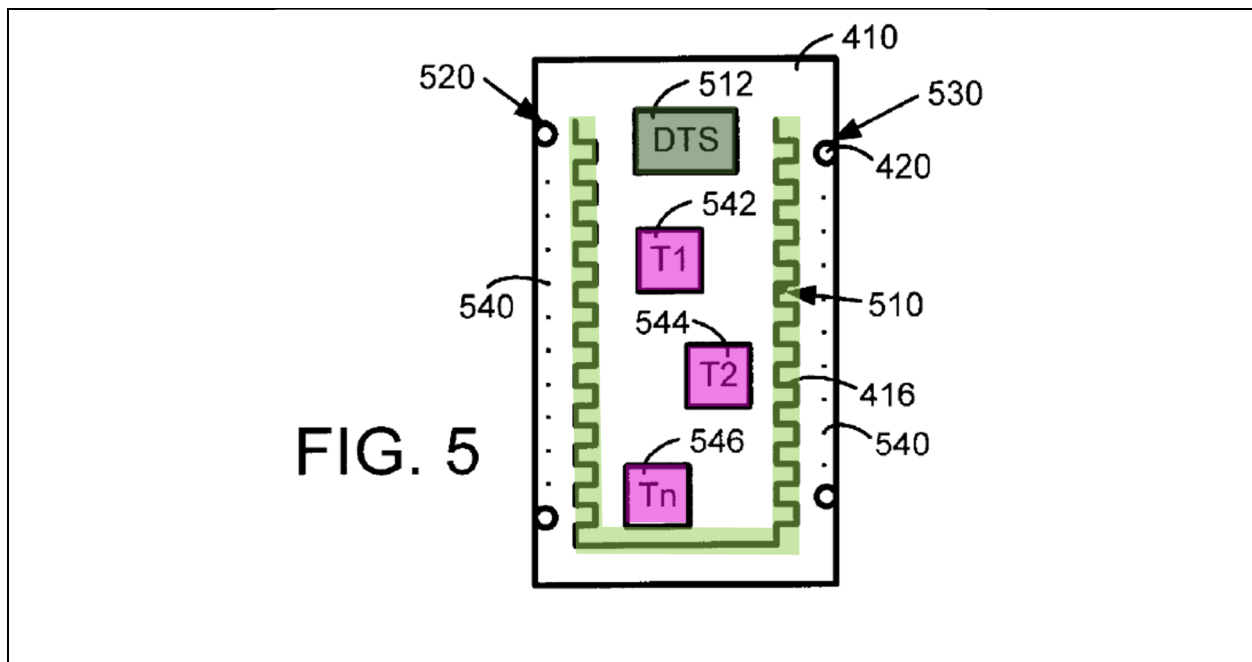
I. PETITIONERS FAIL TO ESTABLISH THAT ANY CLAIMS WOULD HAVE BEEN OBVIOUS IN VIEW OF BENJAMIN AND GIERE '673 (GROUNDS 1 AND 2)

A. Neither Benjamin Nor Giere '673 Suggest Monitoring of Temperatures in Regions Between Ink Vias

It is uncontested that Benjamin does not disclose the placement of its TSR. (PR p. 3; Pet. pp. 13-16 and 21-22; Ex. 1002 ¶¶248-252; Ex. 2003 ¶83.) While Giere '673 discloses a TSR between heater arrays, Petitioners concede that the claims of the '708 patent require a temperature sensor to be disposed both between adjacent heater arrays and also between adjacent ink vias. (PR p. 3) Their argument that Patent Owner has attempted to “recast” the claims thus falls flat. Petitioners are the ones attempting to recast claim language, ignoring that Giere '673 does not have any vias at all, let alone multiple parallel vias with heater arrays on both sides of each via. (See Ex. 2003 ¶84.) Instead, they improperly focus only on the positioning of a TSR between two columns of heaters, using hindsight to selectively pluck this aspect from Giere '673 while ignoring the remainder of Giere '673's teachings. *In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988); *Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH*, 139 F.3d 877, 885 (Fed. Cir. 1998).

The reliance on an isolated aspect of Giere '673 is disingenuous, particularly when Petitioners also rely on alleged optimization of print quality as a motivation to combine without establishing that optimization of print quality results from the isolated aspect they have relied upon. Giere '673's print optimization requires inputs

from multiple temperatures sensors together with firing history data to monitor and predict the thermal conditions of particular ink ejection elements and to set operating conditions. (Ex. 2003 ¶¶ 66-67 and 84; Ex. 1005 col. 2 lns 57-62, col. 5 lns 28-31, col. 6 lns 5-18, and col. 6 lns 35-40.) A fundamental aspect of the disclosed temperature controller is generating local temperature profiles near designated ink ejection elements. (Ex. 2003 ¶66; Ex. 1005 col. 2 lns 57-62.) As shown in Fig. 5 of Giere '673 below, a thermal sense resistor 510 [light green], a digital temperature sensor 512 [dark green], and multiple temperature recorders 542, 544, and 546 [pink] are spread across the substrate:



The disclosed system of Giere '673 stores temperature data to a temperature logic system 606 along with past and future printing data from the logic mapping system 604 that is indicative of which ink ejection chambers 418 will be fired, and when

each will be fired. (*Id.* col. 6 lns 35-46.) The temperature logic system uses these temperature and printing inputs along with other information to generate printing parameters in a closed loop system that approximates a temperature profile to improve ink drop quality. (Ex. 2003 ¶¶64; Ex. 1005 col. 6 lns 47-60.) Petitioners ignore the complexities required to get the benefits of Giere '673's temperature control system, and instead cherry-pick a single TSR while incorrectly assuming that it will confer the identified benefits. Rather than Petitioners' cherry-picking of particular elements with no context, a proper analysis evaluates each reference in its entirety. *In re Evanega*, 829 F.2d 1110, 1112 (Fed. Cir. 1987).

Further, unlike Benjamin and the '708 patent, the printhead die of Giere '673 does not include any ink vias, with ink instead flowing from ink reservoir 424 [blue] around the edges of the heater chip substrate 410 [yellow] and into vaporization chambers 418 [red] as shown in the figures below.

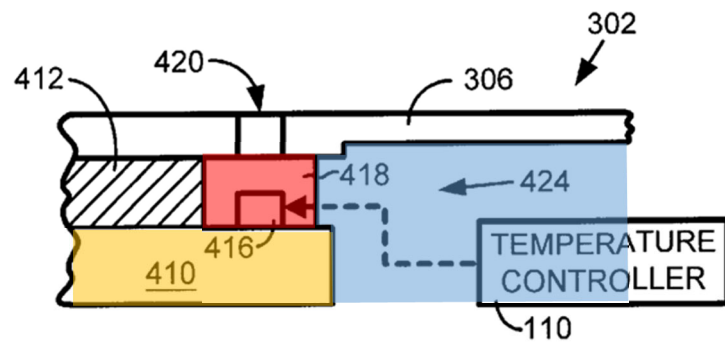


FIG. 4

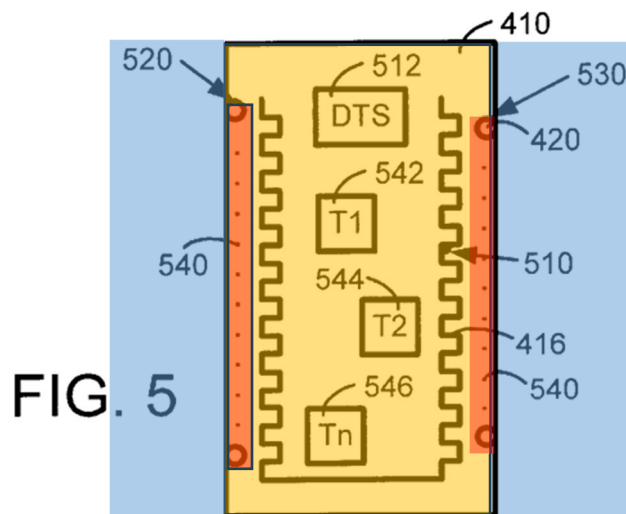


FIG. 5

(Ex. 2003 ¶65; Ex. 1005 col. 5 lns 42-45.) Giere '673 teaches nothing about where to place temperature sensors in a printhead having a plurality of ink vias with heater arrays on both sides of each via as in the '708 patent. (Ex. 2003 ¶65.) The U-shaped TSR 510 of Giere '673 is designed to sense the temperature of the substrate as a whole, not optimize small groups of ink ejector elements, and is positioned between two arrays of heaters only because those heaters are located at the edge of the chip

instead of adjacent ink vias formed as holes within a substrate. (*Id.*) It is Petitioners, not Patent Owner, that fail to consider the combined teachings of references in their entirety to understand what a PHOSITA actually would have been motivated to do without hindsight benefit of the '708 patent.

Petitioners' argument that Patent Owner relies on an "errant" citation to *Par Pharm* is also inaccurate. (PR p. 5.) Patent Owner does not argue that Giere '673 does not disclose a TSR positioned between two columns of heaters. Instead, a major problem with Petitioners' combination is that neither Giere '673 nor Benjamin provide any teachings that would have led a PHOSITA to implement the '708 patent's temperature monitoring approach in a chip similar to that of Benjamin because neither reference even suggests a region-by-region temperature sensing approach in a multi-via heater chip. As stated in Patent Owner's response, the proposed combination necessarily fails to render the subject matter of independent claims 1 and 9 obvious because Benjamin and Giere '673 each fail to disclose a single temperature sensing element in a region between heater arrays and their associated ink vias. *See Par Pharm., Inc. v. TWi Pharms., Inc.*, 773 F.3d 1186, 1194 (Fed. Cir. 2014) (citing *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1164 (Fed. Cir. 2006)). While Benjamin discloses a multi-via heater chip, it suggests only a single temperature sensor that monitors temperature of the chip as a whole, and Giere '673 likewise suggests using a TSR to measure temperature of the chip as a whole,

but in combination with numerous other sensors positioned between the same two heater arrays . The references do not suggest that implementation of a single minor aspect of Giere '673's temperature monitoring system (as illustrated in Petitioners' doctored images (PR p. 4)) would provide the benefits of Giere's full temperature management system, and their expert fails to justify his decision to cherry-pick a single aspect of Giere '673's temperature control system in place of considering the combination of references as a whole.

B. Giere '673 Would Not Have Provided Motivation for the Asserted Combination of References

Petitioners argue that their theory has rested all along on the vague notion of “improved optimization of the print quality” obtained by use of a TSR between heater arrays as in Giere '673. Yet the words “improved optimization” are nowhere in the Petition, and neither Petitioners nor their expert even attempt to properly analyze how Giere '673 allegedly improves “optimization of print quality” or how this improvement could be carried over to the structure of Benjamin. Instead, Petitioners simply resort to selecting discrete elements to conjure up a device that does not comport with the design or operating principles of either of the prior art references.

Petitioners' newfound reliance on wording that does not appear in the Petition and their related attempt to characterize Patent Owner's analysis of “structural similarities” as a straw man are extremely odd given that both the Petition and the

related Declaration state that “[g]iven the structural similarities between Benjamin and Giere673’s printhead dies, a PHOSITA would have applied Giere673’s teachings to Benjamin” (Pet. p. 22; Ex. 1002 ¶185.) As Patent Owner previously pointed out, the logical connection between the cited prior art and Petitioners’ multi-TSR approach is strained. The Petition alleges that a PHOSITA would have disposed a single TSR within each region of Benjamin’s chip (*Id.* p. 22.) Yet Petitioners have acknowledged that it is the “temperature of the **entire printhead die**” that Benjamin utilizes to regulate operational temperature. (Pet. p. 23, emphasis in original.) Acknowledging this discrepancy, they then argue that the PHOSITA would recognize that their multiple temperature sensor approach would not achieve the desired result, so the PHOSITA would add additional structures to average the results of the multiple temperature sensors in order to get back to the same result as the single sensor that was already in Benjamin to begin with. While this *ex post facto* reasoning attempts to justify backing into the invention of the ’708 patent, it bears no relation to what a PHOSITA actually would have been motivated to do based on the combined teachings of Benjamin and Giere ’673 and without the benefit of hindsight or the ’708 patent.

The relevant teachings of Giere ’673 are limited to its complex temperature monitoring circuitry employed on a chip with no vias. Giere ’673 would not have been helpful to a PHOSITA in determining the placement of a TSR for determining

the temperature of a multi-via chip as in Benjamin, nor would it have suggested using only one temperature sensor to measure the temperature of each region. (Ex. 2003 ¶85.) Petitioners argue that they need not present the “best” temperature sensor technique, just one that would improve Benjamin, even if the modification would unnecessarily add cost and take up space. (PR pp. 6-7.) Yet Petitioners do not even explain how Benjamin would be “improved” by the proposed modification, instead they simply make vague statements about the “improved” print quality of Giere ’673 without acknowledging that these benefits come from a complex arrangement of multiple sensors and recording devices, and without explaining how these complex improvements could be applied to Benjamin by adding a single element of that complex arrangement. As noted above, Petitioners’ proposed combination abandons almost all aspects of Giere ’673, instead plucking a single aspect of a single component in order to construct a device that ultimately measures the same thing as Benjamin, just in a much less efficient way. There is no articulated improvement from the actual combination advanced by Petitioners, just added expense.

Petitioners’ criticism of Mr. Dietl’s testimony about what a PHOSITA would actually have been motivated to do is misplaced. While they argue that “a snaking TSR between different regions” is “found nowhere in either reference,” that argument flies in the face of their own contention that one must analyze the combination, not just the individual references. Further, it is equally true that neither

reference shows a single temperature sensor disposed in each region of a multi-via heater chip, as proposed by Petitioners, and that neither reference suggests averaging temperatures detected from two or more regions located between different pairs of vias.

Petitioners' quotation of Dr. Pond's deposition testimony indicating that a single temperature sensor would not allow control of drop size in as short of a time interval (PR p. 8) does not explain why the invention of the '708 patent would have been obvious. Dr. Pond indicated that "there are more sophisticated versions of temperature management control" and that "[the] surrounding sensor that we saw in the prior art Figure 1 and in Chang earlier would be okay for one level of sophistication," but that having more sensors would allow a more sophisticated, albeit more expensive system. (Ex. 2004 107:3-20). Dr. Pond's suggested approach of adding more sensors for more precise control **teaches away** from the approach of the '708 patent (region-by-region temperature measurement with only a single sensor in each region), and the only regional temperature monitoring that Dr. Pond was able to identify in Giere '673 has sensors of an unknown type located in different parts of the same single region between two alleged ink vias. (*Id.* 108:7-18).

C. Giere '673 Does Not Provide Motivation to Dispose a TSR Within Each of Benjamin's Regions

Petitioners' argument that Giere '673 suggests detecting temperature on a region-by-region basis where regions are separated by ink vias improperly relies on

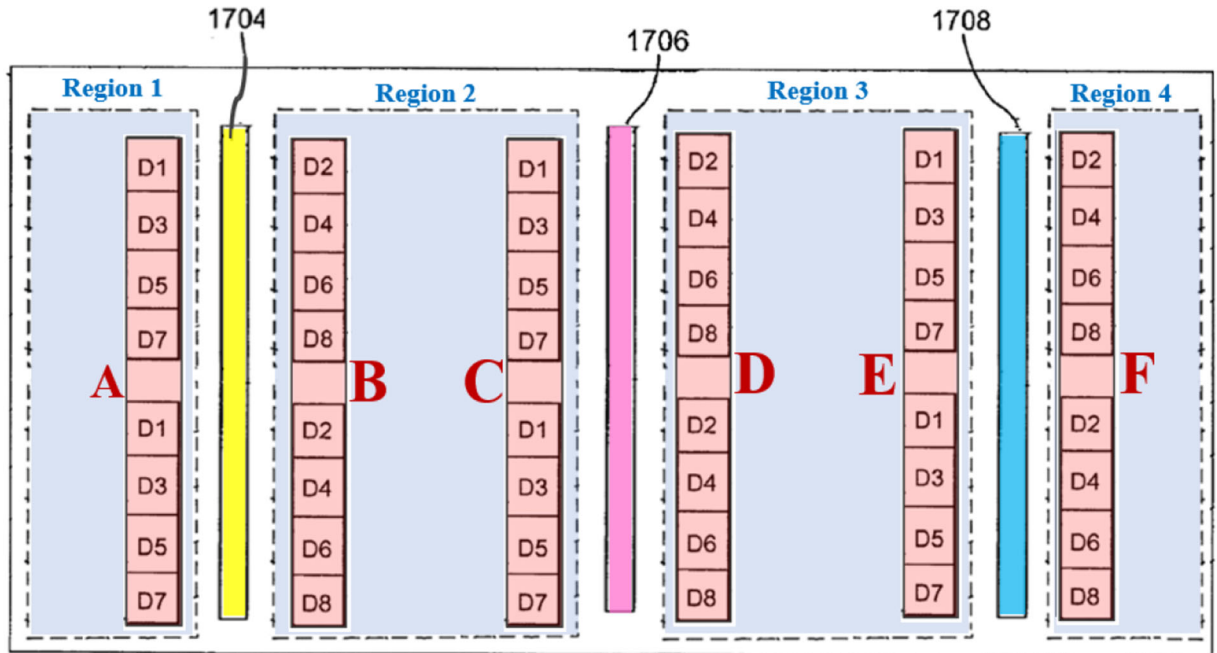
hindsight and conclusory testimony from their expert. First, Petitioners establish that Giere '673 discloses one **or multiple** TSRs between the only two heater arrays of a heater chip. (PR p. 8.) Then, Petitioners conclusorily state that to obtain vague “optimized performance,” a PHOSITA would know to place a single TSR between each pair of heater arrays. (PR p. 9.) Petitioners argue that, “[s]tated 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.” (*Id.*) This is a straw man argument. Patent Owner never argued that a PHOSITA would have placed a TSR only between one set of heater arrays. Instead, Patent Owner simply demonstrated that cited prior art recognizing ink vias as thermal insulators, such as U.S. Patent No. 6,527,367 to Yabe (Ex. 1008), **teach to avoid measuring temperatures between ink vias altogether**, and instead measure mean temperature along the **periphery** of the die. (POR pp. 28-31 and 45.) The same approach is shown in the prior art device depicted in Fig. 1 of the '708 patent. (*Id.* p. 3).

Petitioners’ argument that Patent Owner improperly analyzed each reference individually is simply incorrect. Patent Owner has addressed the combination of references, and a serious defect in Petitioners’ argument is that Benjamin has only a single temperature sensor for the entire printhead die, while Giere '673 teaches nothing about detecting overall die temperature in a multi-via heater chip. Petitioners’ argument that the combination of references would have led a PHOSITA

to “optimize performance in each respective region” (PR p. 9) is nothing more than a rehash of their earlier arguments discussed above in Sections I.A. and I.B above. This argument requires one to ignore that Petitioners are attempting to divorce the alleged optimization of performance in Giere ’673 from the complicated arrangement of multiple sensors actually disclosed in that reference as responsible for said optimization.

D. Admitted Prior Art and Yabe Do Not Provide Motivation to Dispose a Single TSR Within Each Region of Benjamin’s Chip

Finally, Petitioners make the new argument that if Giere ’673 failed to provide a motivation to place a TSR between each set of Benjamin’s heating elements, the admitted prior art or Yabe would have provided such a motivation. Petitioners’ argument should be rejected because Petitioners conflate measurement of temperature on a per-color basis with the invention of the ’708 patent. (PR p. 10.) The claims of the ’708 patent require exactly one temperature sensing element per region, whereas Petitioners’ logic that “a PHOSITA would have known to add Giere ’673’s TSR into each region to provide more accurate temperature **measurement per color** and avoid the issue of ink vias acting as thermal barriers” (PR p. 10, emphasis added) would have resulted in **two** TSRs per region, because the columns on opposite sides of each region between ink vias in Benjamin are associated with different colors, as illustrated below:



(Pet. p. 19). As the image above from the Petition shows, heater array “B” is associated with the yellow via (1704) and heater array “C” is associated with the magenta via (1706), so monitoring temperature on a per-color basis would require two distinct temperature sensors in “Region 2,” contrary to every claim of the ’708 patent.

Petitioners also mischaracterize Patent Owner’s arguments by stating that the principal contention is that ink vias were not known to act as thermal barriers. While the ’708 patent does not admit that this was known in the prior art, the more significant point is that prior art that does recognize that parallel ink vias insulate regions between those vias from one another does not suggest monitoring the temperature of each region, and instead **avoids** placement of temperature sensors between ink vias altogether. This is clearly demonstrated by Yabe (Ex. 1008). *See*

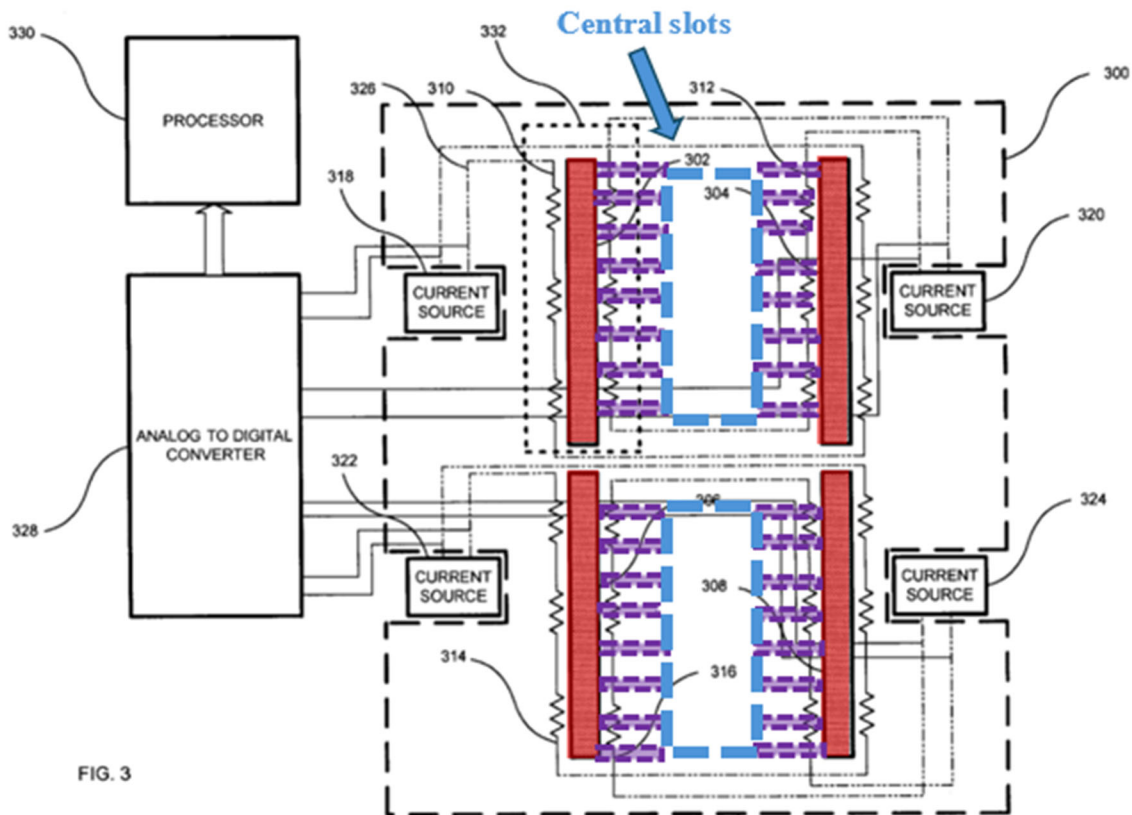
Section I.C. above. Petitioners' extensive arguments that Yabe recognized that ink vias act as thermal insulators therefore completely miss the point.

II. GIERE '178 WOULD NOT RENDER THE CLAIMS OBVIOUS (GROUNDS 3-6)

A. Giere '178 Does Not Include a Plurality of Ink Vias on a Single Heater Chip

Nothing in Petitioners' Reply supports their contention that Giere '178 discloses four ink feed slots in elongated regions 302, 304, 306, and/or 308. As the Institution Decision correctly recognized, "Giere178 does not teach a plurality of ink vias." (ID (Paper 6) at p. 26). Petitioners' main argument to the contrary relies on a single, vague reference to "feed slots." (PR pp. 14-15.) Petitioners simply cannot show that the plural "s" that they emphasize supports their interpretation of the reference as disclosing four feed slots on the same heater chip in a very specific arrangement relative to illustrated temperature sensors. Petitioners read far too much into a statement that "[a]lthough not shown in FIG. 3 for ease of illustration, substrate 300 includes the structures of a typical printhead such as, ink feed slots, ink ejection chambers, firing resistors, etc." (Ex. 1007 col. 8 lns 44-47.) It is unclear if the plural "ink feed slots" language was intentional, but even if it was, the term "slots" likely refers only to the fact that there are multiple slots across multiple separate printheads or that a central ink slot may be divided into multiple slots with the same overall configuration. **In fact, as Patent Owner previously indicated,**

there are two central areas in the chip electrical schematic depicted in Fig. 3 of Giere '178 where an elongated hole can be located between the regions 302, 304, 306, 308 without interfering with the TSR traces identified by Dr. Pond. (POR p. 26.); Ex. 2003 ¶77; The below image of Fig. 3 has been annotated to show a separate ink slot in each of these two central regions:

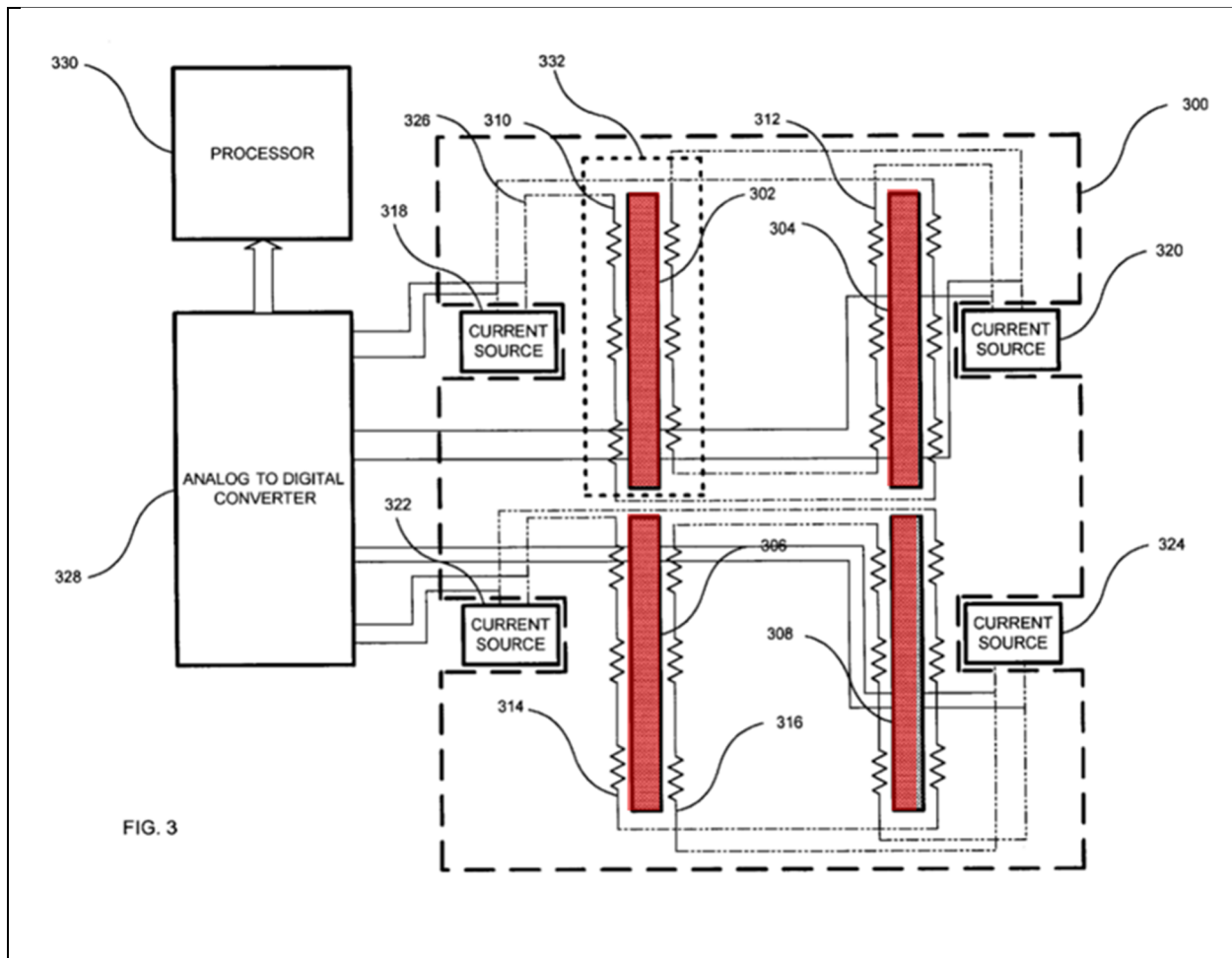


(Ex. 1007 Fig. 3, annotated). Petitioners' undue reliance on, and wild extrapolation from, the "s" in "ink slots" is also contrary to Giere '178's express teaching that "regions 302, 304, 306, and 308 each include *an array* of nozzles and associated firing resistors for ejecting ink." (Ex. 1007 col. 8, lns 47-49 (emphasis added)); Ex.

2003 ¶¶95-96.) Dr. Pond is unable to point to a single passage from Giere '178 that describes the rectangular regions 302, 304, 306, and 308 as having multiple heater arrays separated by an ink via. (Ex. 2003 ¶¶95-96.)

At any rate, the presence of multiple ink feed slots on a single heater chip is not enough to support Petitioners' position. Petitioners must further demonstrate that each of the four rectangular boxes shown in Fig. 3 contains an ink via sandwiched between two columns of heaters in order for the TSR arrangement of Giere '178 to be relevant. They cannot do so. Giere '178 is absolutely clear that the identified boxes include ejection chambers and firing resistors, but it makes no mention of ink slots. (Ex. 1007 col. 8 lns 47-49.) This is especially conspicuous, given that the very next sentence following the mention of "feed slots" relied on by Petitioners specifically mentions two out of the three structures identified in the previous sentence as located within rectangles 302/304/306/308, but declines to mention the third structure(feed slots) being within those same rectangles. (*Id.* col. 8 lns 44-49.)

Moreover, the presence of an "s" at the end of "slot" does not change what the remainder of Giere '178 clearly discloses. Fig. 3 of Giere '178 annotated below is a "high level schematic diagram." (Ex. 1007 col. 8 lns 41-43; Ex. 2003 ¶¶69.)



An ink via is indisputably not shown in the substrate of Fig. 3 (Ex. 1007 col. 8, lns 47-49; Ex. 2003 ¶69.); however, the specification explicitly states that ink is fed to the ejection chambers (i.e. located in regions 302/304/306/308 of Fig. 3 as indicated above) “either through an elongated hole formed in the center of the bottom of the substrate, ‘center feed,’ or around the outer edges of the substrate, ‘edge feed.’” (Ex. 1007 col. 3 lns 34-50; Ex. 2003 ¶69.) This only makes sense if ink vias are not included within the identified rectangular regions. **If ink slots are included within the rectangular regions, this arrangement would not have a “center feed” nor**

would it have an “edge feed,” contrary to Giere ’178’s own description. In other words, location of ink slots in the four rectangular regions is inconsistent with the normal meaning of “center” and totally forecloses the possibility of an edge feed.

Petitioners are also incorrect that Giere ’178 discloses “dual compartment cartridges” as an alternative to the center feed and edge feed designs. (PR p. 17.) The number of compartments in an ink cartridge do not dictate the number or placements of ink vias in a heater chip. In fact, Petitioners’ expert admitted at deposition that a printhead could have multiple chips for different inks:

Q. Is it impossible for a cartridge to include multiple chips?

A. Not impossible.

(Ex. 2004 83:4-6.) Petitioners' alleged support is a quote that two or three (not four) inks may be contained in a single cartridge, which is indisputably not the same as stating that two or three inks are discharged from the same heater chip. The only thing that the passage quoted by Petitioners unequivocally shows is that a single heater chip in Giere ’178 does not produce four colors as Petitioners and their expert contend, because the quoted passage identifies only up to three inks per cartridge. Four separate ink colors associated with a single chip is clearly not contemplated.

Dr. Pond also admitted at deposition that Giere ’178 never actually describes a 4 ink slot design. (Ex. 2004 85:6-15.) Instead, Pond relies on Giere ’178’s incorporation of Axtel. **Importantly, even Axtel fails to show the 4-quadrant**

design alleged by Petitioners, and instead shows side-by-side ink slots. (PR p. 18). It is not sufficient for Petitioners to show that Giere '178 could have had multiple ink slots or could be modified to have multiple ink slots in a row as in Axtel. Grounds 3, 4, 5, and 6 fundamentally rely on Petitioners' incorrect interpretation of Giere '178 having a 4-quadrant design with TSRs arranged in a very particular manner relative to those alleged ink vias. Petitioners' position is supported by nothing but hindsight reimagining of a single vague schematic figure taken out of context. When the figure is properly interpreted, however, with TSRs placed along both sides of columns of heater resistors, it is clear that the temperature-sensing scheme of Giere '178 is completely different from what is claimed in the '708 patent.

In a desperate attempt to prop up their misinterpretation of Giere '178, Petitioners impermissibly turn to new prior art references not included in the original Petition. (PR pp. 18-21.) While Petitioners attempt to portray this as new evidence supporting their interpretation of Giere '178, Petitioners are in fact presenting a new prior art combination. As such, Petitioners' arguments regarding these new references must be disregarded. *See Wasica Fin. GmbH v. Cont'l Auto. Sys.*, 853 F.3d 1272, 1286 (Fed. Cir. 2017) ("Shifting arguments [from the petition to new theories of obviousness in the reply] is foreclosed by statute, our precedent, and Board guidelines."); *Bank of America, N.A. v. Nant Holdings IP, LLC*, IPR2021-01332, Paper 40 at 30 (PTAB Jan. 9, 2023) (new argument in Reply that a figure

discloses a particular embodiment is belated is not entitled to consideration). Even if the new prior art is not considered part of a new combination *per se* (even though it is, and clearly relies on structure of the new references that is not in Giere '178), the Board should refuse to consider Petitioners' new rationale for interpreting Giere '178. *Intelligent Bio-Systems, Inc. v. Illumina Cambridge, Ltd.*, 821 F.3d 1359, 1370 (Fed. Cir. 2016)("[W]e find that the Board did not err in refusing the reply brief as improper under 37 C.F.R. § 42.23(b) because [Petitioners] relied on an entirely new rationale to explain why one of skill in the art would have been motivated to combine [the prior art references].") In fact, these new arguments justify ignoring Petitioners' Reply in its entirety. *Id.* at 1369 ("Once the Board identifies new issues presented for the first time in reply, neither this court nor the Board must parse the reply brief to determine which, if any, parts of that brief are responsive and which are improper.").

Additionally, these new references are not related in any way to Giere '178, and cannot change what Giere '178 actually teaches. Reliance on these new prior art references is simply a *post hoc* attempt to justify Petitioners' misinterpretation of Giere '178. A PHOSITA would not backfill in undisclosed structural details based on operational aspects of the temperature monitoring system that are also not described in Giere '178. (Ex. 2003 ¶¶96.)

Petitioners' impermissible new prior art also fails to support their interpretation of Giere '178 in any way. Despite Petitioners' allegation that Dr. Pond described how this new prior art supports his opinions "in great detail" at his deposition, Dr. Pond actually said very little about these references other than making a vague comparison of their drawings to Fig. 3 of Giere '178, devoid of any context. (Ex. 2004 126:12 – 133:3.) One of ordinary skill in the art would not have consulted other unrelated documents when Giere '178 clearly describes the two options for ink feed positions (center feed and edge feed). (Ex. 2003 ¶¶78 and 96.) Moreover, the new prior art does not show what Petitioners purport it to show. For instance, US 5,519,423 does not even show multiple ink slots. (Ex. 1027). US 4,812,859 does not have regions between different vias, because the vias are staggered. (Ex. 1035 Fig. 5). US 5,030,971 disparages the identified embodiment as a "prior art" arrangement with clear drawbacks, the embodiment has heater resistors on only one side of each via, and the reference indicates that rearrangement of these parts is desirable but "impractical." (Ex. 1034 col. 2 lns 34-48).

Petitioners may not advance an inaccurate, embellished reading of Giere '178 through the artifice of expert opinion testimony purporting to interpret the reference based on the "knowledge of a PHOSITA." Conclusory arguments and expert testimony, unsupported by any corroborating evidence, may not be used to compensate for shortcomings in the prior art. *K/S HIMPP v. Hear-Wear Techs.*,

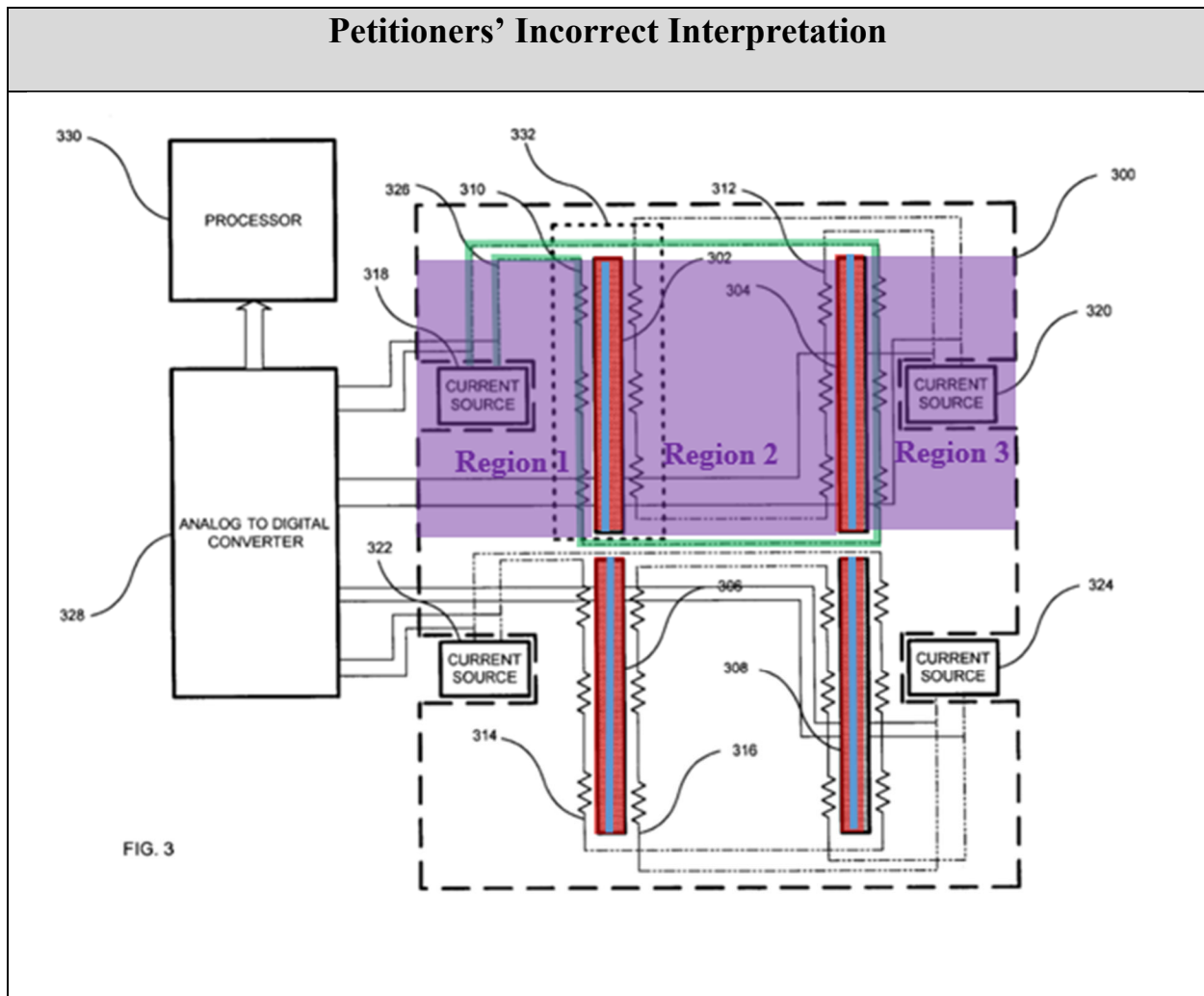
LLC, 751 F.3d, 1362, 1365-67 (Fed. Cir. 2014); *see also Arendi S.A.R.L. v. Apple*, 832 F.3d 1355, 1361-62 (Fed. Cir. 2016) (cautioning against invoking a PHOSITA's common sense or knowledge to supply claim limitation missing from a prior art reference); *Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (disregarding expert testimony where it contradicts disclosure of patent specification). A PHOSITA would not ignore that Giere '178 discloses ink feed regions along the edges of the substrate or through a central via, or or that it does not mention ink vias in regions 302/304/306/308.

Finally, Petitioners' argument that Dr. Pond's criticism of TSRs crossing the center of the chip in Fig. 3 are not inconsistent with other electrical lines crossing rectangular regions 302/304/306/308 is misplaced. Petitioners do not explain the relevance of their argument that connections from the analog to digital converter are "off-chip connections." The electrical connections are still traversing the chip of Fig. 3 in the same manner that the TSRs do. Further, as discussed above, Patent Owner's interpretation (supported by the testimony of Mr. Dietl) is consistent with a central feed slot that is divided in two in order to allow passage of the TSRs across the center of the chip. *See* Section II.A. above.

B. Grounds 3-6 Fail Because Petitioners' Theory Does Not Track the Challenged Claims

Petitioners miss the point of their incorrect interpretation of Giere '178 having two regions that share the same temperature sensor. Even if the printhead of Giere

'178 had disclosed or was redesigned to include ink vias and two heater arrays in each region, as shown in the annotated figure below, this layout results in TSR 310 [green] below extending through both the region to the left of the left-hand ink via (designated "Region 1" below) and the region to the right of the right-hand ink via (designated "Region 3").



(Ex. 1007 Fig. 3, annotated to reflect Petitioners' argument.) Because the TSR 310 would pass through both Regions 1 and 3, it would detect an average temperature of Region 1 and Region 3 combined instead of separately detecting the temperature of

Region 1 (to the left of rectangle 302) and Region 3 (to the right of rectangle 304). (Ex. 2003 ¶98.) According to Petitioners' argument, Regions 1 and 3 are separated by insulating vias and their heater arrays are independently driven, and thus there would be no relationship between the temperature of Region 1 (and its heater array) and Region 3 (and its heater array). As a result, the configuration suggested by Petitioners would not have "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*" as required by claim 1. Claim 9 similarly would not be satisfied.

Petitioners' argument that Giere '178 "teaches using a heating pulse history to sense a temperature representative **of each heater array** within these regions" (PR p. 23, emphasis added) does not address the above issue, and only shows that Petitioners believe that Giere '178 detects the temperature of each array, **not** a temperature of each region, which is contrary to the claims of the '708 patent.

III. THE PETITION FAILS TO ESTABLISH THAT ANY CLAIMS WOULD HAVE BEEN OBVIOUS IN VIEW OF GIERE '178 AND YABE (GROUNDS 4 AND 6)

To a large extent, Ground 4 is based on the same incorrect reading of Giere '178 as in Ground 3. (Pet. pp. 82-87 and 92-94; Ex. 2003 ¶100.) For instance, Paragraphs 372, 381 and 399 of Dr. Pond's declaration relied on by Petitioners incorporate his prior opinion that Giere '178 discloses a plurality of ink vias arranged

parallel to one another with heater arrays disposed adjacent each longitudinal side and regions disposed between the vias. (Ex. 1002 ¶¶ 372, 381, 399.)

When Giere '178 is properly understood, Petitioners' alternative argument that a PHOSITA would have redesigned the ink feed system of Giere '178 and replaced each column of heater resistors with an ink via and twice the number of heater resistors, chambers, nozzles, and other associated structures without modifying the temperature sensors in any way simply makes no sense. Petitioners argue that "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.'" (PR p. 27.) Petitioners' general legal proposition is correct in this instance, but they are simply on the wrong side of the argument given the facts of this case. As Mr. Dietl explained, Ground 4 is not faithful to the teachings of either reference. (Ex. 2003 ¶105.) Dr. Pond's selection of Giere '178's single-via temperature management system ignores that Yabe already discloses a multi-via chip and an efficient multi-via temperature management system, and that the temperature management system of Giere '178 relates to an entirely different substrate design, Dr. Pond's proposal of incorporating the ink vias and heater arrays of Yabe into the alleged 4-quadrant design and temperature management system of Giere '178, which does not disclose how its specific arrangement of TSRs assists printing operations, is entirely arbitrary. (Ex. 2003

¶105.) Petitioners' proposition of maintaining the placement of Giere '178's temperature sensors while changing literally everything around them is purely hindsight-driven cherry-picking. (*See* Ex. 2003 ¶¶106-107.)

The specialized configuration in Giere '178 provides temperature readings indicative of areas close to an ink feed (310 and 314 in the case of edge feed or 312 and 316 in the case of a center feed) and separately provides temperature readings corresponding to areas further away from the ink feed (312 and 316 in the case of edge feed or 310 and 314 in the case of a center feed). Dr. Pond's proposed redesign of Giere '178's print head substrate so that an ink via and two corresponding columns of ink ejectors are in each of four regions arbitrarily leaves the temperature sensors unaltered so that they no longer can measure temperature along the ink feed side and the opposite side of each heater array. (Ex. 2003 ¶107.) A PHOSITA would have had no reason to keep the TSRs of Giere '178 in place while reconfiguring almost every other aspect of the printhead substrate because this would defeat the purpose of Giere '178's temperature sensing scheme. (Ex. 2003 ¶¶73 and 107-108.)

Petitioners' argument that Patent Owner does not rebut Dr. Pond's reasons for incorporating Yabe's printhead design in Giere '178 is nonsense. (PR p. 26). As discussed above, Dr. Pond makes only general statements regarding advantages of prior art references and does not explain how making the identified modifications would achieve identified improvements. Instead, here he simply parrots alleged

advantages of Yabe (which has a specific arrangement and temperature management system) over unidentified prior art and simply assumes that plucking a single aspect from Yabe would somehow improve the different physical arrangement and temperature management system of Giere '178. Dr. Pond does not show that the particular combination he discusses would result in the identified improvement, because he fails to show a nexus between the isolated element that he has plucked from Yabe and the alleged improvement. As a result, Petitioners have failed to adequately demonstrate a motivation to combine. It is not Patent Owner's burden to establish a lack of improvement from Petitioners' arbitrary combination of elements.

IV. CONCLUSION

For the reasons described above, and because Petitioners have not shown that any of the challenged claims are unpatentable, the Board should affirm their patentability.

Respectfully submitted,
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Dated: March 20, 2024

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CERTIFICATE OF WORD COUNT

The undersigned hereby confirms that the foregoing PATENT OWNER SUR-REPLY complies with the type-volume limitation of 37 C.F.R. § 42.24(a). Excluding the items listed in 37 C.F.R. § 42.24(a) as not included in the word count, this Sur-Reply contains 5,551 words, calculated by the word-processing system used to prepare it.

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned hereby certifies that a true copy of the foregoing PATENT OWNER SUR-REPLY was served this 20th day of March, 2024, by e-mail upon the following:

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