

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

SLINGSHOT PRINTING LLC,
Patent Owner.

IPR2023-00313
Patent 7,594,708 B2

Before JO-ANNE M. KOKOSKI, GARTH D. BAER, and
JOHN D. HAMANN, *Administrative Patent Judges*.

HAMANN, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Canon U.S.A., Inc. and Canon Inc. (collectively “Petitioner”) filed a petition for *inter partes* review of claims 1–15 of U.S. Patent No. 7,594,708 B2 (Ex. 1001, “the ’708 patent”). Paper 2 (“Pet.”). Slingshot Printing LLC (“Patent Owner”) filed a Preliminary Response. Paper 5 (“Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 (2018) and 37 C.F.R. § 42.4(a) (2022). An *inter partes* review may be instituted if “the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a).

Upon consideration of the papers, we determined that the information presented in the Petition demonstrates that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one challenged claim of the ’708 patent.

A. *Real Parties-In-Interest*

The parties identify themselves as the real parties-in-interest. Pet. 1; Paper 4, 1.

B. *Related Matters*

The parties identify *Slingshot Printing LLC v. Canon U.S.A., Inc.*, No. 2:22-cv-001852 (E.D.N.Y.) and *Slingshot Printing LLC v. HP Inc.*, No. 6:20-cv-00048 (W.D. Tex.) as matters that may affect, or be affected by, a decision in this proceeding. Pet. 1; Paper 4, 2.

C. The '708 Patent

The '708 patent relates “to printing devices, and more particularly to methods and apparatuses for sensing temperature of multi-via heater chips.” Ex. 1001, 1:15–17. As background, the '708 patent provides that “[a] number of printers, copiers, and multi-function products utilize heater chips in their printing heads for discharging ink drops,” where “[t]he ink is supplied through one or more ink vias in the chip.” *Id.* at 1:21–24. According to the '708 patent, “[t]hese heater chips typically provide only one heater array for each ink via that is disposed along one side of the ink via.” *Id.* at 1:24–26. “However, the traditional use of single heater array on a single side of an ink via limits the achievable printing resolution, including the vertical resolution,” according to the '708 patent. *Id.* at 1:38–40.

“Additionally, for proper functionality, inkjet heater chips need to monitor and maintain the silicon substrate of the heater chip at an acceptable temperature for printing.” *Id.* at 1:48–50. “A thermal sense resistor (TSR) is typically used to sense the temperature of the silicon substrate,” according to the '708 patent. *Id.* at 1:56–57. For example, the '708 patent describes a prior art “metal serpentine temperature sense resistor[, which] is routed around the periphery of the heater chip and provides an average temperature of the entire die.” *Id.* at 1:57–62, Fig. 1 (identifying the figure as prior art). “This average measurement provides no discrimination between individual colors and does not provide any feedback on temperature differences between one area of the heater chip versus another,” according to the '708 patent. *Id.* at 1:62–65.

The '708 patent also describes a prior art improvement on the serpentine temperature sensor. *Id.* at 2:1–2, Figs. 1–2. In particular, the

'708 patent discloses that it was known to provide temperature sensing on a per color basis by placing TSRs “in close proximity to each of the heater arrays, each situated on the same side of their respective ink vias.” *Id.* at 2:1–5, Fig. 2 (identifying the figure as prior art).

In addition, the '708 patent discloses that “ink vias . . . act as a thermal barrier between the colors,” and that “[a]ll the thermal heater arrays . . . are situated on only one side of their respective ink vias, ensuring that there is only a small amount of thermal crosstalk between the temperature sense resistors.” *Id.* at 2:11–15, Fig. 2. “Once the temperature within the heater chip is measured, the temperature can be maintained and regulated at an acceptable temperature for printing.” *Id.* at 2:16–18.

The '708 patent states that “it is desirable to position heater arrays on both sides of the ink vias, which allow the ink vias to provide smaller ink drops in order to achieve higher printing resolutions.” *Id.* at 1:44–47. However, “[w]hen a heater array is positioned on both sides of an ink via[], the temperature sensing and regulating devices utilized in the prior art do not provide adequate thermal control,” according to the '708 patent. *Id.* at 2:36–38. And thus, “there is a need in the industry for heater chips that can provide for monitoring and regulating the various regions of a heater chip at a desired temperature when heater arrays are placed on both sides of the ink vias,” according to the '708 patent. *Id.* at 2:51–54.

In response, the '708 patent discloses embodiments in accordance with its teachings that position heater arrays on both sides of the ink vias. *See, e.g., id.* at 4:61–5:9, Fig. 3. “It will be appreciated that the placement of a single via in between two heater arrays presents a challenge in attempting to sense the temperature of individual colors,” according to the '708 patent.

Id. at 5:35–37. In particular, “[i]f there is a single TSR associated with each heater array . . . , then two TSRs will be placed next to each other between adjacent ink vias.” *Id.* at 5:37–40. The ’708 patent discloses that if a print job is heavy in a color and light in an adjacent color, the thermal energy generated by the color’s heaters would rapidly couple through the common silicon to the adjacent color’s TSR positioned in between the colors’ ink vias, providing a false high reading for the adjacent color. *Id.* at 5:44–48. “Rather than try to sense temperature on a per color basis with TSR’s in close proximity to heaters, the [’708 patent] senses temperature by silicon region.” *Id.* at 5:48–51. Figure 4, shown below, illustrates this approach. *Id.* at 4:28–30.

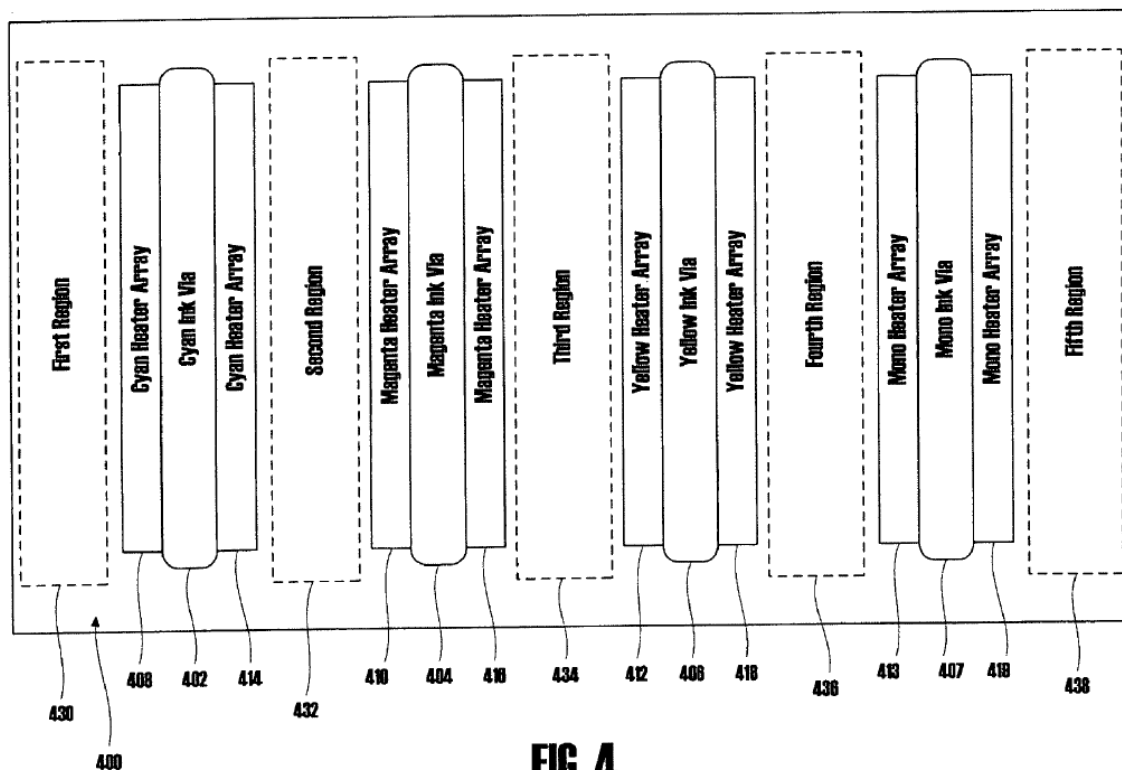


FIG. 4

Figure 4 “illustrates an exemplary configuration for a heater chip 400 having thermal regions defined between the ink vias, according to one embodiment of the” ’708 patent. *Id.* at 5:55–58. As illustrated, “a first region 430 is

defined as the area between the left edge of the heater chip 400 and the cyan ink via 402; a second region 432 is defined as the area between the cyan ink via 402 and the magenta ink via 404, a third region 434 is defined as the area between the magenta ink via 404 and the yellow ink via 406; a fourth region 436 is defined as the area between the yellow ink via 406 and the mono ink via 407; and a fifth region 438 is defined as the area between the mono ink via 407 and the right edge of the heater chip 400.” *Id.* at 5:58–67. Also illustrated are heater arrays 408 and 414; 410 and 416; 412 and 418; and 413 and 419 positioned on both sides of their respective ink vias 402, 404, 406, and 407, respectively. *See id.* at 6:4–6, Fig. 4.

The ’708 patent discloses that the “temperature of the heater chip 400 is measured on a per thermal region basis,” with “[a] temperature sensing element [being] placed in each of the thermal regions.” *Id.* at 6:20–25. “Due to the relative high thermal conductivity of the silicon substrate, each of the thermal regions 430, 432, 434, 436, 438 have a very uniform temperature across the width of that region,” according to the ’708 patent. *Id.* at 6:58–61. Thus, for example, “[a] temperature reading from the second region 432 represents the temperature of both the magenta and cyan heater arrays 414 and 410 in the second region.” *Id.* at 7:2–5. And the ’708 patent discloses that “[t]he ink vias 402, 404, 406, 407 . . . act as thermal insulators between the thermal regions 430, 432, 434, 436, 438.” *Id.* at 6:64–67. The ’708 patent discloses that in accordance with its teachings that “each thermal region can be regulated at its optimal operating temperature.” *Id.* at 8:9–10.

D. Illustrative Claim

Of the challenged claims, claims 1 and 9 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

1. A chip for use with a printing device, comprising:
 - a plurality of ink vias arranged parallel to one another, each of the ink via having two longitudinal sides;
 - a heater array disposed adjacent each longitudinal side of the ink vias such that each ink via is associated with two heater arrays disposed adjacent the two longitudinal sides of the ink via;
 - a region disposed adjacent each heater array, wherein only one region is disposed between two adjacent ink vias and wherein the region disposed between two adjacent ink vias includes two heater arrays each heater array being associated with their respective ink via; and
 - 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 and disposed at a predetermined distance away from adjacent heater arrays.

Ex. 1001, 8:23–39.

E. Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims of the '708 patent are unpatentable based on the following grounds:

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
1–3, 5–12, 14, 15	103	Benjamin, ² Giere673 ³
4, 13	103	Benjamin, Giere673, Parish ⁴

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the '708 patent issued from an application filed before March 16, 2013, we apply the pre-AIA version of this basis for unpatentability.

² US 7,384,113 B2, issued June 10, 2008 (Ex. 1004, “Benjamin”).

³ US 6,612,673 B1, issued Sept. 2, 2003 (Ex. 1005, “Giere673”).

⁴ US 7,163,272 B2, issued Jan. 16, 2007 (Ex. 1006, “Parish”).

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
1–3, 5–12, 14, 15	103	Giere178 ⁵
1–3, 5–12, 14, 15	103	Giere178, Yabe ⁶
4, 13	103	Giere178, Parish
4, 13	103	Giere178, Yabe, Parish

Pet. 3, 8–105. Petitioner submits in support of its arguments the Declaration of Stephen F. Pond (Ex. 1002).

II. LEVEL OF ORDINARY SKILL IN THE ART

To determine whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962–63 (Fed. Cir. 1986)). “[O]ne or more factors may predominate.” *Id.*

Petitioner argues that one of ordinary skill in the art at the time of the invention of the ’708 patent would have had “a Bachelor’s or Master’s level college degree in Mechanical Engineering, Materials Science, Physics, Electrical Engineering, or a related field, and two years of training or experience in the design of inkjet printheads or semiconductor circuit layout.” Pet. 6 (citing Ex. 1002 ¶ 108). Patent Owner states that it “does not

⁵ US 6,565,178 B1, issued May 20, 2003 (Ex. 1007, “Giere178”).

⁶ US 6,527,367 B2, issued Mar. 4, 2003 (Ex. 1008, “Yabe”).

dispute [Petitioner’s] characterization of the level of ordinary skill in the art for the purpose of [Patent Owner’s] Preliminary Response, except that it disagrees that a degree in Materials Science is sufficient.” Prelim. Resp. 38–39. Patent Owner does not explain its basis for this disagreement, nor how the disagreement relates to Petitioner’s proposal, which requires, *inter alia*, “two years of training or experience.” *Id.*; Pet. 6.

For purposes of this Decision on Institution, we adopt Petitioner’s definition of the level of skill for one of ordinary skill in the art. Pet. 6. This definition is consistent with the ’708 patent and the asserted prior art, and we apply it in our analysis below.

III. CLAIM CONSTRUCTION

Because the Petition was filed after November 13, 2018, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2019); 83 Fed. Reg. 51,340, 51,340–41, 51,343 (Oct. 11, 2018). In applying such standard, claim terms are generally given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Petitioner provides a proposed construction for the term “adjacent,” as used in claims 1 and 9. Pet. 6–8. In particular, Petitioner argues that “‘adjacent’ means ‘next to and can include,’ such that a region disposed ‘adjacent’ each heater array can also ‘include’ that adjacent heater array.” *Id.* at 7–8 (footnote omitted). Petitioner argues that its proposed construction “is consistent with the ’708 [p]atent specification describing ‘heaters within each region.’” *Id.* at 8 (citing Ex. 1001, 7:45–50).

Patent Owner disagrees that a construction is required, and argues “that ‘adjacent’ carries its plain and ordinary meaning throughout the claims.” Prelim. Resp. 39. Patent Owner argues that Petitioner parses the claims incorrectly. *Id.* According to Patent Owner, the claims recite “a region disposed adjacent pair of heater arrays . . . which is part of a broader region disposed between two adjacent ink vias,” and that “[i]t is the broader ‘region ***disposed between two adjacent ink vias*** [that] includes two heater arrays.’” *Id.* (second alteration in original). “Thus, the claims do not say that the region disposed adjacent two heater arrays also includes the two heater arrays,” according to Patent Owner. *Id.* at 40.

We determine that no express constructions are needed for us to render our Decision on Institution. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’”). To the extent that a dispute arises during trial concerning the application of the cited prior art to the term “adjacent,” in the context of the limitations, the parties should

during trial fully develop the record for claim construction purposes for this term, in accordance with our Rules.

IV. PRINCIPLES OF LAW

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of non-obviousness, if present.⁷ See *Graham*, 383 U.S. at 17–18. When evaluating a claim for obviousness, we also must “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

V. ALLEGED OBVIOUSNESS OVER BENJAMIN AND GIERE673

Petitioner argues that the combination of Benjamin and Giere673 renders claims 1–3, 5–12, 14, and 15 obvious. Pet. 8–42. For the reasons that follow, we determine that Petitioner establishes a reasonable likelihood that it would prevail in showing that the combination of Benjamin and Giere673 renders these challenged claims obvious.

⁷ Patent Owner does not present arguments or evidence of such objective evidence of non-obviousness. See *generally* Prelim. Resp.

A. Summary of Benjamin

Benjamin is titled “Fluid Ejection Device with Address Generator.” Ex. 1004, code (54). Benjamin teaches “[a] fluid ejection device having firing cells, signal lines configured to receive a series of pulses, and an address generator configured to receive pulses from the series of pulses and generate a set of address signals in response to the received pulses,[] wherein the set of address signals is adapted to enable the firing cells for activation.” *Id.* at code (57).

B. Summary of Giere673

Giere673 is titled “System and Method for Predicting Dynamic Thermal Conditions of an Inkjet Printing System.” Ex. 1005, code (54). Giere673 teaches “an inkjet printing system, having a substrate, a plurality of heating elements disposed on the substrate, an ink ejection assembly adjacent the substrate forming a plurality of ink ejection chambers, each chamber associated with a different one of the heating elements and a controller operatively connected to the heating elements, the controller receiving print data and processing the print data to predict thermal conditions of a subset of the ink ejection chambers for selectively operating the corresponding heating elements of the subset.” *Id.* at code (57).

C. Challenged Claim 1

1. Chip for Use with a Printing Device (Preamble)

Claim 1’s preamble recites “[a] chip for use with a printing device.” Ex. 1001, 8:23. At this stage of the proceeding, we agree with Petitioner and find that Benjamin teaches claim 1’s preamble. Pet. 8–9.

More specifically, we find that Benjamin teaches that “inkjet printhead assembly 22 includes at least one printhead or printhead die 40

that ejects drops of ink through a plurality of orifices or nozzles 34 toward a print medium 36 so as to print onto print medium 36.” Ex. 1004, 3:32–36. Benjamin teaches that a “properly sequenced ejection of ink from nozzles 34 causes characters, symbols, and/or other graphics or images to be printed upon print medium 36 as inkjet printhead assembly 22 and print medium 36 are moved relative to each other.” *Id.* at 3:39–44.

At this stage of the proceeding, we find persuasive Dr. Pond’s testimony that one of ordinary skill in the art “would have understood that the term ‘die’ is another name for a chip such that the printhead die 40 used in Benjamin’s printing system 20 is synonymous with the term “chip for use with a printing device.” Ex. 1002 ¶¶ 115–117. We find that this testimony is consistent with the cited art.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that Benjamin teaches “[a] chip for use with a printing device.” In light of our finding, we need not, and thus do not, reach whether claim 1’s preamble is limiting.

2. Plurality of Ink Vias

Claim 1 further recites “a plurality of ink vias arranged parallel to one another, each of the ink via having two longitudinal sides.” Ex. 1001, 8:24–25. At this stage of the proceeding, we agree with Petitioner and find that Benjamin teaches this limitation. Pet. 10–13.

At this stage, we agree with Petitioner and find that Benjamin teaches a plurality of ink vias, each having two longitudinal sides. More specifically, Benjamin teaches “[i]nk feed slot 46 includes opposing ink feed

slot sides 46a and 46b,” and that “[d]rop generators 60 are disposed along each of the opposing ink feed slot sides 46a and 46b.” Ex. 1004, 5:51–55, Fig. 3. Benjamin’s Figure 3 is shown below.

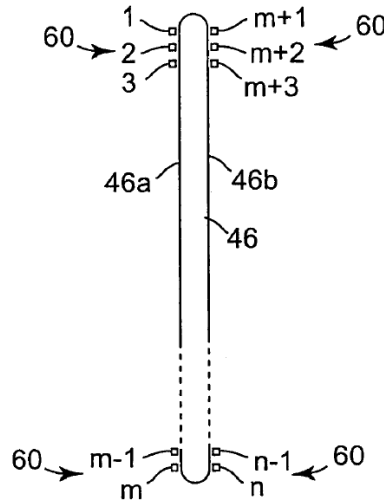


Fig. 3

Figure 3 “is a diagram illustrating drop generators 60 located along ink feed slot 46 in one embodiment of printhead die 40.” *Id.* at 5:51–53. As illustrated, “drop generators 60 [are] located along ink feed slot side 46a, and . . . along ink feed slot side 46b.” *Id.* at 5:55–58.

In addition, Benjamin teaches an embodiment of a printhead die having three ink fluid feed sources. *Id.* at 64:53–56, Fig. 21. In particular, Benjamin teaches printhead die 1700 having “ink feed slots 1704, 1706 and 1708 [which] are located parallel to one another and each ink feed slot 1704, 1706 and 1708 includes a length that extends along the y-direction of printhead die 1700.” *Id.* at 64:60–63; *see also id.* at 65:34–36, 66:37–39, 67:37–39 (teaching that each of the three ink feed slots include opposing sides that extend along the y-direction of the printhead die).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded

that Petitioner demonstrates, for purposes of this institution decision, that Benjamin teaches “a plurality of ink vias arranged parallel to one another, each of the ink via having two longitudinal sides.”

3. Heater Array

Claim 1 further recites “a heater array disposed adjacent each longitudinal side of the ink vias such that each ink via is associated with two heater arrays disposed adjacent the two longitudinal sides of the ink via.”

Ex. 1001, 8:26–29. At this stage of the proceeding, we agree with Petitioner and find that Benjamin teaches this limitation. Pet. 13–16.

In particular, we agree with Petitioner and find that Benjamin teaches heater arrays (single vertical rows of firing resistors) disposed adjacent each side of the ink vias and associated therewith. *Id.* at 16 (citing Ex. 1002 ¶ 132). Benjamin’s Figure 21, as annotated by Petitioner, is shown below.

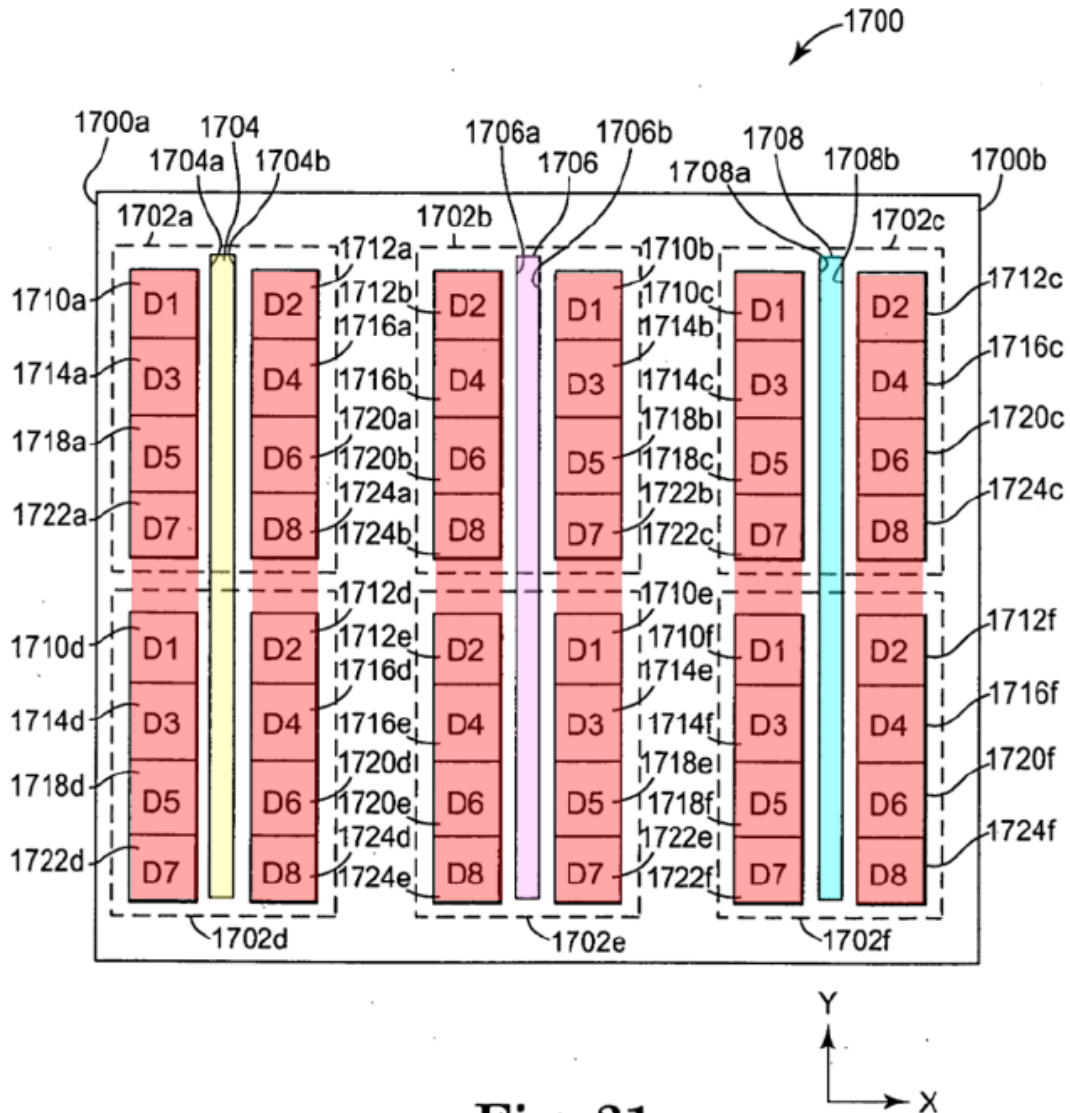


Fig. 21

Id. at 15 (annotating Ex. 1004, Fig. 21). Figure 21 “is a diagram illustrating an example layout of one embodiment of a printhead die 1700.” Ex. 1004,

64:53–54. Petitioner annotates the figure by coloring ink via 1704 yellow, ink via 1706 magenta, and ink via 1708 cyan.⁸ Pet. 15.

As illustrated, “[t]he printhead die 1700 includes six fire groups 1702a–1702f disposed along . . . [ink] feed slots 1704, 1706 and 1708.” Ex. 1004, 64:54–57. More specifically, “[f]ire groups 1702a and 1702d are disposed along ink feed slot 1704, fire groups 1702b and 1702e are disposed along ink feed slot 1706 and fire groups 1702c and 1702f are disposed along ink feed slot 1708.” *Id.* at 64:57–60. Figure 21 also depicts that “[t]he fire groups 1702a–1702f are [each] divided into eight data line groups, indicated at D1–D8.” *Id.* at 65:5–6; Ex. 1002 ¶ 127. Petitioner annotates in red the data line groups D1–D8 for each fire group. Pet. 15 (annotating Ex. 1004, Fig. 21).

Benjamin teaches that “[e]ach data line group D1–D8 includes pre-charged firing cells 120 from each of the fire groups 1702a–1702f,” and that “[t]he pre-charged firing cells 120 . . . include firing resistors 52 that are part of drop generators 60.” Ex. 1004, 65:6–8, 65:36–38. In addition, Benjamin teaches that the drop generators in the data line groups for each fire group are disposed along the sides of their respective ink feed slots, and are fluidically coupled to their ink feed slot to receive ink. *Id.* at 65:40–68:35; Ex. 1002 ¶¶ 128, 131.

⁸ Petitioner incorrectly states that it colors ink via 1706 cyan and ink via 1708 purple; the coloring is reversed in the annotated figure. Pet. 14–15 (annotating Ex. 1004, Fig. 21). In addition, although Petitioner refers to the color as purple, we refer to this color for ink via 1706 as magenta to remain consistent with Benjamin’s teachings for Figure 21. *See* Ex. 1004, 64:66–65:2. We note that Dr. Pond at times uses the correct coloring of the ink vias, and refers to the coloring of ink via 1706 as magenta, as we do herein. *Compare* Ex. 1002 ¶ 127, *with id.* at ¶ 135.

Hence, at this stage of the proceeding, we agree with Petitioner and find that “Benjamin’s layout of printhead die 1700 disposes a heater array *adjacent* each longitudinal side of the ink feed slots 1704, 1706, and 1708 because looking at ink feed slot 1704 . . . , for example, the firing resistors from the left half of [fire group (‘FG’)]1 (1702a) and FG4 (1702d) . . . collectively form an array of heaters lying near or close to longitudinal side 1704a . . . of ink feed slot 1704 . . . ; and the firing resistors from the right half of FG 1 (1702a) and FG4 (1702d) . . . collectively form an array of heaters lying near or close to longitudinal side 1704b . . . of ink feed slot 1704.” Pet. 15–16 (citing Ex. 1002 ¶ 132) (alterations in original).

In addition, at this stage of the proceeding, we find persuasive Dr. Pond’s testimony that Benjamin discloses “a heater array [*e.g.*, a single vertical row of firing resistors 52 from FG1/FG4, FG2/FG5, or FG3/FG6] disposed adjacent each longitudinal side of the ink vias [*e.g.*, sides 1704a and 1704b for ink feed slot 1704; sides 1706a and 1706b for ink feed slot 1706; and sides 1708a and 1708b for ink feed slot 1708] such that each ink via is associated with two heater arrays disposed adjacent the two longitudinal sides of the ink via.” Ex. 1002 ¶ 132. We find that this testimony is consistent with Benjamin’s teachings, which we discuss above.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that Benjamin teaches “a heater array disposed adjacent each longitudinal side of the ink vias such that each ink via is associated with two heater arrays disposed adjacent the two longitudinal sides of the ink via.”

4. Region Disposed Adjacent Each Heater Array

Claim 1 further recites “a region disposed adjacent each heater array, wherein only one region is disposed between two adjacent ink vias and wherein the region disposed between two adjacent ink vias includes two heater arrays each heater array being associated with their respective ink via.” Ex. 1001, 8:30–34. At this stage of the proceeding, we agree with Petitioner and find that Benjamin teaches this limitation. Pet. 17–20.

In support of its arguments, Petitioner provides a “simplified” and annotated version of Figure 21, which we reproduce below. *Id.* at 19.

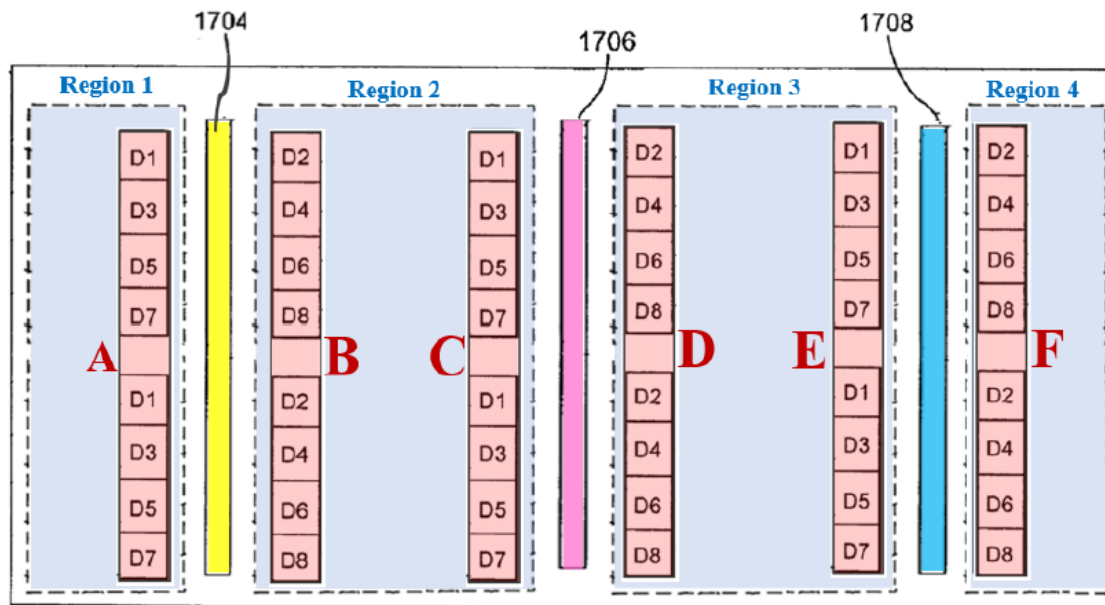


Figure 21 “is a diagram illustrating an example layout of one embodiment of a printhead die 1700.” Ex. 1004, 64:53–54. Petitioner modifies the figure by, *inter alia*, (i) removing the reference numerals (other than for ink vias 1704, 1706, and 1708); and (ii) removing the six dotted boxes indicating each of the fire groups. Pet. 19. Petitioner annotates the figure by coloring ink via 1704 yellow, ink via 1706 magenta, and ink via 1708 cyan, and the data line groups (D1–D8) for each fire group red. *Id.* Petitioner also draws

a dotted-line box around the substrate portion and data line groups on the (i) left side of ink via 1704 and labels the enclosed area “Region 1,” and labels the enclosed data line groups “A”; (ii) right side of ink via 1704 and the left side of ink via 1706 and labels the enclosed area “Region 2,” and labels the enclosed data line groups associated with ink via 1704 “B” and associated with ink via 1706 “C”; (iii) right side of ink via 1706 and the left side of ink via 1708 and labels the enclosed area “Region 3,” and labels the enclosed data line groups associated with ink via 1706 “D” and associated with ink via 1708 “E”; and (iv) right side of ink via 1708 and labels the enclosed area “Region 4,” and labels the enclosed data line groups “F.” *Id.* Petitioner colors Regions 1–4 light blue. *Id.*

As illustrated, Benjamin teaches a region (the portions of Regions 1–4 that do not include the heater arrays to their associated ink feed slots) disposed adjacent each heater array (the single vertical row of firing resistors of the data line groups from the fire groups associated with the ink feed slot), wherein only one region is disposed between two adjacent ink vias (Regions 2 and 3),⁹ and wherein the region disposed between two adjacent ink vias (Regions 2 and 3) includes two heater arrays (data line groups B and C, or D and E). Pet. 19 (modifying and annotating Ex. 1004, Fig. 21). This is consistent with the plain and ordinary meaning of the limitation because the “wherein clauses,” as Patent Owner argues, relate to “only one region,” rather than “a region” and the limitation as a whole explains that these

⁹ Petitioner states that “Benjamin’s printhead 1700 *does not* includes one and only one region between two adjacent ink feed slots” Pet. 19 (citing Ex. 1002 ¶ 137) (emphasis added). We view the inclusion of the phrase “does not” as a typographical error, as it is inconsistent with the sentence as a whole, and the context of where it appears. *Id.*

regions are of different scope. Ex. 1001, 8:31–35; Prelim. Resp. 39–40. As Patent Owner puts it, “[t]he claims say that there is a region between two heater arrays and there is region between two ink vias that also includes the two heater arrays.” Prelim. Resp. 40. At this stage of the proceeding, we find that Petitioner’s showing is sufficient to show that Benjamin teaches the plain and ordinary meaning of this limitation. *See supra*.

We also agree with Petitioner and find that Benjamin teaches that each of the heater arrays “is fluidically coupled” to its associated ink via (ink feed slot). Ex. 1004, 65:36–42, 66:41–43; Ex. 1002 ¶ 146. We find that Benjamin thus teaches each heater array being associated with its respective ink via.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that Benjamin teaches “a region disposed adjacent each heater array, wherein only one region is disposed between two adjacent ink vias and wherein the region disposed between two adjacent ink vias includes two heater arrays each heater array being associated with their respective ink via.”

5. Single Temperature Sensing Element

Claim 1 further recites “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.” Ex. 1001, 8:36–39. At this stage of the proceeding, we agree with Petitioner and find that the combination of Benjamin and Giere⁶⁷³ teaches this limitation. Pet. 21–27, 29–32.

We agree with Petitioner and find that Benjamin teaches using a TSR to determine a temperature of a printhead die. Ex. 1004, 79:60–67; Fig. 25B (illustrating contacts for the TSR and a return path). We also agree with Petitioner that Benjamin does not teach where the TSR is located on the die. Pet. 21.

On the other hand, Giere673 teaches locating a TSR on a printhead assembly's substrate. *E.g.*, Ex. 1005, 4:57–60. Giere673's Figure 5 is shown below.

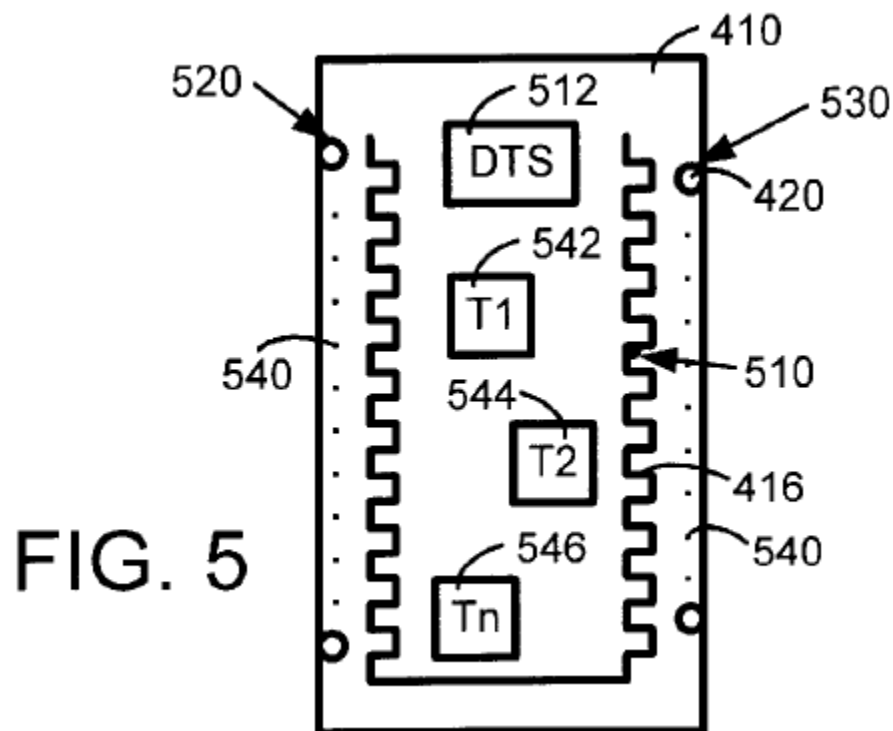


Figure 5 is a schematic top view of a substrate of a printhead assembly in accordance with Giere673's teachings. *Id.* at 2:9–11. As illustrated, “TSR 510 is located along the length of the substrate 410.” *Id.* at 5:10–12. More specifically, Giere673 teaches that “[t]he TSR 510 can have two legs that are approximately 680 um inboard from the center of the columns of ink ejection elements 416” (e.g., resistor heater elements). *Id.* at 4:36–39, 5:10–

12. In addition, Giere673 teaches that “[p]referably, [TSR 510] is not located adjacent to any particular heating element and reflects the temperature of the substrate 410 after heat has moved from the heating elements to the TSR 510.” *Id.* at 4:57–60. In other words, Giere673 teaches that the TSR 510 is operable to sense a temperature representative of the adjacent heater arrays. *Id.*

Also illustrated are “a first column 520 of nozzles 420 (not shown to scale) and a second column 530 of nozzles 420 (the dotted lines 540 represent numerous consecutive nozzles, which are not shown for simplicity).” *Id.* at 4:63–66; *see also* Ex. 1002 ¶¶ 155–156 (describing Giere673’s teachings).

At this stage of the proceeding, we find persuasive Petitioner’s arguments that one of ordinary skill in the art would have been motivated to apply Giere673’s teachings to Benjamin by disposing Giere673’s TSR in a region of Benjamin’s printhead die (e.g., Region 2). Pet. 22; Ex. 1002 ¶ 159. As we discuss above, Benjamin teaches that a TSR is used to sense printhead die temperature. Ex. 1004, 79:60–67; Fig. 25B. And Giere673 teaches locating a single TSR on a substrate in a region (e.g., between heater arrays) to measure the substrate’s mean temperature. *See* Ex. 1005, Fig. 5 (locating TSR 510 in a region between two columns of resistor heater elements); *id.* at 4:55–56 (“*One or multiple TSRs 510 can be used to provide an approximation of the mean temperature of the substrate.*”) (emphasis added).

At this stage of the proceeding, we agree with Petitioner that these combined teachings provide for improved optimization of the print quality for that region using the temperature value measured by the TSR located on

the substrate as taught by Giere673, which would have motivated one of ordinary skill in the art to make the combination. Pet. 31 (citing Ex. 1002 ¶¶ 181–195 (testifying to functional benefits motivating the combination)); *KSR*, 550 at 417 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”).

In addition, at this stage of the proceeding, we find persuasive Petitioner’s arguments that one of ordinary skill in the art would have been motivated to dispose a single TSR in each of Benjamin’s regions. Pet. 23–24; Ex. 1002 ¶¶ 149–169. First, Giere673 teaches that “*multiple* TSRs 510 can be used to provide an approximation of the mean temperature of the substrate.” Ex. 1005, 4:55–56 (emphasis added). In addition, Giere673 teaches having a temperature controller coupled to multiple temperature sensors, which determine a mean temperature of the substrate “and an actual local temperature profile near designated ink ejection elements.” *Id.* at 2:57–62. Giere673 teaches that the temperature controller selectively fires particular heating elements based on thermal conditions. *Id.* at 3:3–6. These 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.* at 2:57–62, 3:3–6.

Second, at this stage of the proceeding, we agree with Petitioner and find 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. 23 (citing Ex. 1001, 2:1–15, 2:28–29, 2:47–49). The ’708 patent makes

these admissions, as shown in its Figure 2 and accompanying text. Figure 2 is shown below.

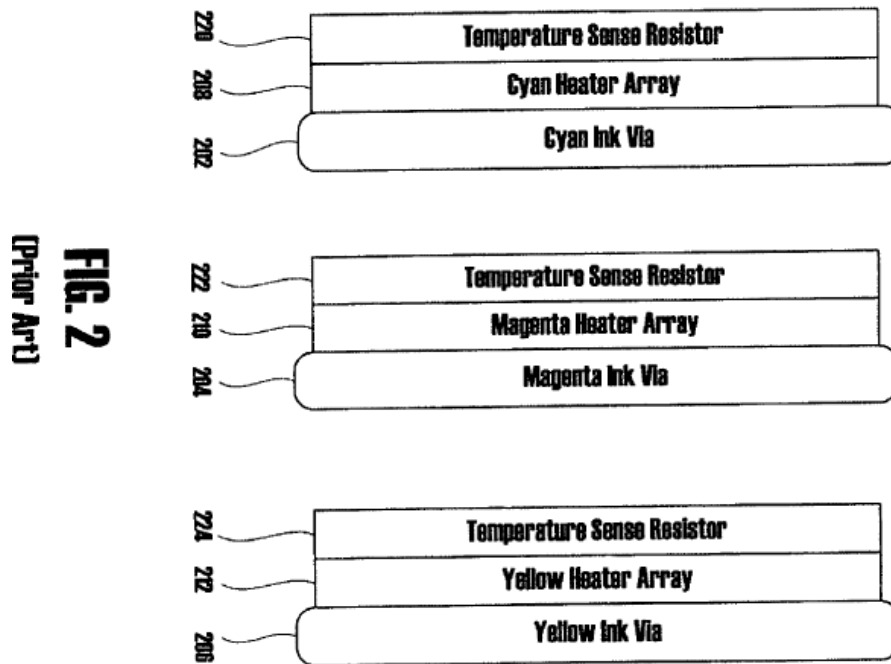


Figure 2 “illustrates a traditional heater chip utilizing temperature sense resistors and heater arrays to monitor and regulate temperature on a by color basis.” Ex. 1001, 4:21–23. In the ’708 patent’s Background of the Invention section, accompanying text states the following:

The heater chip shown in F[igure] 2 improves on that of F[igure] 1 by *providing for temperature sensing on a per color basis*. Three temperature sense resistors 220, 222, and 224 are placed in close proximity to each of the heater arrays, each situated on the same side of their respective ink vias. As shown, a first TSR 220 is situated on the left side of the cyan ink via 202 and cyan heater array 208; a second TSR 222 is situated on the left side of the magenta ink via 204 and magenta heater array 210; and a third TSR 224 is situated on the left side of the yellow ink via 206 and the yellow heater array 212. *The ink vias 202, 204, and 206 act as a thermal barrier between the colors.* All the thermal heater arrays 208, 210, and 212 are situated on only one side of their respective ink vias, ensuring that there is only a

small amount of thermal crosstalk between the temperature sense resistors.

Id. at 2:1–15 (emphases added).

In addition, we agree with Petitioner and find 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.” Pet. 23; Ex. 1008, 3:17–22. We appropriately consider such evidence of the knowledge that one of ordinary skill in the art would have had as part of our obviousness analysis. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362–63 (Fed. Cir. 2013).

Accordingly, in light of these admissions and Yabe’s teaching, we agree with Petitioner and find that one of ordinary skill in the art would have known that placing a TSR within a single region would not accurately report the mean temperature of the entire printhead die. Ex. 1002 ¶ 160; Pet. 23. We also agree with Petitioner and find persuasive Dr. Pond’s testimony that one of ordinary skill in the art thus would have been motivated to dispose a single TSR within each of Benjamin’s regions (e.g., Regions 1–4) to determine temperature across the entire die to regulate the die’s operational temperature and optimize the printing quality of the inkjet printing device. Ex. 1002 ¶ 161. Moreover, disposing a single TSR within each region allows for sensing temperature on a per color basis when heater arrays are used on both sides of the ink vias, such as taught by Benjamin, with certain regions (e.g., Regions 2 and 3 in Benjamin) having the same temperature for one side of their adjacent colors. *E.g.*, Ex. 1001, Fig. 2; Ex. 1004, Fig. 4.

In addition, at this stage of the proceeding, we agree with Petitioner and find that one of ordinary skill in the art would have had a reasonable

expectation of success in combining Benjamin and Giere673's teachings. Pet. 31–32. The references teach similar printing system technologies, and we are persuaded by Dr. Pond's testimony that one of ordinary skill in the art would have found it a routine and obvious matter to combine, replace, and modify various features from Benjamin with features taught by Giere673. Ex. 1002 ¶¶ 195–197. At this stage of the proceeding, we do not find including TSRs in each of Benjamin's regions would have been uniquely challenging or difficult for one of ordinary skill in the art. *See Leapfrog Enterprises, Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007) (citing *KSR*, 550 U.S. at 419–20) (finding that obviousness was supported because there was no evidence that making the combination was uniquely challenging or difficult for one of ordinary skill in the art).

Accordingly, at this stage of the proceeding, we find that Petitioner has provided sufficiently articulated reasoning with rational underpinning to support combining Benjamin and Giere673 in the manner Petitioner proposes. *See In re Kahn*, 441 F.3d at 988; *see also Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1374 (Fed. Cir. 2019) (“A motivation to combine may be found ‘explicitly or implicitly in market forces; design incentives; . . . and the background knowledge, creativity, and common sense of the person of ordinary skill.’”) (quoting *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1371 (Fed. Cir. 2018)).

At this stage of the proceeding, we find unavailing Patent Owner's argument that Giere673 “relates exclusively to a system that requires inputs from” “a temperature sense resistor 510, a digital temperature sensor 512 and multiple temperature recorders 542, 544 and 546,” “together with firing history data, to monitor and predict substrate thermal conditions of particular

ink ejection elements and to set operating conditions so as to maintain optimal temperatures.” Prelim. Resp. 45 (citing Ex. 1005, 4:55–56, 5:28–31, 6:5–18, 6:35–40, Fig. 5). Giere673 instead teaches that its “invention should not be construed as being limited to the particular embodiments discussed.” Ex. 1005, 9:42–43. Moreover, Giere673 states in the context of Figure 5’s embodiment that “the temperature controller 110 of F[igure] 1 is coupled to *at least one* measurement sensor.” *Id.* at 4:50–52 (emphasis added). In other words, the TSR 510 alone is sufficient. *Id.* Regardless, one of ordinary skill in the art in reading Giere673’s disclosure is not “compelled to adopt every single aspect of its teaching without the exercise of independent judgment.” *Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889 (Fed. Cir. 1984); *In re Mouttet*, 686 F.3d 1322, 1331 (Fed. Cir. 2012) (“A reference may be read for all that it teaches, including uses beyond its primary purpose.”).

At this stage of the proceeding, we also find unavailing Patent Owner’s argument that Giere673 fails to disclose a single temperature sensing element to the extent that this argument relates to Giere673 also disclosing that additional sensors may be employed. Prelim. Resp. 45–46; *see also id.* at 47 (making same argument). As we discuss above, Giere673 teaches that the TSR 510 alone is sufficient. Ex. 1005, 4:50–52. Moreover, at this stage of proceeding, we find that an embodiment that also employs temperature recorders 542, 544, and 546 (“that work with the measurement sensors”) teaches a single temperature sensing element. *Id.* at 5:6–17. These components work together to determine the temperature of the substrate and form a single temperature sensing element. *Id.* at 4:49–31.

At this stage of the proceeding, we also find unavailing Patent Owner's argument that "neither Benjamin nor Giere[]673 are directed to monitoring the temperature of individual regions between two heater arrays on a printhead having a plurality of such regions." Prelim. Resp. 47. Patent Owner argues that "Benjamin discloses a printhead having multiple such regions[, h]owever, Benjamin discloses that only a single temperature sensor is on the printhead die and that the temperature sensor measures the temperature of the entire printhead." *Id.* And Patent Owner argues that "Giere[]673 does not disclose ink vias, let alone multiple parallel ink vias having heater arrays adjacent each longitudinal side resulting in multiple regions between heater arrays." *Id.* at 49. Patent Owner incorrectly focuses on Benjamin's and Giere673's teachings individually, rather than their combined teachings. *See In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) ("Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references"). The relevant inquiry is whether the claimed subject matter would have been obvious to those of ordinary skill in the art in light of the combined teachings of Benjamin and Giere673. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981). As we discuss above, at this stage of the proceeding, we find that this limitation would have been obvious in light of the combined teachings.

At this stage of the proceeding, we also find unavailing Patent Owner's argument that "the Benjamin device can accommodate only one temperature sense resistor because there is only a single contact area (TSR) . . . on the flex circuit shown in Figs. 25A and 25B . . . , and a single return contact area (TSR-RT)." Prelim. Resp. 47–48 (citing Ex. 1004, Figs.

25A–B, 79:29–34, 79:63–65); *see also id.* at 53–54 (making same argument). This argument is akin to arguing that Benjamin and Giere673’s teachings cannot be physically combined, which is an improper focus for determining whether the claim would have been rendered obvious by the prior art as a whole. *See Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (quoting *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983)); *see also id.* (quoting *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc)) (“Etter’s assertions that Azure cannot be incorporated in Ambrosio are basically irrelevant, the criterion being not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.”). Rather, we find that one of ordinary skill in the art would have “be[en] able to fit the teachings of [Benjamin and Giere673] . . . together like pieces of a puzzle” because the skilled artisan is “a person of ordinary creativity, not an automaton.” *KSR*, 550 U.S. at 420–21.

At this stage of the proceeding, we also find unavailing Patent Owner’s argument that “the ’708 patent . . . reveals that the ink vias act as thermal barriers but does not indicate that this was well known at the time or that other investigators appreciated the implications of this when designing temperature sensing circuitry for printheads having multiple parallel ink vias.” Prelim. Resp. 52. We disagree. The ’708 patent’s discussion of temperature sensing on a per color basis (illustrated by Figure 2) being known 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. Ex. 1001, 2:1–15. In particular, the ’708 patent explains what Figure 2’s traditional heater chip’s design discloses: (i) “[t]hree temperature sense

resistors 220, 222, and 224 are placed in close proximity to each of the heater arrays, each situated on the same side of their respective ink vias;” (ii) “[t]he ink vias 202, 204, and 206 act as a thermal barrier between the colors”; and (iii) “[a]ll the thermal heater arrays 208, 210, and 212 are situated on only one side of their respective ink vias, ensuring that there is only a small amount of thermal crosstalk between the temperature sense resistors.” *Id.* The discussion of the temperature sense resistors being situated on the same side of their respective ink vias to ensure only a small amount of thermal crosstalk evidences that ink vias acting as thermal barriers was well known, and its implications were appreciated for design purposes. *Id.*

Moreover, the ’708 patent’s labeling Figure 2 as “Prior Art” “thereby qualifies that system as [Applicant Admitted Prior Art (‘AAPA’)] available for Petitioner’s use in the Petition, including to supply a missing claim element.” Ex. 1001, Fig. 2; *Solaredge Techs. Ltd. v. SMA Solar Tech. AG*, IPR2020-00021, Paper 34, at 10 (PTAB June 8, 2023) (Director Vidal). “Thus, whether the substance of the admission was ‘known’ in the art is an inquiry that does not impact the use of this admission as AAPA.” *Solaredge Techs.*, Paper 34 at 10.

At this stage of the proceeding, we also find unavailing Patent Owner’s argument that Yabe relates to ink supply ports in “side shooter” printheads, and “Yabe does not disclose temperature sensors between ink vias, and instead measures mean temperature of a printhead . . . with sensors in the peripheral region of the die instead of between ink vias.” Prelim. Resp. 53. Petitioner relies on Yabe to show that one of ordinary skill in the art would have known that ink vias are insulating.

Pet. 23 (citing Ex. 1008, 3:16–21). We consider Yabe for that purpose. *Randall Mfg.*, 733 F.3d at 1362–63.

At this stage of the proceeding, we also find unavailing Patent Owner’s argument that Petitioner employs impermissible hindsight. Prelim. Resp. 50–51. To the contrary, as we discuss above, at this stage of the proceeding, we find that Petitioner has provided sufficiently articulated reasoning with rational underpinning to support combining Benjamin and Giere673 in the manner Petitioner does.

At this stage of the proceeding, we also find unavailing Patent Owner’s argument that neither Benjamin nor Geire673 “teaches computing an average temperature of an entire substrate from multiple individual temperature measurements taken in discrete regions.” Prelim. Resp. 51. This argument is premised on Patent Owner’s argument that Petitioner “impl[ies] that [one of ordinary skill in the art] somehow would have used [individual region] measurements, in a manner unexplained in the Petition, to determine an average temperature of the entire substrate.” *Id.* (citing Pet. 23–24; Ex. 1002 ¶¶ 177, 188). Rather, we view Petitioner as arguing that one of ordinary skill in the art would have disposed a single TSR in each region “so that, *individually*, each TSR provides a temperature value reflective of the temperature of its region, including the heater arrays within those regions, *and collectively*, the values provided by the TSRs reflect the mean temperature of the entire printhead die.” Ex. 1002 ¶ 177; *see also id.* ¶ 187; Pet. 23–24. In other words, one of ordinary skill in the art would have understood that a TSR was needed in each region to measure temperature over all regions of the die. Ex. 1002 ¶ 177, 187; Pet. 23–24.

At this stage of the proceeding, we also find unavailing Patent Owner’s argument that “Petitioner[] allege[s] only generic motivations that are unpersuasive.” Prelim. Resp. 55. As the Federal Circuit has recently reminded us, “[t]he motivation-to-combine analysis is a flexible one.” *Intel Corp. v. PACTXPP Schweiz AG*, 61 F.4th 1373, 1379 (Fed. Cir. 2023). “[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *Id.* (quoting *KSR*, 550 U.S. at 420) (alteration in original). We find that regulating temperature to optimize print quality is such a problem. *E.g.*, Ex. 1002 ¶ 161.

In sum, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that the combination of Benjamin and Giere673 teaches this limitation. We also find, for purposes of institution, that Petitioner provides sufficiently articulated reasoning with rational underpinning to support Petitioner’s combining of Benjamin and Giere673’s teachings for this limitation. *See In re Kahn*, 441 F.3d at 988.

6. Operable to Sense

Claim 1 further recites that the temperature sensing element is “disposed at a predetermined distance away from adjacent heater arrays.” Ex. 1001, 8:39–40. At this stage of the proceeding, we agree with Petitioner and find that the combination of Benjamin and Giere673 teaches this limitation. Pet. 27–29.

At this stage of the proceeding, we find that Giere673 teaches that “[t]he TSR 510 is located along the length of the substrate 410,” and that “[t]he TSR 510 can have two legs that are approximately 680 um inboard from the center of the columns of ink ejection elements 416.” Ex.1005,

5:10–12; *see also* *id.* at 4:36–39 (teaching that “[t]he ink ejection elements 416 may be resistor heater elements”), 4:63–66, Fig. 4 (showing resistor heater element 416 located directly below nozzle 420), Fig. 5 (showing “a first column 520 of nozzles 420 . . . and a second column 530 of nozzles 420 (the dotted lines 540 represent numerous consecutive nozzles, which are not shown for simplicity)”). In other words, Giere673 teaches that the TSR 510 is disposed at a predetermined distance (about 680 um) away from adjacent heater arrays (ink ejection elements 416). *Id.* at 4:36–39, 5:10–12.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that Giere673 teaches that the temperature sensing element is “disposed at a predetermined distance away from adjacent heater arrays.”

7. Summary

In summary, based on the current record, and for purposes of this institution decision, we determine that Petitioner shows a reasonable likelihood that claim 1 would have been obvious to one of ordinary skill in the art in view of Benjamin and Giere673.

D. Challenged Claims 2, 3, 5–12, 14, and 15

At this stage in the proceeding, Patent Owner does not address separately Petitioner’s arguments and evidence as to how the combination of Benjamin and Giere673 teaches the limitations of claims 2, 3, 5–12, 14, and 15. *See generally* Prelim. Resp. We have reviewed Petitioner’s arguments and evidence regarding these claims, and, on the current record, we find them persuasive for purposes of institution.

VI. ALLEGED OBVIOUSNESS OVER BENJAMIN, GIERE673, AND PARISH

Petitioner argues that the combination of Benjamin, Giere673, and Parish renders claims 4 and 13 obvious. Pet. 42–45. At this stage in the proceeding, Patent Owner does not address separately Petitioner’s arguments and evidence as to how the combination of Benjamin, Giere673, and Parish teaches these claims. *See* Prelim. Resp. 57. We have reviewed Petitioner’s arguments and evidence regarding claims 4 and 13, and, on the current record, we find them persuasive for purposes of institution.

VII. REMAINING GROUNDS

Petitioner argues that (i) Giere178 renders claims 1–3, 5–12, 14, and 15 obvious; (ii) the combination of Giere178 and Yabe renders claims 1–3, 5–12, 14, and 15 obvious; (iii) the combination of Giere178 and Parish renders claims 4 and 13 obvious; and (iv) the combination of Giere178, Yabe, and Parish renders claims 4 and 13 obvious. Pet. 45–105.

Petitioner already has demonstrated a reasonable likelihood of success in proving that at least one claim of the ’708 patent would have been obvious. In order to provide guidance to the parties, we address the issues in dispute for the remaining grounds. *See* Consolidated Trial Practice Guide (November 2019)¹⁰ (“CTPG”) 6 (“If a trial is instituted, the Board generally will provide analysis of the strengths and weaknesses of all challenges in the petition in order to provide guidance to the parties for the upcoming trial.”). In particular, these disputes relate to (i) Giere178’s teachings, and (ii) the teachings of the Giere178 and Yabe combination. We address these disputes below.

¹⁰ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

A. Summary of Giere178

Giere178 is titled “Temperature and Measurement Device.” Ex. 1007, code (54). Giere178 teaches an apparatus that includes (i) “a substrate and a resistive element attached to a region of the substrate and formed of a first material having a first temperature coefficient of resistivity,” (ii) “a pair of traces coupled to the resistive element, attached to the substrate, and formed of a second material having a second temperature coefficient of resistivity with the first material selected so that the first temperature coefficient of resistivity exceeds the second temperature coefficient of resistivity,” (iii) “a substrate and a resistive element disposed onto a first region of the substrate and formed of a first material having a first temperature coefficient of resistivity,” and (iv) “a pair of traces coupled to the resistive element and each formed of a first plurality of sections of a second material having a second temperature coefficient of resistivity and a second plurality of sections of a third material having a third temperature coefficient of resistivity.” *Id.* at code (57).

B. Summary of Yabe

Yabe is titled “Inkjet Recording Head and Inkjet Recording Apparatus.” Ex. 1008, code (54). Yabe “relates to the structure of the element base plate (heater board) of an inkjet recording head.” *Id.* at 1:9–11. In particular, Yabe teaches that a base plate has a plurality of heat generating resistive elements arranged on the base plate for generating thermal energy for discharging ink as ink droplets, a plurality of ink discharge ports each arranged in a position facing each of the heat generating resistive elements, a plurality of ink flow paths each communicated with each of the ink discharge ports, and elongated ink supply ports arranged on the base plate

along the lines of the heat generating elements for use of ink discharges, being communicated with the plurality of ink flow paths. *Id.* at code (57). In addition, the base plate also has means for detecting the temperature of the base plate, and means for heating the base plate, arranged on the base plate in the vicinity of the end portion of the ink supply ports in the longitudinal direction. *Id.*

C. Geier178's Teachings for a Plurality of Ink Vias

The parties dispute whether Giere178 teaches “a plurality of ink vias arranged parallel to one another,” as recited in independent claim 1, and similarly recited in independent claim 9. Pet. 47–54; Prelim. Resp. 57–62. For the reasons below, at this stage of the proceeding, we agree with Patent Owner and find that Petitioner does not show that Giere178 teaches this limitation.

Petitioner cites to Giere178's Figure 3, shown below, in support of its arguments. Pet. 47–54.

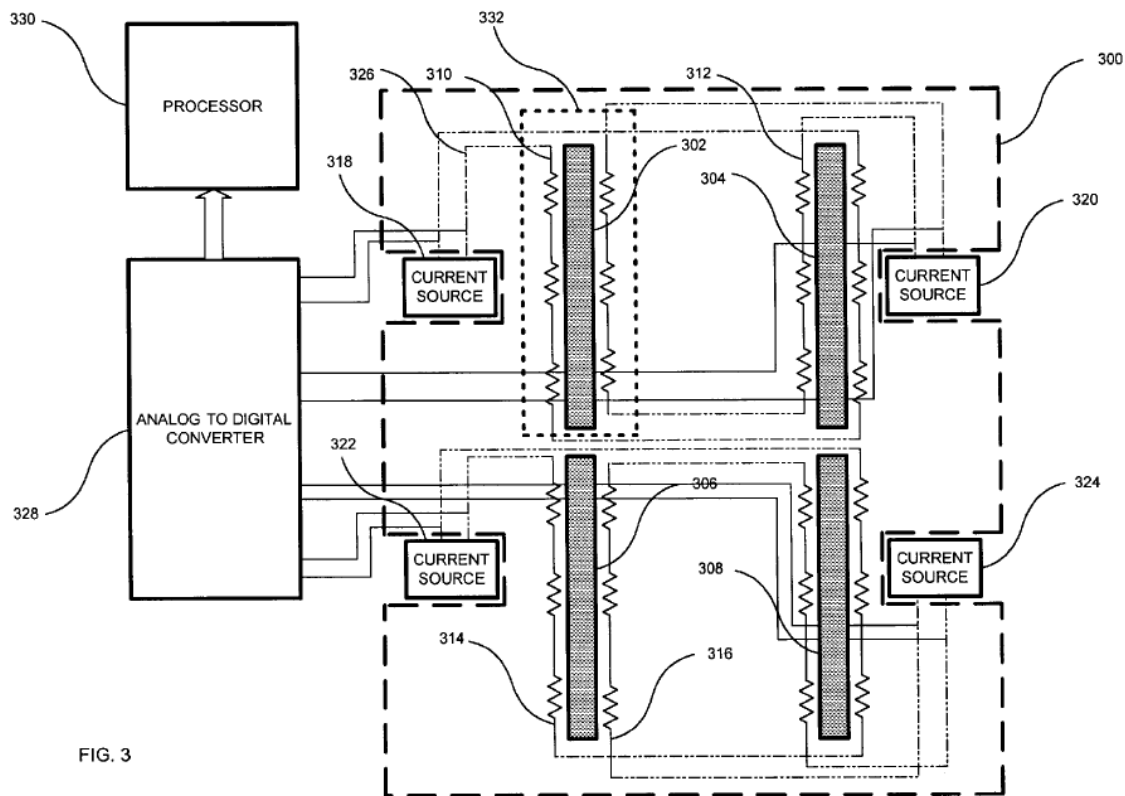


Figure 3 “is a high level schematic diagram of an embodiment of [Giere178’s] temperature measurement system.” Ex. 1007, 1:57–58.

Petitioner argues that “Giere178 explains that printhead substrate 300 . . . **‘includes the structures of a typical printhead such as, ink feed slots, ink ejection chambers, firing resistors, etc.’**” Pet. 47 (quoting Ex. 1007, 8:45–47) (alterations in original). Petitioner argues that one of ordinary skill in the art “would have understood that ‘ink feed slots’ are synonymous with ‘ink vias.’” *Id.* at 48 (citing Ex. 1002 ¶ 269).

In addition, Petitioner argues that Giere178 teaches that “[r]egions 302, 304, 306, and 308 each include an array of nozzles and associated firing resistors for ejecting ink.” *Id.* (quoting Ex. 1007, 8:47–49) (alteration in original) (emphasis omitted). According to Petitioner, “[b]ecause Giere178 describes these regions as including ‘nozzles and associated firing resistors’

[one of ordinary skill in the art] would have understood that these regions must also include ‘ink ejection chambers’ because, as Giere178 explains, typical inkjet printheads have nozzles and firing resistors co-located with ink ejection chambers.” *Id.* at 48–49 (citing Ex. 1002 ¶ 270; Ex. 1007, 2:59–3:4).

Up to this point, we agree with Petitioner’s arguments concerning Giere178’s teachings, at this stage of the proceeding. Petitioner next argues that one of ordinary skill in the art “would have also understood that because regions 302, 304, 306, and 308 of substrate 300 include ink ejection chambers then they must also include ink feeds slots/vias because that is the structural arrangement of a typical printhead.” *Id.* at 49 (citing Ex. 1002 ¶ 270; Ex. 1007, 3:36–38, 8:45–47). We disagree.

Giere178 instead teaches that ink is fed to the ink ejection chambers using either “center feed” or “edge feed.” Ex. 1007, 3:37–40. In particular, Giere178 teaches the following:

Ink is . . . fed to the various ink ejection chambers 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.” In center feed the ink then flows through a central slot in the substrate into a central manifold area formed in a barrier layer between the substrate and a nozzle member, then into a plurality of ink channels, and finally into the various ink ejection chambers. In edge feed ink from the ink reservoir flows around the outer edges of the substrate into the ink channels and finally into the ink ejection chambers.

Id. at 3:37–47. In other words, Giere178 does not teach a plurality of ink vias. *Id.* Moreover, we do not credit Dr. Pond’s testimony on this issue as it is contrary to these teachings from Giere178. *Compare* Ex. 1002 ¶ 270, *with* Ex. 1007, 3:37–47.

At this stage of the proceeding, we find insufficient Petitioner’s argument that one of ordinary skill in the art “would have understood that firing resistors (and corresponding ink ejection chambers) are necessarily disposed very close to ink feed slots/vias to ensure that ink can refill a chamber quickly after it has fired an ink drop.” Pet. 49 (citing Ex. 1002 ¶ 270); *see also id.* at 52–53 (making same argument). We find that this argument is based on testimony from Dr. Pond that lacks factual support, and does not quantify “very close,” nor explain how it relates to Giere178’s center feed or edge feed teachings. *Id.* at 49; Ex. 1002 ¶¶ 270, 273.

In addition, at this stage of the proceeding, we find insufficient Petitioner’s argument that one of ordinary skill in the art “would have also understood that Giere178 discloses an **ink via in each of regions 302, 304, 306, and 308** because the component layout of Giere178’s temperature management system requires measuring the substrate temperature on both sides of those regions where ink, fed from nearby ink feed slots/vias, is being excessively fired from firing chambers and thereby generating excessive heat in the substrate.” Pet. 50–51 (citing Ex. 1002 ¶ 272–274). As above, we find that this argument is based on testimony from Dr. Pond that lacks factual support, and does not quantify “nearby,” nor explain how it relates to Giere178’s center feed or edge feed teachings. *Id.*; Ex. 1002 ¶¶ 272–274.

In addition, at this stage of the proceeding, we find insufficient Petitioner’s argument that having a plurality of ink vias arranged in parallel would have been obvious to one of ordinary skill in the art based on their knowledge and Giere178’s teachings. Pet. 54 (citing Ex. 1002 ¶ 276). We view this as arguing that one of ordinary skill in the art could have made the

modification (i.e., used parallel ink vias in lieu of center feed or edge feed), rather than explaining why they would have been motivated to do so, which is insufficient.

D. Giere178 and Yabe's Combined Teachings

At this stage of the proceeding, we disagree with Patent Owner that for the Giere178 and Yabe asserted ground, Petitioner fails to identify or explain which elements are allegedly taught by the references in combination, and why one of ordinary skill in the art would have combined the references' teachings. Prelim. Resp. 63. Rather, we find that Petitioner's allegations for this asserted ground are sufficiently clear. *See* Pet. 82–101.

In addition, at this stage of the proceeding, we find unavailing Patent Owner's arguments that Petitioner's combination of Giere178 and Yabe (i) “would fundamentally alter the entire design principle of the printheads disclosed in” Giere178, (ii) “presents a wholesale reconstruction resulting in a printhead that does not remotely resemble the device disclosed in” Giere178, (iii) “fundamentally alters the structures of Giere[]178's printhead,” (iv) “require[s] significantly shrinking the ink vias and heaters to fit . . . or significantly expanding the printhead substrate,” (v) “require[s] a fundamental alteration in how Giere[]178's printhead deposits ink,” and (vi) “would completely change Giere[]178's temperature monitoring scheme and what the temperature sensors detect.” *See* Prelim. Resp. 64–68. At this stage of the proceeding, we find that Patent Owner incorrectly focuses on Giere178's (e.g., center feed, TSR design) and Yabe's (e.g., not teaching a quadrant arrangement) individual teachings rather than their combined teachings to one of ordinary skill in the art. We also find that these

arguments are largely attorney argument without expert testimony or other factual support. *See In re Geisler*, 116 F.3d 1465, 1471 (Fed. Cir. 1997) (explaining that attorney arguments and conclusory statements that are unsupported by factual evidence are entitled to little probative value). Nor does Patent Owner sufficiently account for one of ordinary skill in the art having ordinary creativity and being able to fit the combined teachings together like pieces of a puzzle.

In addition, at this stage of the proceeding, we find unavailing Patent Owner's arguments concerning Giere178's purpose being thwarted. Prelim. Resp. 72. *See In re Mouttet*, 686 F.3d at 1331 ("A reference may be read for all that it teaches, including uses beyond its primary purpose."); *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985) ("A reference must be considered for everything it *teaches* by way of technology and is not limited to the particular *invention* it is describing and attempting to protect.").

In addition, at this stage of the proceeding, we find unavailing Patent Owner's argument that Petitioner's proposed alteration of Giere178 with Yabe keeps Giere178's temperature sensors in place but replaces the single array of heaters between each pair of sensors with an ink via sandwiched between two heater arrays, and as a result, the temperature sensors "measure only **one side** of each heater array, not both sides." Prelim. Resp. 71. At this stage of the proceeding, we find that Patent Owner's argument does not address Petitioner's showing for how Giere178 teaches the "a single temperature sensing element" limitation, which we find sufficient for purposes of institution. *Compare* Prelim. Resp. 69–72, *with* Pet. 64–71, 92. We also note that Patent Owner does not clearly tether these arguments to

claim language it argues is not met. This issue may be further developed during trial, in accordance with our Rules.

VIII. CONCLUSION

For the foregoing reasons, we determine that Petitioner shows a reasonable likelihood that it would prevail in proving the unpatentability of at least one of the challenged claims of the '708 patent. We thus institute an *inter partes* review of all of the challenged claims of the '708 patent on all grounds asserted in the Petition. *See* 37 C.F.R. § 42.108(a).

Any findings or conclusions in this Decision are made only for the purposes of institution and are not dispositive of any issue. We have not made a final determination with respect to the patentability of any challenged claim. Our final determination will be based on the record as fully developed during trial, including any evidence or argument timely presented by the parties under our Rules.

IX. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of the '708 patent is instituted on all of the challenged claims and all grounds asserted in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial commences on the entry date of this Decision.

IPR2023-00313
Patent 7,594,708 B2

FOR PETITIONER:

Dion M. Bregman
Amanda S. Williamson
Jason E. Gettleman
MORGAN, LEWIS & BOCKIUS LLP
dion.bregman@morganlewis.com
amanda.williamson@morganlewis.com
jason.gettleman@morganlewis.com

PATENT OWNER:

Timothy P. Maloney
Paul B. Henkelmann
Mark A. Borsos
FITCH, EVEN, TABIN & FLANNERY LLP
tim@fitcheven.com
phenkelmann@fitcheven.com
mborsos@fitcheven.com