

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 RESPONSE

Mail Stop PATENT BOARD
Patent Trial and Appeal Board
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
II. BACKGROUND	2
A. The '708 Patent	2
B. The Asserted Prior Art	10
1. U.S. Patent No. 7,384,113 to Benjamin <i>et al.</i> (Ex. 1004)	10
2. U.S. Patent No. 6,612,673 to Giere <i>et al.</i> (Ex. 1005)	11
3. U.S. Patent No. 6,565,178 to Giere <i>et al.</i> (Ex. 1007)	15
4. U.S. Patent No. 6,527,367 to Yabe (Ex. 1008).....	28
III. THE PERSON OF ORDINARY SKILL IN THE ART	31
IV. CLAIM CONSTRUCTION	32
V. LEGAL STANDARDS	34
A. Anticipation.....	34
B. Obviousness.....	36
VI. THE PETITION FAILS TO ESTABLISH THAT ANY OF CLAIMS 1-3, 5-12, AND 14-15 WOULD HAVE BEEN OBVIOUS IN VIEW OF BENJAMIN IN VIEW OF GIERE '673 (GROUND 1).....	38
A. Ground 1 Fails Because Neither Benjamin Nor Giere '673 Suggest Monitoring of Temperatures in Regions Between Ink Vias	38
B. Ground 1 Fails Because The Proposed Modifications To Benjamin Are Based On Hindsight-Driven Cherry Picking And Reconstruction.....	41
VII. THE PETITION FAILS TO ESTABLISH THAT CLAIMS 4 AND 13 WOULD HAVE BEEN OBVIOUS IN VIEW OF BENJAMIN, GIERE '673, AND PARISH (GROUND 2)	47

VIII.	THE PETITION FAILS TO ESTABLISH THAT ANY OF CLAIMS 1-3, 5-12, AND 14-15 ARE RENDERED OBVIOUS BY GIERE '178 AND KNOWLEDGE OF A PHOSITA (GROUND 3).....	47
A.	Ground 3 Fails Because It Is Based On Inaccurate Characterizations of Giere '178	47
B.	Ground 3 Fails Because The Theory Does Not Meet The Challenged Claims Even Under Petitioner's Inaccurate Characterizations of Giere '178	56
IX.	THE PETITION FAILS TO ESTABLISH THAT ANY OF CLAIMS 1-3, 5-12, AND 14-15 WOULD HAVE BEEN OBVIOUS IN VIEW OF GIERE '178 AND YABE (GROUND 4).....	58
A.	Ground 4 Fails To The Extent That It Depends On The Same Inaccuarate Characterizations of Giere '178.....	58
B.	Ground 4 Fails Because The Proposed Combination Would Involve Extensive Redesign That Does Not Result In The Subject Matter of the Challenged Claims	61
X.	THE PETITION FAILS TO ESTABLISH THAT CLAIMS 4 AND 13 WOULD HAVE BEEN OBVIOUS IN VIEW OF GIERE '178 AND PARISH (GROUND 5).....	67
XI.	THE PETITION FAILS TO ESTABLISH THAT CLAIMS 4 AND 13 WOULD HAVE BEEN OBVIOUS IN VIEW OF GIERE '178, YABE, AND PARISH (GROUND 6).....	67
XII.	CONCLUSION.....	67

TABLE OF AUTHORITIES

	<u>Page</u>
Cases	
<i>ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.</i> , 694 F.3d 1312 (Fed. Cir. 2012)	38
<i>Akzo N.V. v. United States ITC</i> , 808 F.2d 1471 (Fed. Cir. 1986)	37
<i>Arendi S.A.R.L. v. Apple</i> , 832 F.3d 1355 (Fed. Cir. 2016)	54
<i>Continental Can Co. USA, Inc. v. Monsanto Co.</i> , 948 F.2d 1264 (Fed. Cir. 1991)	35
<i>Graham v. John Deere Co. of Kansas City</i> , 383 U.S. 1 (1966)	36, 40
<i>Hansgird v. Kemmer</i> , 102 F.2d 212 (CCPA 1939)	35
<i>Homeland Housewares, LLC v. Whirlpool Corp.</i> , 865 F. 3d 1372 (Fed. Cir. 2017)	54
<i>In re Arkley</i> , 455 F.2d 586 (CCPA 1972)	35
<i>In re Dow Chem. Co.</i> , 837 F.2d 469 (Fed. Cir. 1988)	37
<i>In re Evanega</i> , 829 F.2d 1110 (Fed. Cir. 1987)	37
<i>In re Gordon</i> , 733 F.2d 900 (Fed. Cir. 1984)	37
<i>In re NTP, Inc.</i> , 654 F.3d 1279 (Fed. Cir. 2011)	36, 46
<i>In re NuVasive, Inc.</i> , 842 F.3d 1376 (Fed. Cir. 2016)	38
<i>In re Oelrich</i> , 666 F.2d 578 (CCPA 1981)	35
<i>In re Ratti</i> , 270 F.2d 810 (CCPA 1959)	37
<i>In re Wesslau</i> , 353 F.2d 238 (CCPA 1965)	46
<i>In re Young</i> , 927 F.2d 588 (Fed. Cir. 1991)	37

<i>KSR Int’l Co. v. Teleflex Inc.</i> , 550 U.S. 398 (2007)	36, 38
<i>Medichem, S.A. v. Rolabo, S.L.</i> , 437 F.3d 1157 (Fed. Cir. 2006)	40
<i>Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH</i> , 139 F.3d 877 (Fed. Cir. 1998)	37
<i>Net MoneyIN, Inc. v. VeriSign, Inc.</i> , 545 F.3d 1359 (Fed. Cir. 2008)	35
<i>Par Pharm., Inc. v. TWi Pharms., Inc.</i> , 773 F.3d 1186 (Fed. Cir. 2014)	40
<i>Personal Web Techs., LLC v. Apple, Inc.</i> , 848 F.3d 987 (Fed. Cir. 2017)	36
<i>Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.</i> , 655 F.3d 1364 (Fed. Cir. 2011)	36

LIST OF EXHIBITS

Ex. 1001	U.S. Patent No. 7,594,708 to Barkley <i>et al.</i>
Ex. 1002	Declaration of Stephen F. Pond, Ph.D.
Ex. 1003	File History of U.S. Patent 7,594,708
Ex. 1004	U.S. Patent No. 7,384,113 to Benjamin <i>et al.</i> (“Benjamin”)
Ex. 1005	U.S. Patent No. 6,612,673 to Giere <i>et al.</i> (“Giere673”)
Ex. 1006	U.S. Patent No. 7,163,272 to Parish <i>et al.</i> (“Parish”)
Ex. 1007	U.S. Patent No. 6,565,178 to Giere <i>et al.</i> (“Giere178”)
Ex. 1008	U.S. Patent No. 6,527,367 to Yabe (“Yabe”)
Ex. 1009	U.S. Patent No. 5,808,640 to Bhaskar <i>et al.</i> (“Bhaskar”)
Ex. 1010	U.S. Patent No. 6,488,363 to Torgerson <i>et al.</i> (“Torgerson”)
Ex. 1011	U.S. Patent No. 6,082,854 to Axtell <i>et al.</i> (“Axtell”)
Ex. 1012	Excerpts of Prior Art Dictionaries – Adjacent
Ex. 1013	Oxford English Dictionary, Second Edition (2005)
Ex. 1014	U.S. Patent No. 7,131,714 to Edelen <i>et al.</i> (“Edelen”)
Ex. 1015	U.S. Patent No. 6,357,863 to Anderson <i>et al.</i> (“Anderson”)
Ex. 1016	U.S. Patent No. 6,382,773 to Chang <i>et al.</i> (“Chang”)
Ex. 1017	Daniel A. Kearl & Michael S. Ard, Low-Cost Plain Paper Color Inkjet Printing, Hewlett-Packard J. 43, No. 4, 64 (1992)
Ex.1018	William A. Buskirk et al., Development of a High-Resolution Thermal Inkjet Printhead, Hewlett-Packard J. 39, No. 5, 55 (1988)
Ex.1019	U.S. Patent No. 7,278,703 to Benjamin <i>et al.</i> (“Benjamin703”)
Ex. 1020	<i>Curriculum Vitae</i> of Stephen F. Pond, Ph.D.
Ex. 1021	Order Granting Stay of <i>Slingshot Printing LLC v. Canon U.S.A., Inc. et al.</i> , Case No. 2:22-cv-01852, Dkt. 42 (E.D.N.Y. Dec. 1, 2022)
Ex. 1022	Letter Requesting Extension of Temporary Stay of <i>Slingshot Printing LLC v. Canon U.S.A., Inc. et al.</i> , Case No. 2:22-cv-01852, Dkt. 43 (E.D.N.Y. Dec. 27, 2022)
Ex. 1023	Order granting Motion to Stay (Dkt. 43) in <i>Slingshot Printing LLC v. Canon U.S.A., Inc. et al.</i> , Case No. 2:22-cv-01852 (E.D.N.Y. Dec. 27, 2022)
Ex. 1024	Case Management Schedule for <i>Slingshot Printing LLC v. Canon U.S.A., Inc. et al.</i> , Case No. 2:22-cv-01852, Dkt. 36-1 (E.D.N.Y. Nov. 2, 2022)
Ex. 1025	Slingshot LLC’s Infringement Contentions for <i>Slingshot Printing LLC v. Canon U.S.A., Inc. et al.</i> , Case No. 2:22-cv-01852, (E.D.N.Y.)

IPR2023-00313: Patent Owner Response

Ex. 1026	Claim Construction Order for <i>Slingshot Printing LLC v. HP, Inc.</i> , Case No. 1:20-cv-00186-ADA, Dkt. 82 (W.D.T.X. Jan. 14, 2021)
Ex. 2001	U.S. Patent Publication No. 2003/0142159 to Askeland <i>et al.</i> (“ <i>Askeland</i> ”)
Ex. 2002	Curriculum Vitae of Steven J. Dietl
Ex. 2003	Declaration of Steven J. Dietl
Ex. 2004	October 10, 2023 Deposition transcript of Stephen F. Pond

I. INTRODUCTION

Patent owner Slingshot Printing LLC respectfully submits this Response to Canon's Petition.

Petitioners fall far short of their burden of proving that challenged claims 1-15 of U.S. Pat. No. 7,594,708 (the '708 patent) are invalid under the asserted grounds. The '708 patent discloses and claims novel configurations for inkjet printheads, specifically a chip with a plurality of ink vias and a single temperature sensing element disposed within each region separated by adjacent ink vias, with 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 the adjacent heater arrays.

Petitioners challenge the '708 patent claims as obvious, but rely on hindsight in an attempt to arrive at the inventions claimed in the '708 patent. For instance, in Grounds 1-2 Petitioners rely on aspects of prior art relating to the measurement of a single temperature of an entire printhead die, and while arguing that temperature of an entire printhead die is meaningful to regulating operational temperature, conclude that those skilled in the art would have placed numerous sensors in different regions between ink vias (which is not shown by either cited prior art reference) and then calculated an average temperature instead of detecting the average temperature using a single sensor as in the cited references. In Grounds 3-6, Petitioners make

unwarranted assumptions regarding the cited prior art in an attempt to arrive at the structure claimed in the '708 patent, but even their mischaracterization of the prior art fails to result in all of the features of the challenged claims. On the whole, Petitioners have done nothing but use the '708 patent itself as a template to pick and choose elements from prior art references in an attempt to reconstruct the claimed invention.

Patent Owner relies upon the declaration of Steven J. Dietl (Ex. 2003) in support of this Response.

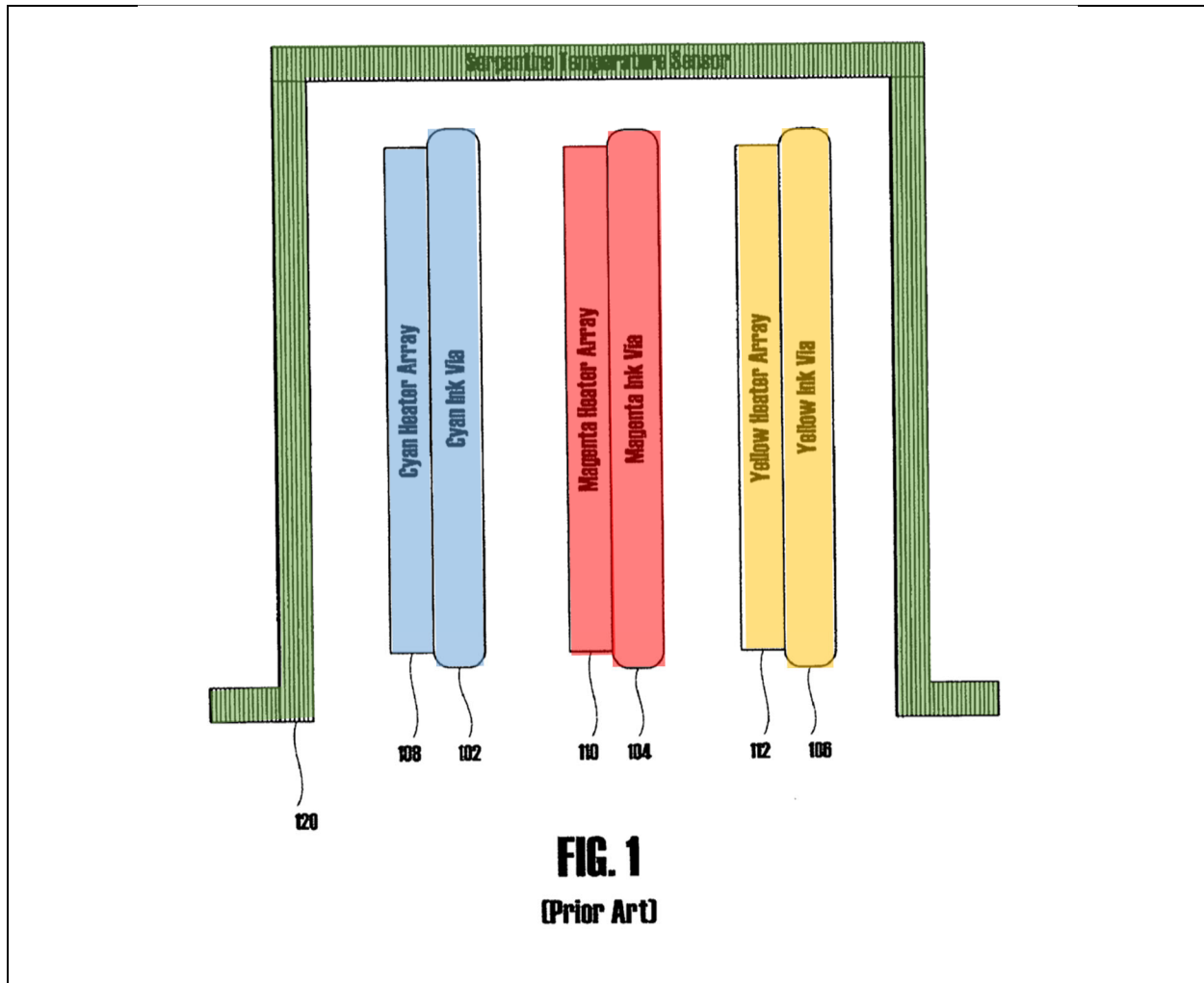
II. BACKGROUND

A. The '708 Patent

The '708 patent describes technical challenges associated with controlling the temperature of “heater chips” for discharging ink in an ink jet printer. A heater chip is a component of the printhead of the printer that discharges ink drops to form images, and may contain multiple ink “vias” or slots through which ink is supplied to the heater chip. (Ex. 2003 ¶40; Ex. 1001 col. 1 lns 21-26.) In the type of chips relevant to the '708 patent, arrays of heater resistor elements (“heaters”) are positioned along ink vias to heat ink supplied through the vias, causing the ink to be discharged through associated nozzles. (Ex. 2003 ¶41; Ex. 1001. col. 1 lns 21-47 and col. 4 lns 58-60.) In order to properly function, inkjet printers need to monitor and maintain the silicon substrate of the heater chip at an acceptable temperature for

printing, avoiding low temperatures that result in formation of smaller ink drops with lower drop-weight than required for good image quality and avoiding variations in temperature that will cause inconsistent drop-weight and resulting visible hue shifts in a printed image. (Ex. 2003 ¶41; Ex. 1001 col. 1 lns 48-55.) Once the temperature of the heater chip is measured, an acceptable temperature for printing may be maintained by applying short pulses to heater arrays or by utilizing separate substrate heating elements. (Ex. 2003 ¶41; Ex. 1001 col. 2 lns 16-25.)

Controlling the temperature of a heater chip requires the ability to measure its temperature. (Ex. 2003 ¶42.) One way of measuring heater chip temperature is attaching a temperature sense resistor (TSR) to the substrate and monitoring its current. As the substrate temperature of the heater chip increases, the resistance of the TSR increases, allowing a temperature measurement to be determined. (*Id.*; Ex. 1001 col. 6 lns 29-32.) At the time that the application that led to the '708 patent was filed, some heater chips included a single TSR regardless of the number of ink vias in a chip. For instance, the example from Fig. 1 of the '708 patent below includes one ink via for each primary color (magenta, yellow, and cyan), and a metal serpentine temperature sense resistor 120 [green] is routed around the periphery of the heater chip to detect an average temperature of the entire print head die. (Ex. 2003 ¶42; Ex. 1001 col. 1 lns 56-62.)



(Ex. 1001 Fig. 1.) 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, and thus cannot be used to control temperature on a per-color or area basis. (Ex. 2003 ¶42; Ex. 1001 col. 1 lns 57-65.)

In contrast, the heater chip shown in Fig. 2 includes three temperature sense resistors (220, 222, and 224), one for each heater array. Because each ink via is

associated with only one heater array this configuration allows for temperature sensing on a per color basis. (Ex. 2003 ¶43; Ex. 1001 col. 2 lns 1-11.)

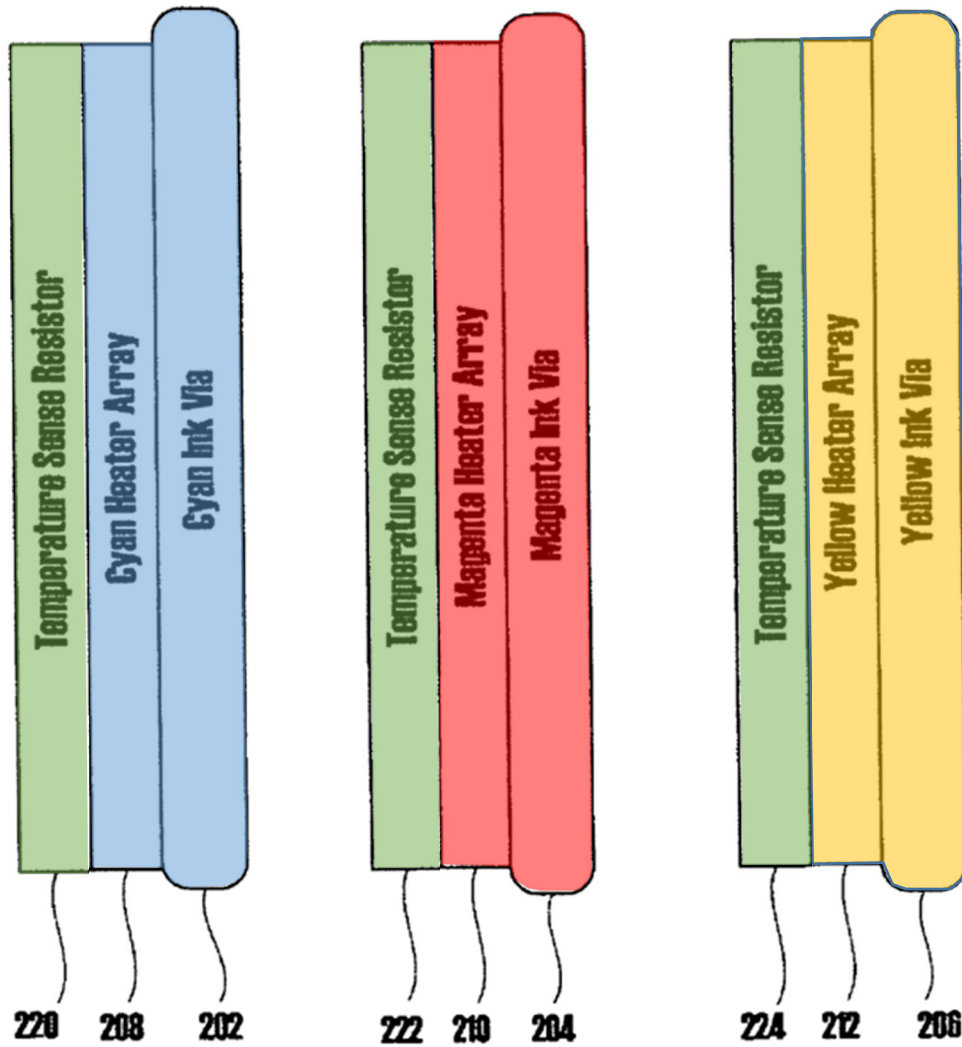
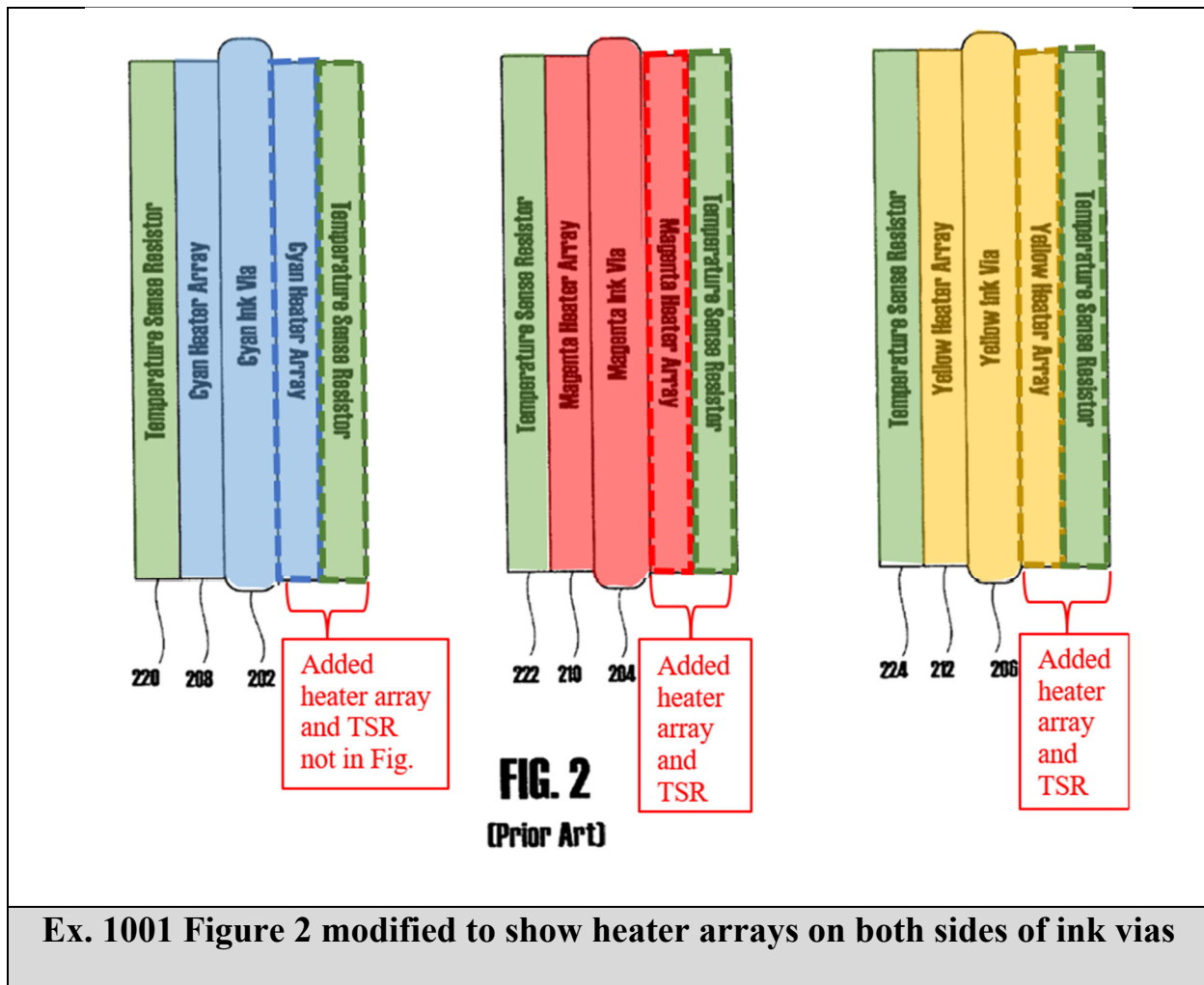


FIG. 2
(Prior Art)

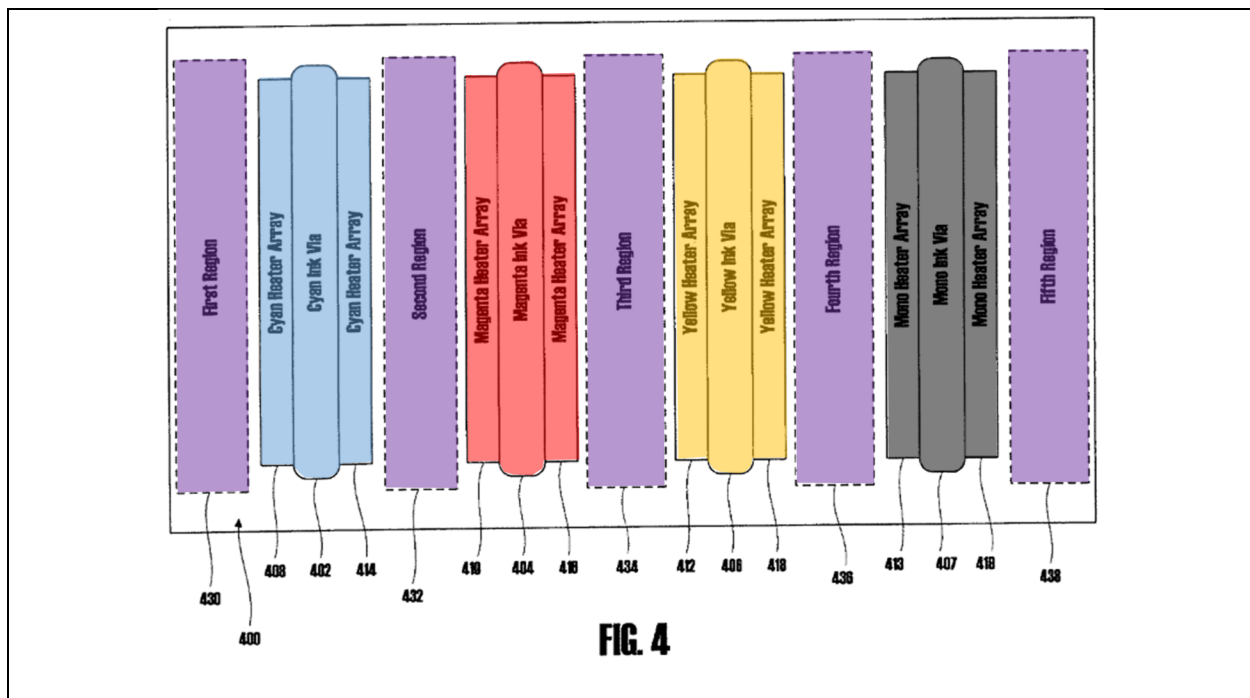
As the '708 patent notes, an approach of placing a temperature sensor immediately adjacent each heater array in a printhead having heater arrays on both sides of each via would result in the region between adjacent vias having two different TSRs. (Ex. 2003 ¶45; Ex. 1001 col. 5 lns 35-40.) This is shown below in a modified version of Fig. 2 that adds a second heater array and associated temperature sensor to each ink via in the manner described in the '708 patent, making it difficult to accurately detect and control temperature on a per color basis. (Ex. 2003 ¶45; Ex. 1001 col. 5 lns 35-50.) For example, if a print job is heavy in yellow and light in magenta, thermal energy generated by the yellow heaters would transfer through the common silicon to the magenta TSR positioned between the yellow and magenta ink vias, providing a false high reading for magenta. (*Id.* col. 5 lns. 44-48.)



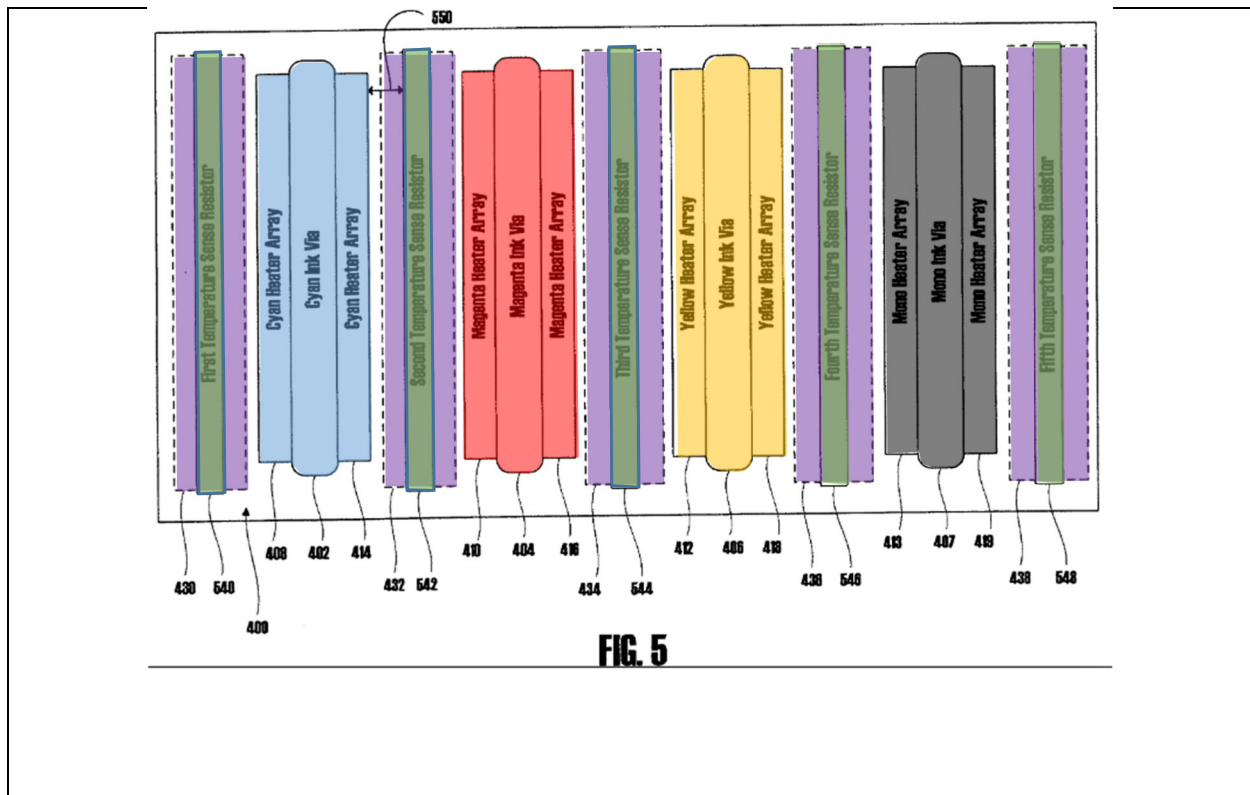
The '708 patent addresses the particular problem of detecting and controlling temperature in a printhead that has multiple parallel ink vias with heater arrays positioned on both sides of the ink vias. (Ex. 2003 ¶¶45-46; Ex. 2003 col. 2 lns 51-54 and col. 5 lns 35-51.) The inventors recognized that due to high thermal conductivity of the silicon substrate, the region between the heater array of one ink via and the opposite heater array of an adjacent ink via can have a fairly uniform temperature if the width of the region is small enough for the temperature to equalize at the firing frequency and temperature sampling rate of the temperature sense

element. (Ex. 2003 ¶46; Ex. 1001 col. 6 lns 58-64 and col. 7 lns 5-16.) However, the temperature between two adjacent ink vias may differ from the temperature of other regions of the chip because the ink vias act as thermal insulators. (Ex. 2003 ¶46; Ex. 1001 col. 6 lns 64-67.) Based on these principles, the inventors developed a design whereby the temperature of a heater chip is monitored and regulated on a per region basis where regions are defined by their relationship to ink vias. (Ex. 2003 ¶46.)

Fig. 4 below shows an embodiment of the invention of the '708 patent where several regions [purple] defined between heater arrays associated with ink vias of different colors (or between an ink via and an edge of the heater chip).



(Ex. 1001 Fig. 4.) As shown in Fig. 5 below, a temperature sensor (540, 542, 546, 548) [green] may be placed in each such region.

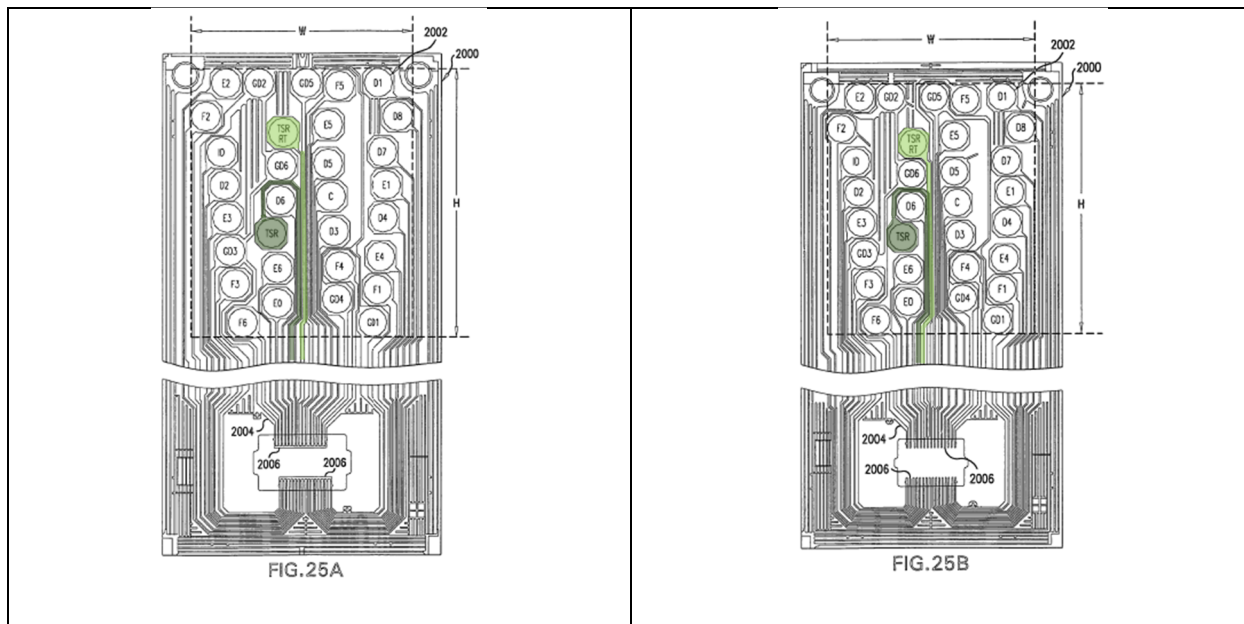


(*Id.*, Fig. 5 and col. 5 lns 35-41; Ex. 2003 ¶48.) The '708 patent teaches that a single temperature sensor in such a region can sense a temperature that represents the temperature of the two heater arrays adjacent the region if the width of the region is small enough and the temperature sampling rate of the sensor is sufficient for the firing rate of the heater arrays. (Ex. 2003 ¶48; Ex. 1001 col. 6, ln 58 – col. 7, ln 16.) However, that temperature may differ from the temperature of other regions of the chip because the ink vias act as thermal insulators. (*Id.* col. 6 lns 64-67.) Regulating the temperature of a heater chip by regions as defined by ink vias allows for each region to be regulated at its optimal operating temperature using a simplified design. (Ex. 2003 ¶48.)

B. The Asserted Prior Art

1. U.S. Patent No. 7,384,113 to Benjamin *et al.* (Ex. 1004)

U.S. Patent No. 7,384,113 to Benjamin *et al.* (“Benjamin”) discloses a “printhead die 40 that ejects drops of ink through a plurality of orifices or nozzles 34 toward a print medium 36.” (Ex. 1004 col. 3 lns 32-36.) Figs. 25A and 25B of Benjamin illustrate contact areas of a flex circuit that couples external circuitry to a printhead die, and the “[t]emperature sense resistor contact area TSR allows a printer coupled to an ink jet cartridge to determine a temperature of the printhead die, based upon a measurement of the resistor” and “[a] temperature sense resistor return contact area TSR-RT provides a return path for signals provided at temperature sense resistor contact area TSR.” (Ex. 1004 col. 3 lns 1-3 and col. 79 lns 29-35 and 60-65; Ex. 2003 ¶61.) There is no indication as to where this temperature sense resistor is positioned on the printhead die itself. (Ex. 2003 ¶61.) It is clear that the die includes only a single temperature sense resistor connected to a single contact area (TSR) [dark green] and a single return contact area (TSR-RT) [light green] of the flex circuit as shown below in both of the embodiments shown in Figs. 25A and 25B.



(*Id.*; Ex. 1004 Figs. 25A-25B and col. 79 lns 60-65.) Benjamin teaches that the temperature sense resistor determines “a temperature” of the “printhead die,” not temperatures of individual regions of the die. (Ex. 2003 ¶61; Ex. 1004 col. 79 lns 60-63.) Benjamin teaches nothing about where the temperature sensor is located on the semiconductor chip, nor does it indicate that the temperature sensor detects a specific region of the die rather than a temperature of the die as a whole. (Ex. 2003 ¶62; Ex. 1002 ¶179; Ex. 2004 31:19-23.)

2. U.S. Patent No. 6,612,673 to Giere *et al.* (Ex. 1005)

U.S. Patent No. 6,612,673 to Giere *et al.* (“Giere ’673”) discloses a system including a controller that receives print data to predict thermal conditions of a subset of ink ejection chambers for selectively operating the corresponding heating elements of the subset. (Ex. 1005 Abstract; Ex. 2003 ¶63.) A fundamental aspect of the disclosed temperature controller is that it is coupled to multiple temperature

sensors in order to determine a mean or average temperature of the printhead substrate as well as local temperature profiles near designated ink ejection elements. (Ex. 2003 ¶¶66; Ex. 1005 col. 2 lns 57-62.)

Fig. 5 below shows a thermal sense resistor 510 [light green], a digital temperature sensor 512 [dark green], and multiple temperature recorders 542, 544, and 546 [pink] spread across the substrate.

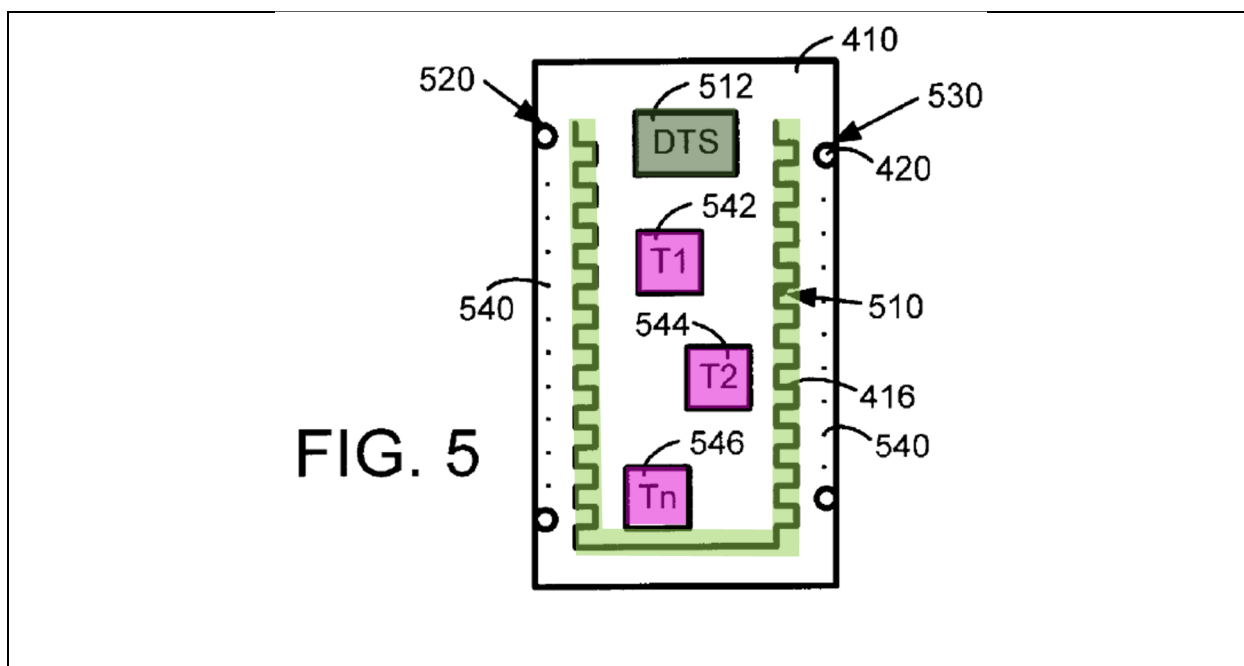


Fig. 5 shows all of the temperature sensing elements between two columns (520, 530) of nozzles 420, some of which are presented as dots (540) for simplicity. The temperature recorders [pink] are distributed around the substrate and each measure local current temperatures and store the measurements as temperature histories, and are averaged to generate a mean average temperature of the substrate. (Ex. 1005 col. 5 lns 28-31 and col. 6 lns 35-40.)

The system uses inputs from these multiple temperature sensors to predict thermal conditions of a subset of the ink ejection elements, and to establish operating conditions so that the corresponding heating elements operate at an optimal temperature. (Ex. 2003 ¶67; Ex. 1005 col. 6 lns 5-8, col. 5 lns 28-31, col. 6 lns 35-40.) A firing history of a plurality of subsets of ink ejection elements may also be maintained, so that when an average temperature of the printhead assembly is sensed, the firing history and the average temperature are processed to determine estimated temperatures of certain ones of the subset in order to set optimal temperature conditions for specific ink ejection elements. (Ex. 2003 ¶67; Ex. 1005 col. 6 lns 10-18.)

The disclosed temperature sensing system provides for storing 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.)

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] with overlying nozzles 420 as shown in the figures below.

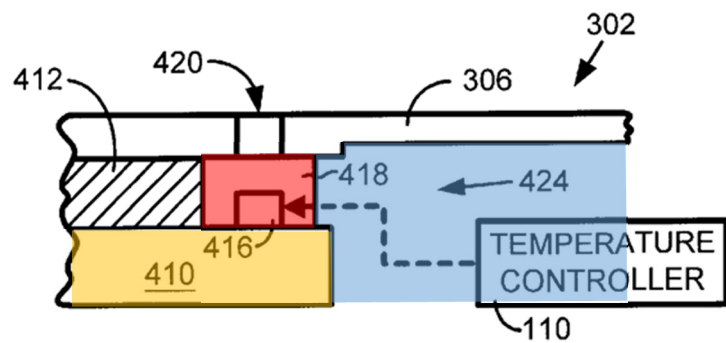


FIG. 4

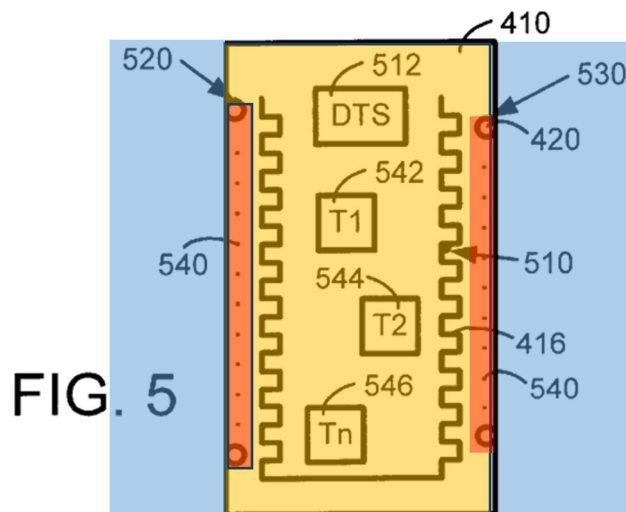


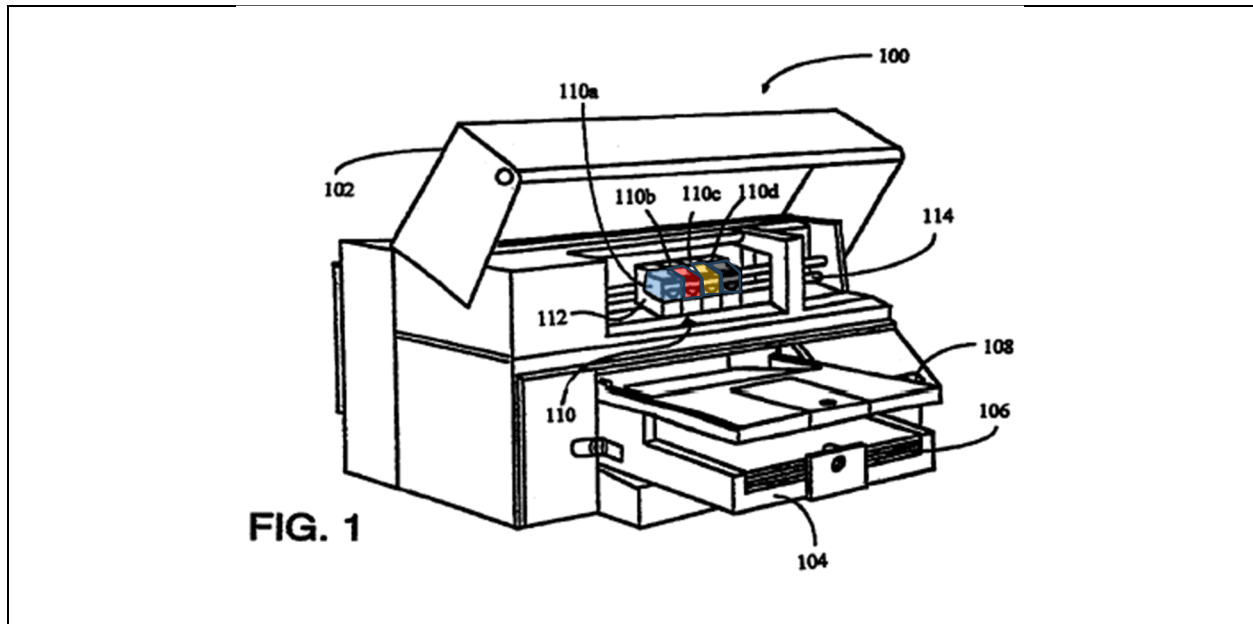
FIG. 5

(Ex. 2003 ¶65; Ex. 1005 col. 5 lns 42-45.) Therefore, Giere '673 teaches nothing about where to place temperature sensors in the type of printhead relevant to the challenged '708 patent claims, i.e., one having a plurality of ink vias with heaters arrays on both sides of the vias. (Ex. 2003 ¶65.) The u-shaped TSR 510 of Giere '673 is designed to sense the temperature of the substrate as a whole, and is positioned between two arrays of heaters only because those heaters are located at the edge of the chip in an edge feed design. (*Id.*)

Giere '673 also does not provide any teachings suggesting that placement of a single temperature sensor between two heater arrays could permit accurately sensing a temperature representative of both adjacent heater arrays. (Ex. 2003 ¶65.) The presence of additional temperature sensor 512 and temperature recorders 542, 544, and 546 to detect localized temperatures suggest that the temperature in the region is not uniform such that the temperature measured by the u-shaped TSR 510 is not representative of the adjacent heater arrays. (*Id.* ¶67.)

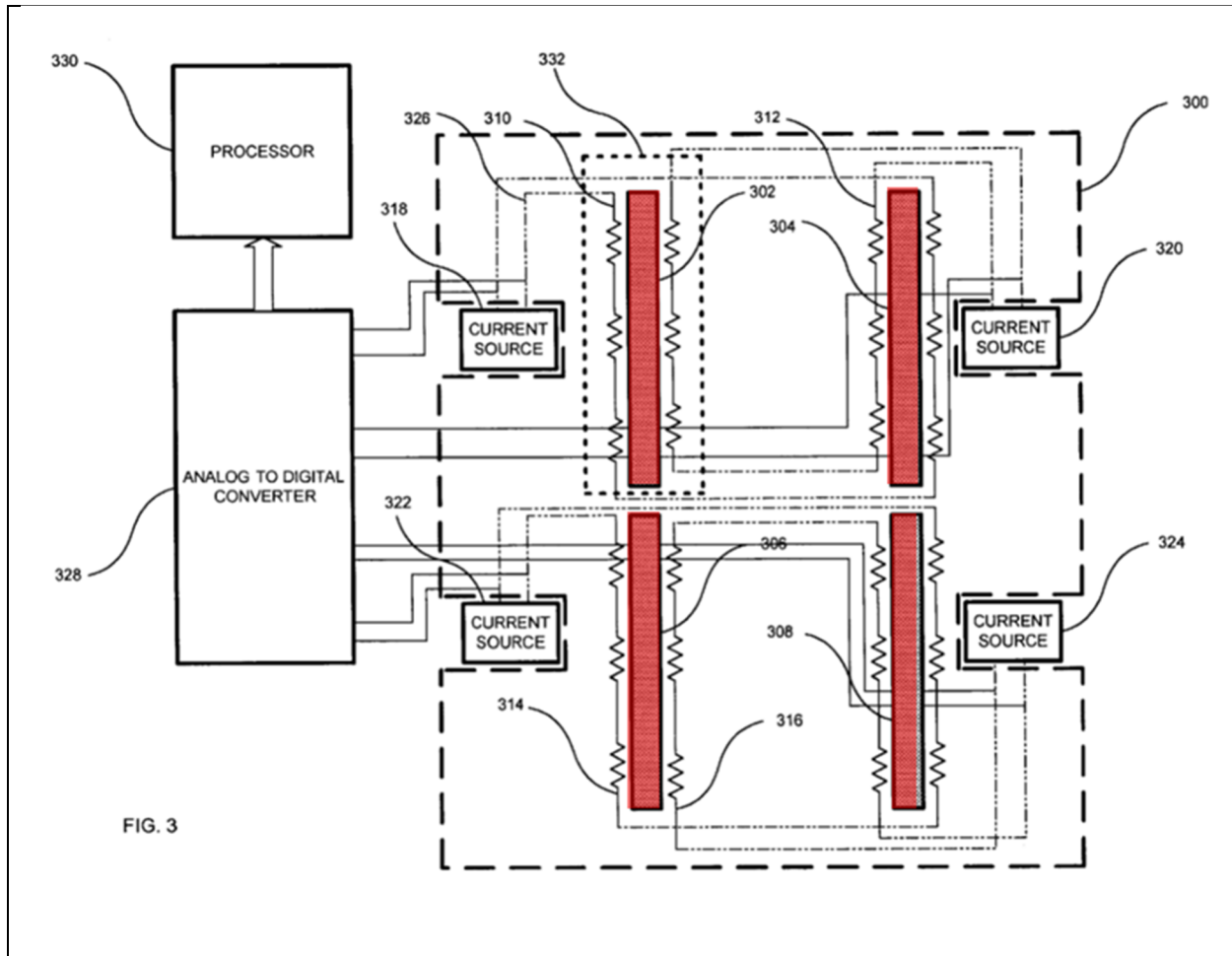
3. U.S. Patent No. 6,565,178 to Giere *et al.* (Ex. 1007)

U.S. Patent No. 6,565,178 to Giere *et al.* ("Giere '178) discloses a printer with multiple cartridges 110a (cyan cartridge) [blue], 110b (magenta cartridge) [red], 110c (yellow cartridge) [yellow], and 110d (black cartridge) [gray], as shown in the color annotated figure below



(Ex. 2003 ¶68; Ex. 1007 Fig. 1 and col. 7 lns 1-17.) Each cartridge contains its own print head that implements parts of the temperature measurement system described by Giere '178. (Ex. 2003 ¶68; Ex. 1007 col. 7 lns 13-17.)

Fig. 3 of Giere '178 annotated below is a “high level schematic diagram” of a temperature measurement system for one of the printheads from the cartridge above. (Ex. 1007 col. 8 lns 41-43; Ex. 2003 ¶69.)



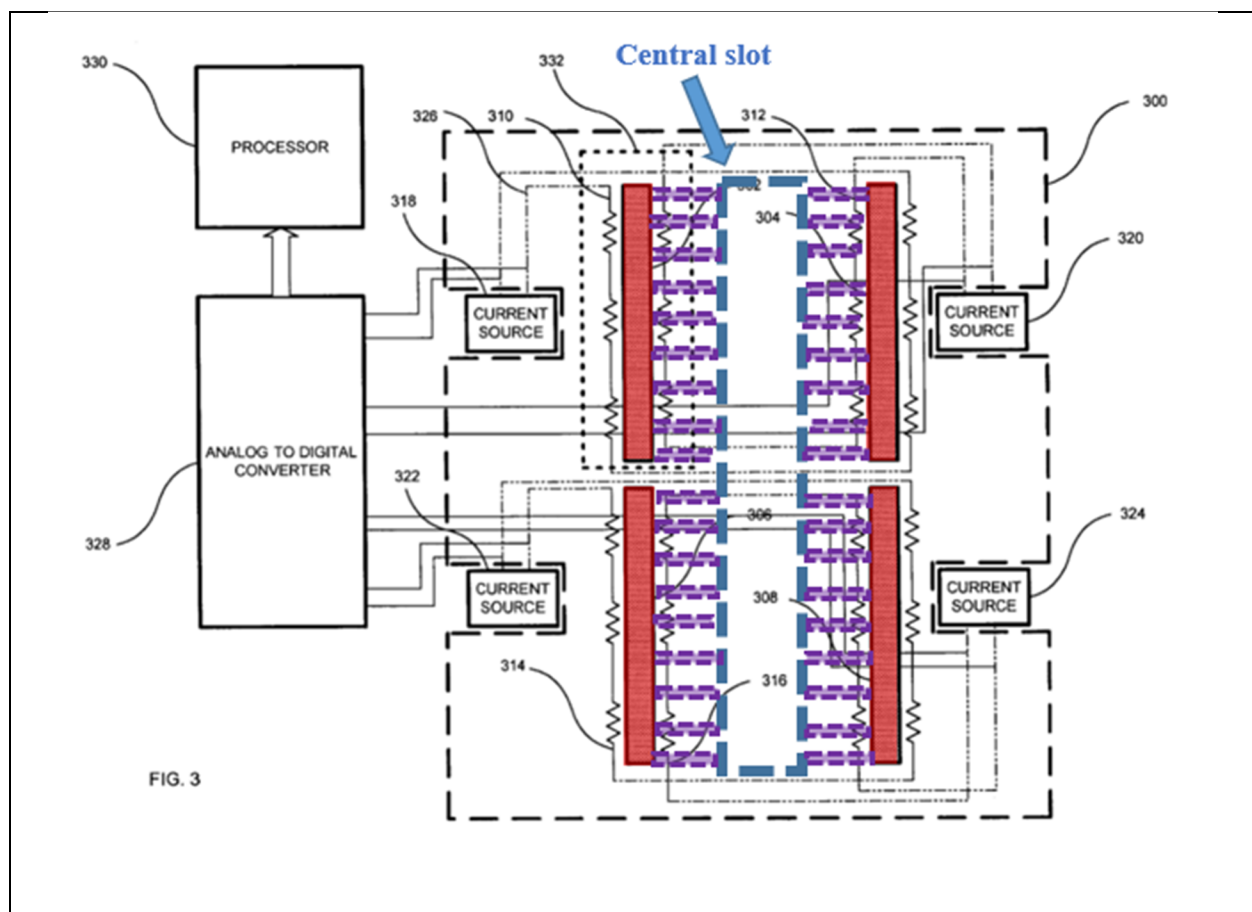
Giere '178 states that “although not shown in Fig. 3 for ease of illustration, substrate 300 includes the structures of a typical printhead such as, ink feed slots, ink ejection chambers, firing resistors, etc.” Particularly, “regions 302, 304, 306, and 308 [red above] each include an array of nozzles and associated firing resistors for ejecting ink.” (Ex. 1007. col. 8, lns 47-49; Ex. 2003 ¶69.) An ink via is not shown in the substrate of Fig. 3; however, the specification 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.) Further, “[i]n 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.” (Ex. 1007 col. 3 lns 40-45; Ex. 2003 ¶69.) At the time that the ’708 patent was filed, those were the two common options for feeding ink to the types of ink jet devices shown in the ’708 patent and Giere ’178, and Giere does not indicate any other potential placement of ink feed regions from a reservoir to the heater chip. (Ex. 2003 ¶69.) Giere ’178 does not at any point describe ink vias or ejection actuators on opposite sides of an ink via within each of the rectangular regions 302, 304, 306, and 308. (*Id.*)

Fig. 3 of Giere ’178 is characterized as a “high level schematic diagram” (Ex. 2003 ¶70; Ex. 1007 col. 8 lns 41-43), and appears to be intended to convey information regarding electrical connections of TSRs positioned adjacent both sides of groups of heaters. Fig. 3 would not be seen by a PHOSITA as conveying details regarding the ink supply structures that deviate from the two options described in the written description, summarized above. (Ex. 2003 ¶71.)

A blue rectangle has been added to Fig. 3 below to illustrate a “central slot” in substrate 300 between the column of nozzles and ink ejection actuators on the left (regions 302 and 306) and the column of nozzles and ink ejection actuators on the

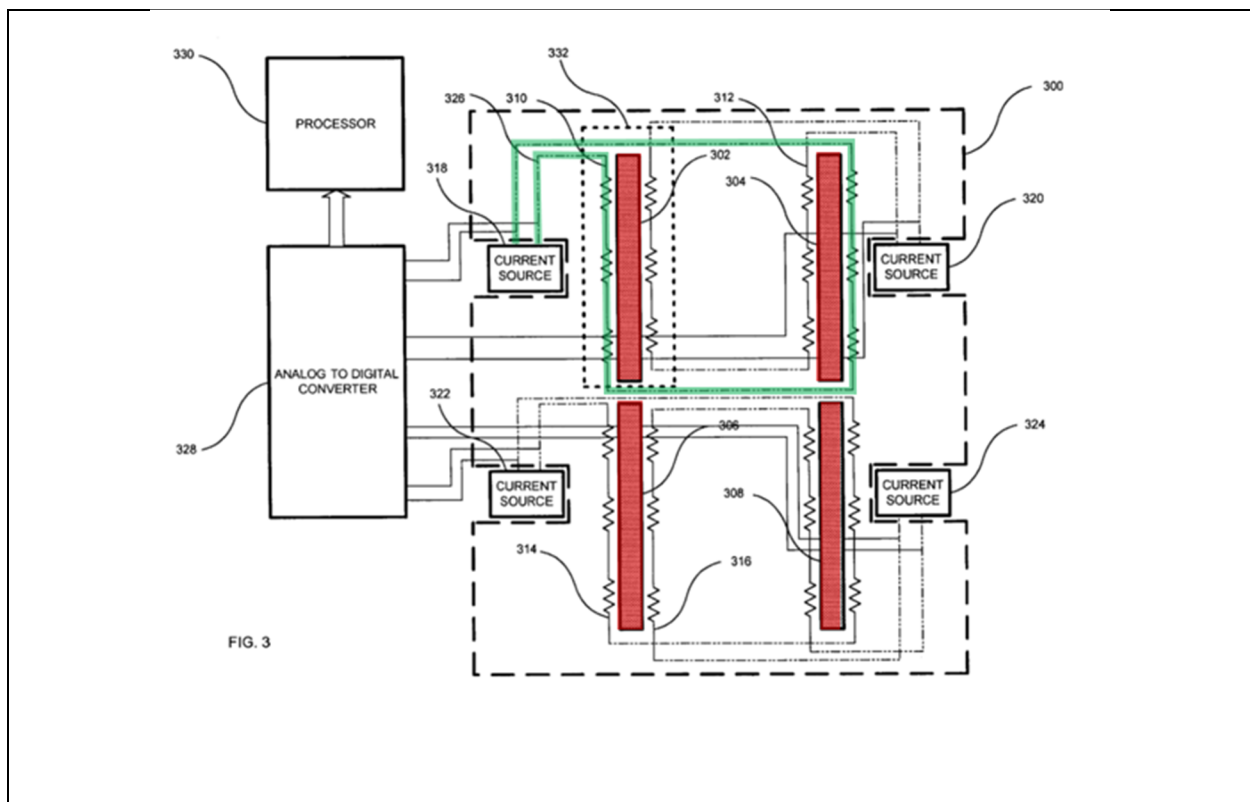
right (regions 304 and 308). (Ex. 2003 ¶71.) Channels that allow ink to flow from this slot [blue outline] to chambers associated with heaters of the heater arrays [red] have been added in purple below. While Fig. 3 is a view from above, Giere '178 describes the channels as extending from a central manifold area formed in a barrier layer between the substrate and a nozzle plate to supply ink to the various ink ejection chambers. (Ex. 2003 ¶71; Ex. 1007 col. 3 lns 40-45.)



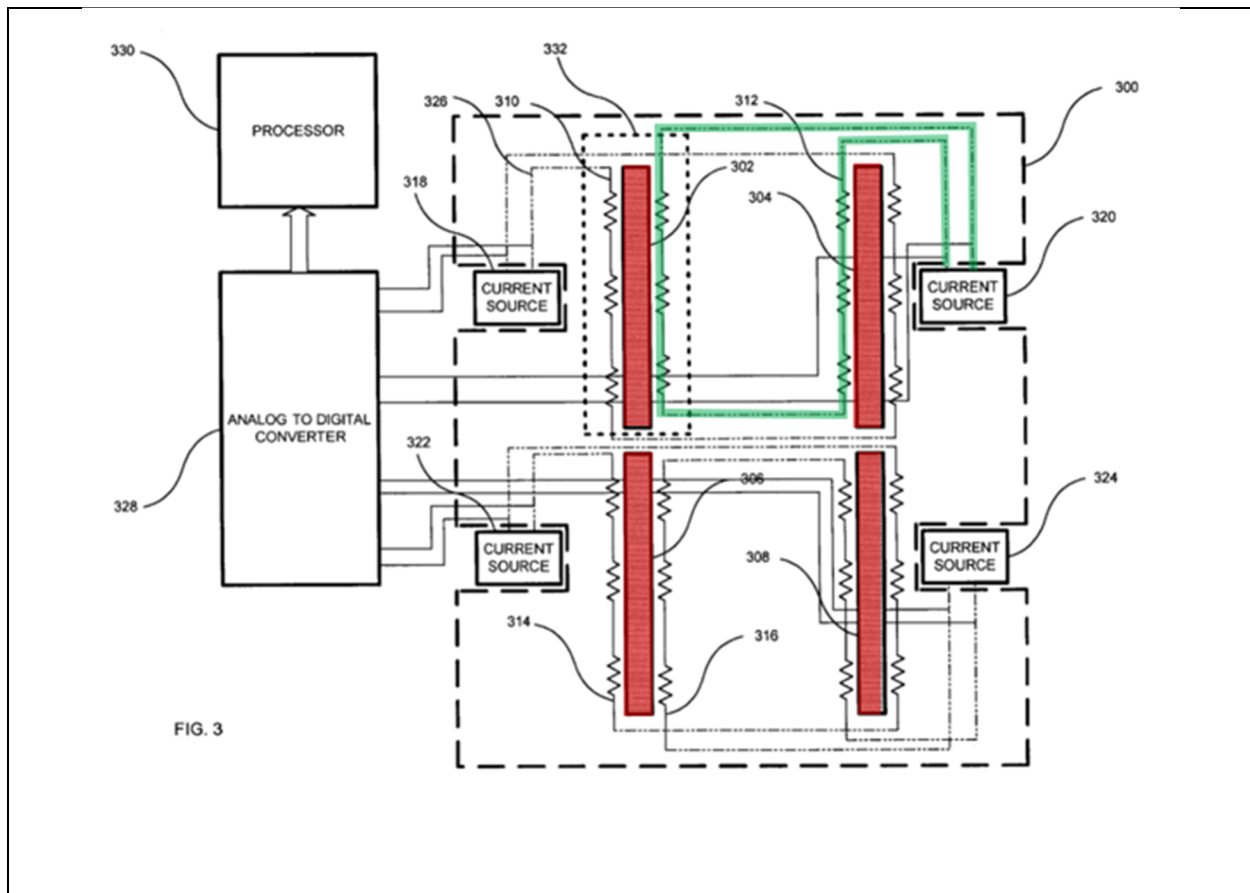
Unlike the '708 patent, Giere '178 does not disclose a printhead substrate having multiple vias, nor does it suggest implementing a single temperature sensing element in a region between two parallel ink vias. (Ex. 2003 ¶73.) It certainly does not disclose or suggest using such a single temperature sense element to measure a

temperature that is representative of the temperature of heater arrays adjacent two such ink vias. (Ex. 2003 ¶73.)

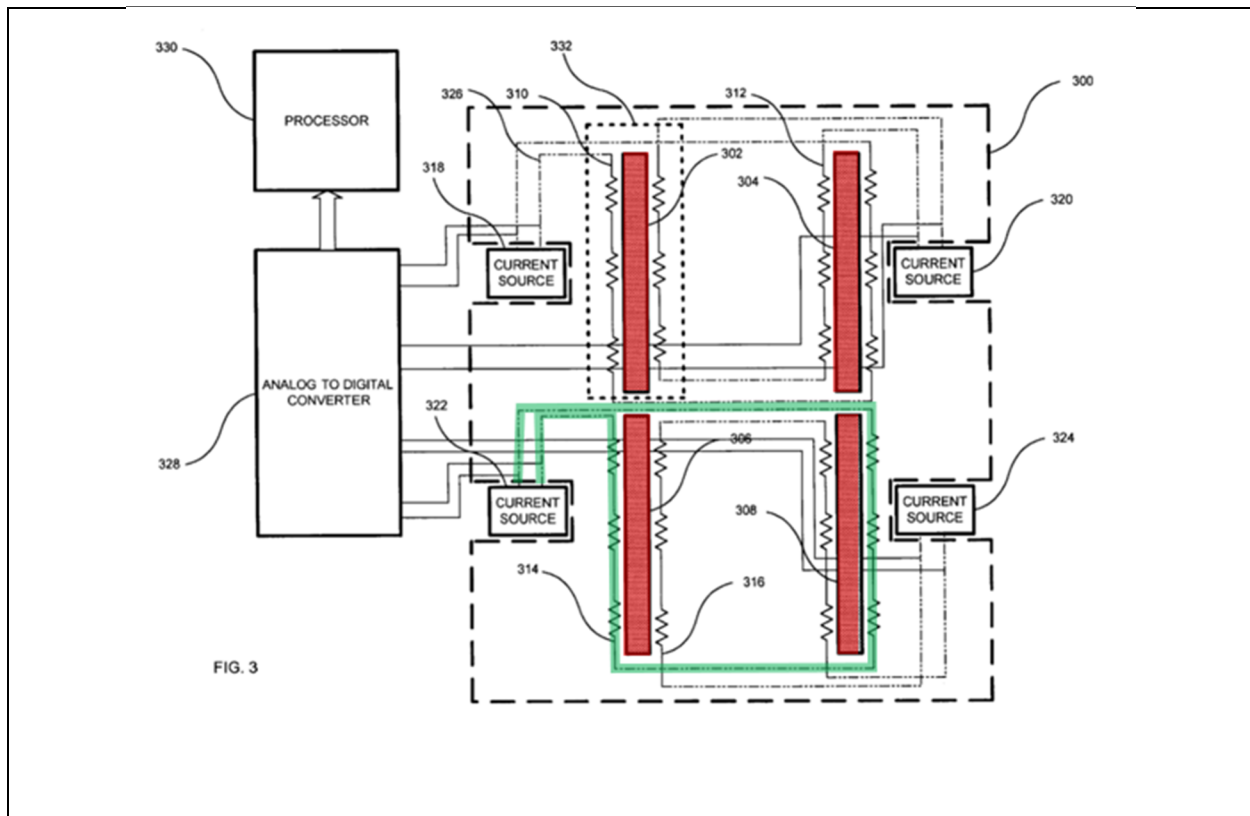
Instead, Giere '178 includes 4 temperature sensors comprising resistive elements 310, 312, 314, and 316 positioned along electrical traces formed in a loop. Ex. 2003 ¶72.) . First, temperature sensor 310 [green below] is positioned along outside edges of the upper arrays of heating elements in regions 302/304:



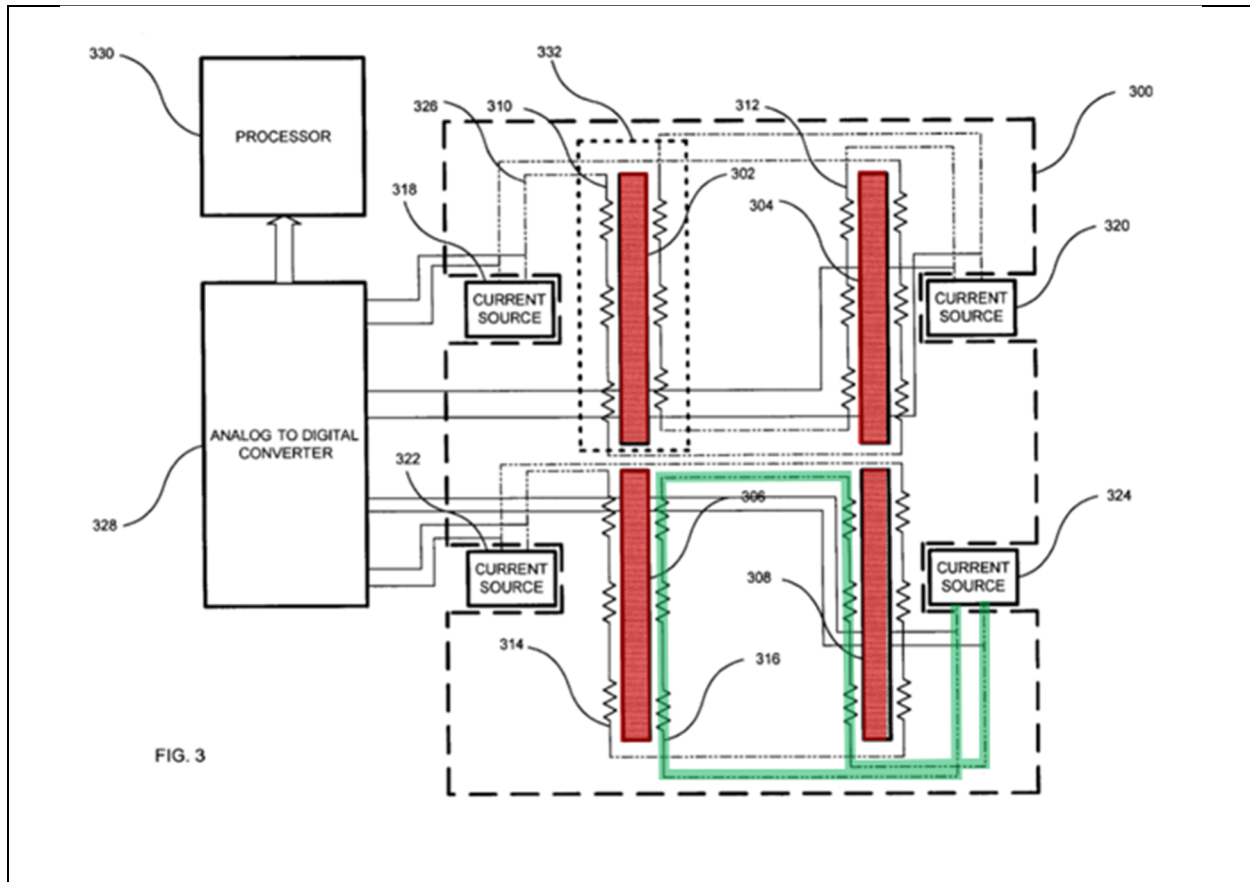
Second, temperature sensor 312 [green below] is positioned along inside edges of the upper arrays of heating elements in regions 302/304:



Third, temperature sensor 314 [green below] is positioned along outside edges of the lower arrays of heating elements in regions 306/308:



Finally, temperature sensor 316 [green below] is positioned along inside edges of the lower arrays of heating elements in regions 306/308:



(Ex. 2003 ¶72.)

A PHOSITA would understand that Giere '178 does not disclose a printhead with multiple adjacent ink vias having heater arrays along the two longitudinal sides of each via. (Ex. 2003 ¶73-74.) Giere '178 also does not teach any solution to the problems associated with measuring temperatures representative of the heater arrays in such a printhead design. (Ex. 2003 ¶73) Giere 178's design is directed to sensing temperature along each side of multiple ink ejector heater arrays that are supplied with ink by channels extending from a single central ink via or an edge feed ink supply mechanism. (*Id.*) Giere '178's temperature sensing circuitry is adaptable to

either of those two specific ink supply approaches. (*Id.*) One pair of TSRs detects temperature on a side of the upper or lower heater array opposite the ink feed (312 and 316 in the case of edge feed or 310 and 314 in the case of a center feed), while the other two TSRs would detect the temperature of the side of the heater array closest to the ink feed. (*Id.*)

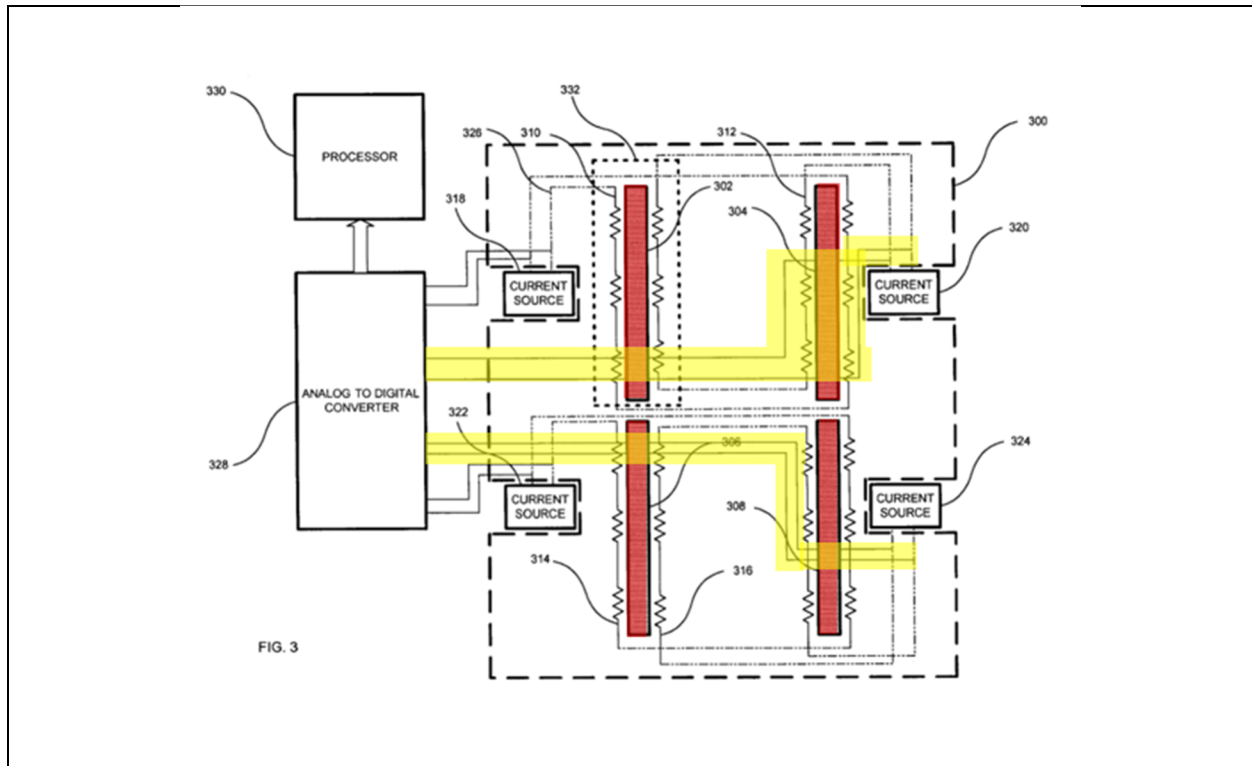
Petitioners are incorrect in arguing that the rectangular boxes 302, 304, 306, and 308 in Giere '178 would have been understood by a PHOSITA to include not only heaters and nozzles, but also ink vias. (*See, e.g.*, Pet. pp. 49-52; Ex. 1002 ¶ 272; Ex. 2003 ¶¶74-78.) There is nothing in Giere '178 to support that interpretation. (Ex. 2003 ¶74.) Giere '178 states only that “regions 302, 304, 306, and 308 each include **an array of nozzles and associated firing resistors** for ejecting ink” without mentioning ink vias. (*Id.*; Ex.1007 at 8:47-49, emphasis added.) This is consistent with the rest of Giere '178's disclosure describing either a center feed design, with ink flowing through a central slot in the substrate and then through channels extending from a central manifold area formed in an adjacent barrier layer, or an edge feed design with ink flowing through channels extending from the edge. (Ex. 2003 ¶74.; Ex. 1007 col. 3 lns 34-50.) Neither of those ink supply approaches, which are the only approaches described in Giere '178, would include a separate via for each of the four rectangular regions 302, 304, 306, and 308. (Ex. 2003 ¶74.)

Despite the limited disclosure of Giere '178, Petitioners have tried to bolster their erroneous reading of the reference in several ways. At his deposition, their expert Dr. Pond asserted that the phrase “for ejecting ink” in the sentence “Regions 302, 304, 306, and 308 each include an array of nozzles and associated firing resistors for ejecting ink” (see Ex. 1007 col. 8 lns 47-49) would be understood to infer that all of the structures required for ejecting ink would be located within those rectangular regions. (Ex. 2004 44:16 - 46:23.) However, as Mr. Dietl establishes, there are many structures required for ejecting ink, including power sources, ground lines, and drive transistors, none of which would reasonably be seen as indicated by a simple rectangular box. (Ex. 2003 ¶75.) Furthermore, contrary to Dr. Pond’s characterization, a PHOSITA would recognize that an ink via is not a structure “for ejecting ink,” and is instead a structure for allowing ink to flow from an ink reservoir through the substrate and into an ink distribution system. (*Id.*) In other words, an ink via is no more necessary for ejecting ink than any other portion of the printhead. As discussed above, the only ink via contemplated by Giere '178 is a central via that supplies ink to a central manifold from where it is directed by channels to the ink ejection chambers. (*Id.*)

Dr. Pond has also asserted that a central ink via would not be possible in Fig. 3 because portions of the TSRs are shown as crossing the central area of the chip. (Ex. 2004 131:4 – 132:2.) However, Giere '178 describes the center feed design as

including an “elongated hole formed in the center of the bottom of the substrate.” (Ex. 1007 col. 3 lns 37-39.) In the chip electrical schematic depicted in Fig. 3, there are two central areas between the regions 302, 304, 306, 308 where such an elongated hole can be located without interfering with the TSR traces identified by Dr. Pond. (Ex. 2003 ¶77.) Giere ‘178 describes that 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 the nozzle member, then into a plurality of ink channels, and finally into the various ink ejection chambers.” (Ex. 1007 col 3 lns 40-45.) Such a central manifold in an adjacent barrier layer can function to distribute ink over the region of the substrate containing the TSR traces identified by Dr. Pond.

For at least those reasons, a PHOSITA would not view Fig. 3 as being in any way inconsistent with the center feed design described in Giere ‘178. (Ex. 2003 ¶77.) Indeed, Dr. Pond’s interpretation of ink vias being located within rectangular regions 302, 304, 306, 308 encounters the same issue. (Ex. 2003 ¶78.) As shown below, connections from the analog to digital converter 328 [highlighted in yellow] are shown as traversing rectangular regions 302, 304, 306, and 308 [red] where Dr. Pond asserts that vias would be located:



(Fig. 1007 Fig. 3.)

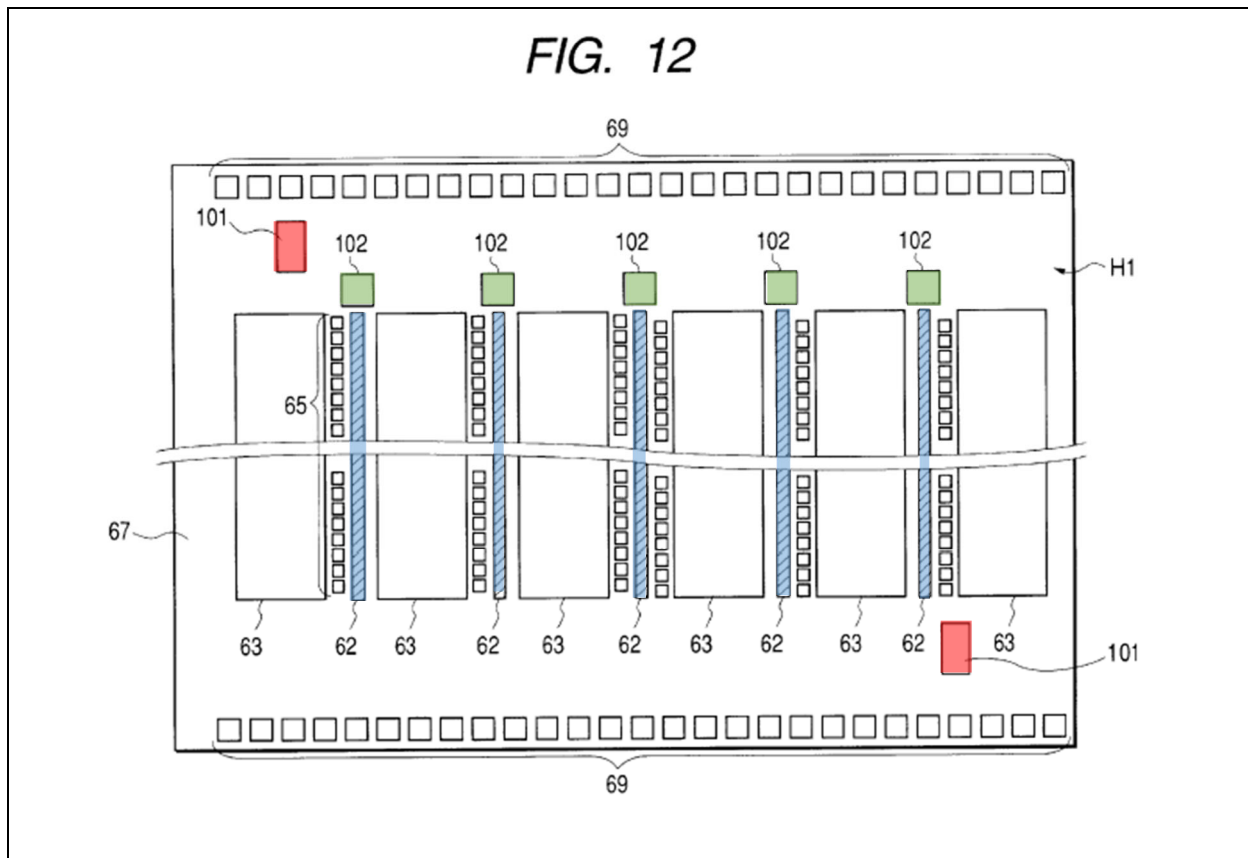
At his deposition, Dr. Pond has also attempted to justify his mistaken reading of Giere '178 by indicating that the rectangular regions would have called to mind earlier printhead designs not cited in his declaration or the Petition. However, one of ordinary skill in the art would not have consulted other unrelated documents when Giere '178 clearly describes the two options for ink feed positions (center feed and edge feed) applicable to the disclosed printhead chip, and provides no indication that the substrate illustrated in Fig. 3 has an entirely different structure involving separate ink vias in each of the ejector array regions. (Ex. 2003 ¶78.) In fact, Fig. 1 of Giere '178 illustrates providing a separate cartridge for each color of ink. (Ex. 1007 Fig. 1 and col. 7 lns 3-12; Ex. 2003 ¶78.) This is consistent with designs represented by

Fig. 3 of Giere '178 where each semiconductor chip contains only two columns of heaters (which may be separated into upper and lower halves or other groupings) for ejecting one color of ink supplied by either a central feed system or an edge feed system. (*Id.*)

4. U.S. Patent No. 6,527,367 to Yabe (Ex. 1008)

In Yabe, temperature detectors are placed to detect the temperature of the substrate as a whole, and one or more “sub-heater” devices other than ink ejection actuators are provided to heat the substrate. (Ex. 1008 col. 14 lns 27-54; Ex. 2003 ¶79.) Specifically, there are “temperature detecting means for detecting the temperature of the heater board, and the heat generating resistive elements (sub-heaters) serving as means for heating the base plate in order to control temperature to make the temperature distribution of the heater board uniform in accordance with the detection result of the temperature detecting means.” (*Id.* col. 14 lns 29-37; Ex. 2003 ¶79.)

In Fig. 12, Yabe discloses a substrate with multiple temperature detecting means 102 [green below], but “each of the temperature detecting means 102 is arranged only on one side in the vicinity of each end portion of the ink supply ports 105 [blue].” (Ex. 1008 col.15 lns 51-61.)



This arrangement is provided in order to “detect the temperature of the heater board H1.” (*Id.* col. 15 lns 61-64.) There is no suggestion in Yabe to position the temperature sensors between arrays of heaters or between ink supply ports [ink vias], such as in the areas occupied by driving circuits 63. Two sub-heaters 101 [red] are provided in order to keep temperature as uniform as possible. (*Id.* col. 15 lns 36-44.)

Alternatively, in Fig. 14 only one temperature detecting means 102 is arranged in the vicinity of one end of a central ink supply port because the size of the “base plate” is smaller than in Fig. 12. (*Id.* col. 16 lns 35-44.)

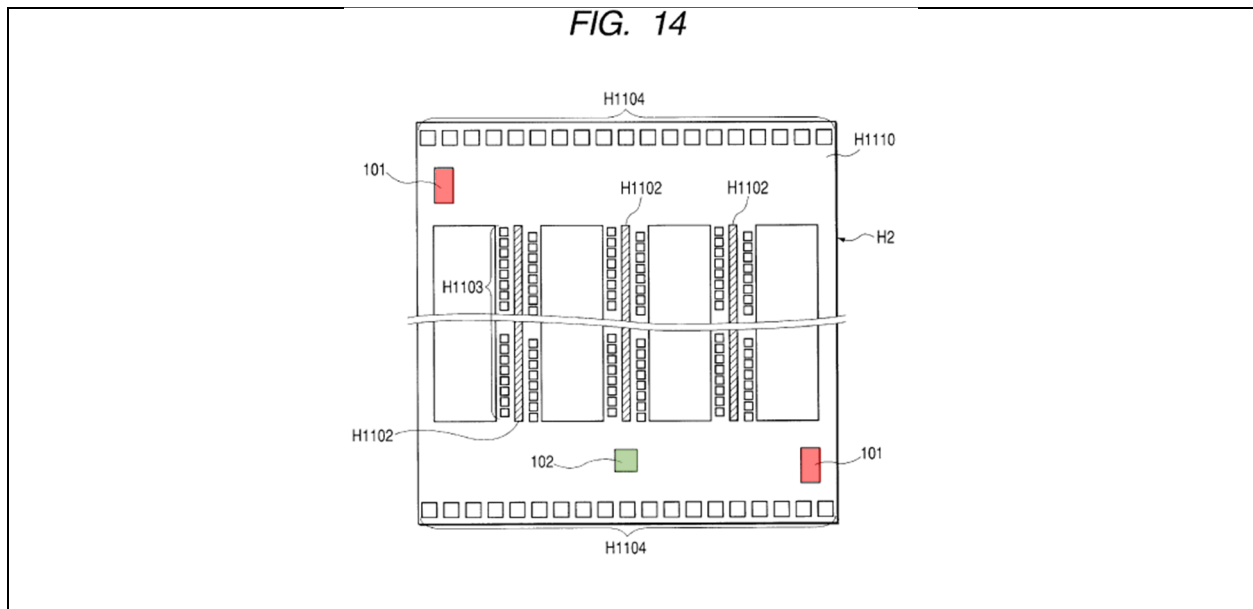
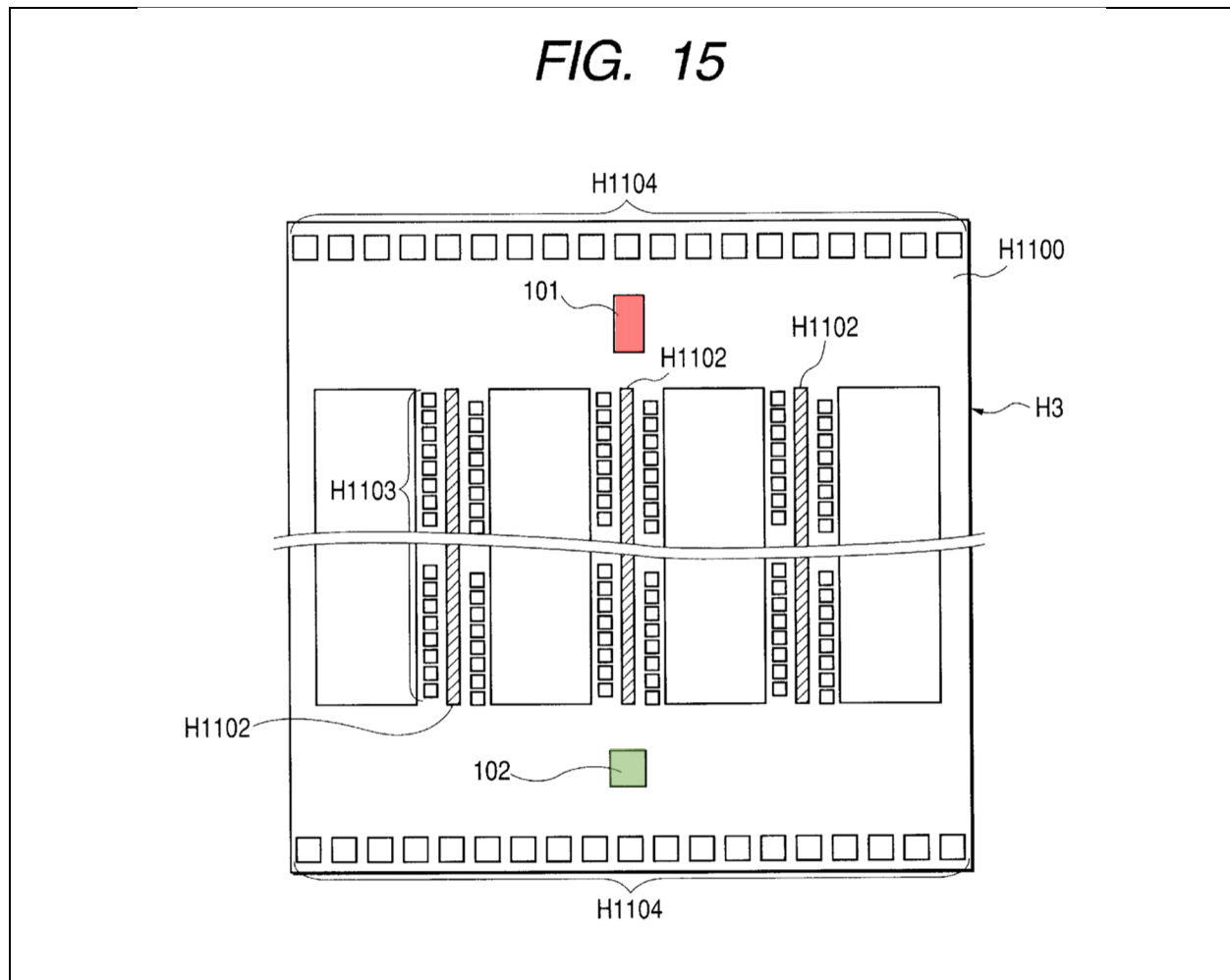


Fig. 15, meanwhile, shows only one temperature detector 102 [green] and sub-heater [red]. (*Id.* col. 17 lns 33-36.)



III. THE PERSON OF ORDINARY SKILL IN THE ART

Petitioners contend that a person of ordinary skill in the art (“PHOSITA”) at the time of the priority date of the ’708 patent would have had at least a bachelor’s level college degree in Mechanical Engineering, Materials Science, Physics, Electrical Engineering, or a related field, and at least two years of training or experience in the design of inkjet printheads. (Pet. at 6). Slingshot does not dispute this characterization of the level of ordinary skill in the art for the purpose of this

Preliminary Response, except that it disagrees that a degree in Materials Science is sufficient. (Ex. 2003 ¶¶32-34.)

IV. CLAIM CONSTRUCTION

Petitioners propose to construe the term “adjacent” to mean “next to and can include” in the context of claims 1 and 9. Patent Owner does not agree with this construction and contends that “adjacent” carries its plain and ordinary meaning throughout the claims.

According to Petitioners, claims 1 and 9 recite a region that is both disposed “adjacent each heater array” and also “includes two heater arrays.” (Pet. at 7.) But Petitioners parse the claims incorrectly, ellipting out additional words that clarify the structure being described. Claim 1 recites a plurality of parallel ink vias with heater arrays on each longitudinal side of the ink vias. The claim then recites “a region disposed adjacent each heater array” and that a “region is disposed between two adjacent ink vias.” A PHOSITA would readily understand that this reflects the layouts shown in Figures 4 and 5, in which there is a region disposed adjacent pair of heater arrays (such as 432, 434 and 436 in Fig. 4) which is part of a broader region disposed between two adjacent ink vias. Per the claim language, it is the broader “region *disposed between two adjacent ink vias* [that] includes two heater arrays.” Claim 9 describes essentially the same structure in the context of a method of fabricating a printing chip. (Ex. 2003 ¶59.)

Thus, the claims do not say that the region disposed adjacent two heater arrays also includes the two heater arrays. The 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. Accordingly, Petitioners' proposed construction of "adjacent" to mean "next to and can include" is not necessary to a proper understanding of the scope and meaning of claims 1 and 9. The proposed construction does not reflect the ordinary meaning of "adjacent" and is not supported by a proper reading of the claims or specification of the '708 patent.

The proposed construction should be rejected for the additional reason that the term "adjacent" appears six times in claim 1 and five times in claim 9. Petitioners focus solely on the usage of "adjacent" in the phrase "a region disposed adjacent each heater array" of claim 1 and the phrase "a region adjacent each heater array" of claim 9. Petitioners have not shown that their nonconventional construction would be appropriate for any other claim limitations reciting "adjacent," and, indeed, it would potentially distort those limitations in unintended ways. Therefore, any consideration given to Petitioners' construction of "adjacent" should be limited to construing the meaning of those two phrases as a whole and not the word "adjacent" per se.

While not mentioned in the Petition, Dr. Pond's Declaration also states that he has been advised that the term "ink via" was construed with regard to another

patent to mean “[a] path to fluidly connect [a] supply of ink to one or more heaters,” and that he has applied that analysis to the prior art. (Ex. 1002 ¶20.) However, as Mr. Dietl notes, “ink via” has a more particular meaning in the thermal ink jet printing industry, and refers to an ink passage in or through the substrate of the heater chip. (Ex. 2003 ¶56.) An ink via in the context of a printhead is not just any path that connects an ink supply to the heaters, but a passage in the chip itself. This is clear from the claim language of the ’708 patent, which recites a “chip for use with a printing device” that comprises “a plurality of ink vias.” (*Id.*; Ex. 1001 col. 8 lns 23-24 and col. 8 lns 59-61.) The specification of the ’708 patent also states that ink is supplied through one or more ink vias “in the chip” (Ex. 1001 col. 1 lns 23-24) and contains other discussion indicating that multiple vias are within the boundary of the heater chip. (Ex. 1001 col. 2 lns 58-62 and col. 4 ln 66 – col. 5 ln 2.) Dr. Pond agreed in his deposition that the term “via” allows ink to be fed from some depth below the surface of a heater chip in the type of device shown in the ’708 patent. (Ex. 2004 10:8 – 11:19.)

V. LEGAL STANDARDS

A. Anticipation

“[R]ejections under 35 U.S.C. § 102 are proper only when the claimed subject matter is identically disclosed or described in ‘the prior art. . . .’ The [prior art] reference must clearly and unequivocally disclose the claimed [invention] or direct

those skilled in the art to the [invention] without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference.” *In re Arkley*, 455 F.2d 586, 587 (CCPA 1972). Thus, “unless a reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations arranged or combined in the same way as recited in the claim, it cannot be said to prove prior invention of the thing claimed and, thus, cannot anticipate under 35 U.S.C. § 102.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008).

“To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991) (citing *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981)). “Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient.” *Id.* at 1268–69 (quoting *Hansgirk v. Kemmer*, 102 F.2d 212, 214 (CCPA 1939)).

B. Obviousness

Petitioners' obviousness grounds are not supported by the required § 103 analysis. Petitioners must prove that the claimed subject matter would have been obvious to a PHOSITA at the time of the invention. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). A complete analysis requires that the Board determine (1) the scope and content of the prior art, (2) differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) relevant objective indicia of non-obviousness (also known as secondary considerations). *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966).

An invention “composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. Rather, Petitioners must show, but do not, that a PHOSITA would have been motivated to pick out the asserted multiple references and combine them in a way the claimed invention does. *Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993–94 (Fed. Cir. 2017). This showing must be made without any “hint of hindsight,” *Star Scientific, Inc. v. R.J. Reynolds Tobacco Co.*, 655 F.3d 1364, 1375 (Fed. Cir. 2011), so as to avoid “reconstruction by using the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.” *In re NTP, Inc.*, 654 F.3d 1279, 1299 (Fed. Cir. 2011) (internal citations omitted). A

challenger cannot, as Petitioners do here, pick and choose among individual parts of assorted prior art references as a mosaic to recreate a facsimile of the claimed invention. *Akzo N.V. v. United States ITC*, 808 F.2d 1471, 1481 (Fed. Cir. 1986).

The test for obviousness is what the combined teachings of the references would have suggested to a PHOSITA. *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991). Each reference must be evaluated in its entirety. *In re Evanega*, 829 F.2d 1110, 1112 (Fed. Cir. 1987). A reference must be considered for all that it teaches, including disclosures that teach away from the invention at hand. *In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988). A reference teaches away when a skilled artisan would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path taken by the inventor. *Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH*, 139 F.3d 877, 885 (Fed. Cir. 1998).

If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984). Similarly, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to support a theory of obviousness. *In re Ratti*, 270 F.2d 810, 813 (CCPA 1959).

Petitioners must support their obviousness contentions with articulated reasoning and based on rational, factual underpinnings; conclusory statements of obviousness will not suffice. *KSR*, 550 U.S. at 418; *In re NuVasive*, 842 F.3d 1376, 1382–83 (Fed. Cir. 2016). Similarly, any expert testimony must explain in detail how specific references could be combined, which combinations of elements in specific references would yield a predictable result, and how any specific combination would operate or read on the asserted claims. *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012).

VI. THE PETITION FAILS TO ESTABLISH THAT ANY OF CLAIMS 1-3, 5-12, AND 14-15 WOULD HAVE BEEN OBVIOUS IN VIEW OF BENJAMIN IN VIEW OF GIERE '673 (GROUND 1)

Ground 1 challenges independent claims 1 and 9 and dependent claims 2-3, 5-8, 10-12, and 14-15 as obvious in view of the combination of Benjamin and Giere '673. For the reasons explained below this theory of obviousness does not withstand scrutiny, and should be rejected.

A. Ground 1 Fails Because Neither Benjamin Nor Giere '673 Suggest Monitoring of Temperatures in Regions Between Ink Vias

The Petition states that Benjamin discloses a plurality of ink vias each having a heater array disposed adjacent each longitudinal side of the ink vias, but admits that Benjamin does not disclose anything regarding where on the printhead die the temperature sense resistor (TSR) should be disposed. (Pet. pp. 13-16 and 21-22; Ex. 1002 ¶¶248-252; Ex. 2003 ¶83.) Indeed, Dr. Pond admits that Benjamin discloses

only a single TSR for the entire substrate and does not disclose anything regarding the location of that TSR. (Ex. 1002 ¶¶248-252; Ex. 2003 ¶83.) Thus, Benjamin indisputably fails to disclose a fundamental aspect of independent claim 1 – “a single temperature sensing element disposed within each region [disposed adjacent each heater array], the temperature sensing element operable to sense a temperature representative of the heater arrays adjacent to the region . . . ” – and also fails to disclose the corresponding limitation of independent claim 9.

Petitioners resort to Giere '673 for the missing single temperature sensing limitation. However, Giere '673 also fails to disclose this. Giere '673 does not relate to a printhead chip having any via at all, let alone multiple parallel vias with heater arrays on both sides of the vias. (Ex. 2003 ¶84.)

As discussed above, the temperature monitoring and control system disclosed in Giere '673 includes a temperature sense resistor 510, a digital temperature sensor 512 and multiple temperature recorders 542, 544, and 546 in the center of the chip. (Ex. 1005 at Fig. 5 and col. 4 lns 55-56, col. 5 lns 28-31, col. 6 lns 35-40.) Giere '673 relates exclusively to a system that requires inputs from these multiple temperatures sensors, 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. (Ex. 2003 ¶ 84; Ex. 1005 col. 6 lns 5-18.) The approach of Giere '673 does not at all suggest detecting or controlling

temperature of distinct regions separated by ink vias using a single temperature sensor in each region as in the '708 patent. (Ex. 2003 ¶84.)

Thus, there is simply no teaching in Benjamin or in Giere '673 that would have led a PHOSITA to implement a temperature monitoring approach for the type of substrate relevant to the '708 patent (i.e. with multiple parallel ink vias having heater arrays along each side of each via) involving a single TSR in each of multiple regions between parallel ink vias. Neither reference discloses or suggests this approach as a way to accurately measure a temperature in each region that is representative of adjacent heater arrays, and neither does their combined teachings.

Establishing obviousness requires proving the scope and content of the prior art. *Graham*, 383 U.S. at 17–18. Demonstrating that all claimed limitations are disclosed in the prior art is a threshold component of any obviousness challenge. *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) (stating that motivation to combine and reasonable expectation of success considered only “if all the elements of an invention are found in a combination of prior art references”)). Because Benjamin and Giere '673 each fail to disclose a printhead chip having a single temperature sensing element in any region disposed between the heater arrays associated with two parallel ink vias, the proposed combination of these two

references necessarily fails to render the subject matter of independent claims 1 and 9 obvious. Ground 1 must be rejected for this threshold reason.

B. Ground 1 Fails Because The Proposed Modifications To Benjamin Are Based On Hindsight-Driven Cherry Picking And Reconstruction

Unable to show that all of the claimed limitations are disclosed in the prior art as the first step of a proper obviousness theory, Petitioners resort to selecting discrete elements to conjure up a printhead that does not comport with the design or operating principles of the devices disclosed in either of the prior art references. According to the Petition, “a PHOSITA would have applied Giere ’673’s teachings to Benjamin by (i) disposing a single TSR within a region of Benjamin’s printhead formed between two adjacent heater arrays...and (ii) positioning the TSR equidistant from both heater array[s] within the region but no less than approximately 680 μm inboard from the center of the heater arrays...to ensure that the temperature value provided by the TSR reflects the mean temperature of the region.” (*Id.* p. 22.) The logical connection between the cited prior art and Petitioners’ multi-TSR approach is strained.

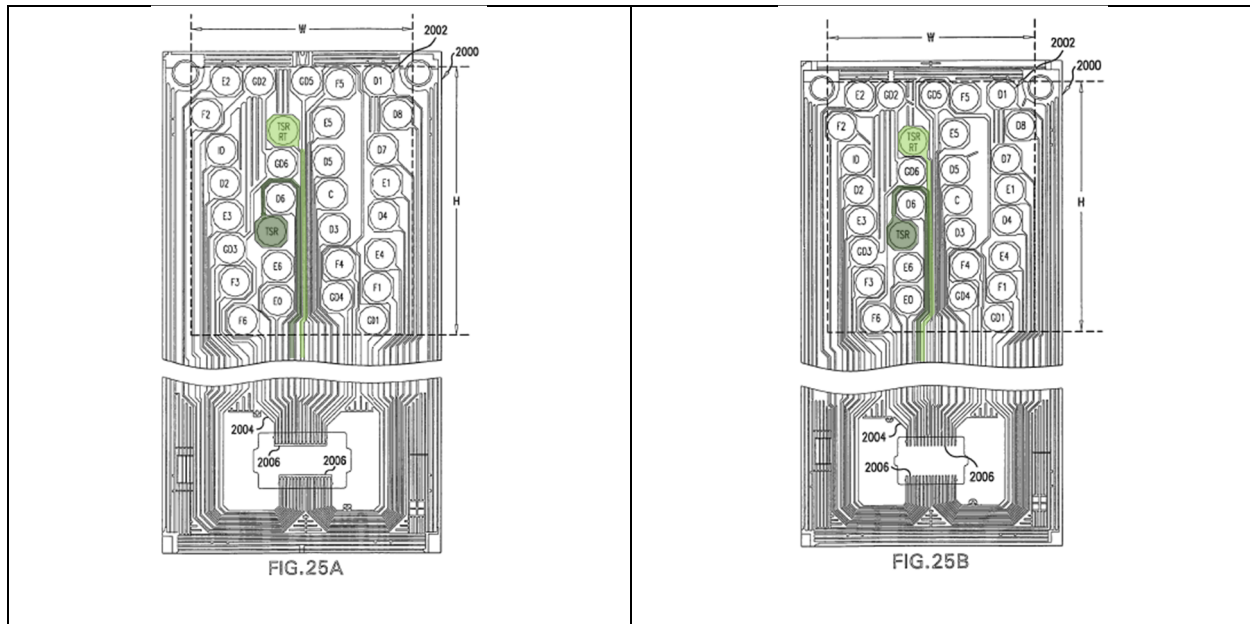
The Petition acknowledges that it is the “temperature of the entire printhead die” that Benjamin utilizes to regulate operational temperature. (Pet. p. 23, emphasis in original.) Although Benjamin itself discloses doing this using one temperature sensor, Petitioners counter-intuitively suggest that a PHOSITA would have been

motivated to modify Benjamin to achieve the same result using a far more convoluted and complex approach. According to Petitioner’s backwards reasoning, a PHOSITA would have first been motivated to place a single temperature sense resistor in one region between heater arrays in Benjamin’s printhead based on Giere ’673’s teachings due to alleged “structural similarities” (there are none) between the references. This plainly ignores that Giere ’673 never discloses measuring temperature of any region using a single temperature sensor. Equally problematic for Petitioners is that such a structure does not meet the challenged claims because the claims recite a temperature sensor in each region. And so Petitioners assert that PHOSITA would have then recognized that this “would not be an ideal location to accurately report the mean temperature of the entire printhead die” and consequently would have placed additional temperature sense resistors to measure other individual regions of the die of Benjamin. (Pet. pp. 21-24; Ex. 1002 ¶¶ 182-188.) Petitioners further assert that the PHOSITA would have used those measurements to compute an average temperature of the entire substrate. (Pet. pp. 23-24; Ex. 1002 ¶¶ 177 and 188.) But this *ex post facto* reasoning bears no relation to what a PHOSITA would have been motivated to do based on the teachings of Benjamin or Giere ’673 and without the benefit hindsight or the teachings of the ’708 patent.

A PHOSITA would have had no reason to modify Benjamin to include a single temperature sensor in each of the multiple regions between Benjamin’s ink

vias in view of Giere '673. The relevant teachings of Giere '673 are limited to its fundamentally different temperature monitoring circuitry employed on a chip with no vias, 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, and would not have suggested using only one temperature sensor to measure the temperature of each region. (Ex. 2003 ¶¶85.) Dr. Pond acknowledges that the end goal of his proposed combination of Benjamin and Giere '673 would be to detect a temperature representative of the printhead as a whole. (Ex. 1002 ¶¶161-162) Yet Benjamin discloses a entirely suitable way of achieving tis using only a single temperature sensor on the printhead die that measures the temperature of the entire printhead: “[t]emperature sense resistor contact area TSR allows a printer coupled to an ink jet cartridge to determine *a temperature of the printhead die*, based upon a measurement of *the resistor*” (Ex. 1004 col. 79 lns 60-67.)

As discussed above, the Benjamin device can accommodate only one temperature sense resistor because there is only a single contact area (TSR) [dark green] on the flex circuit shown in Figs. 25A and 25B below, and a single return contact area (TSR-RT) [light green]. (*Id.* Figs. 25A-B and col. 79 lns 29-34 and 63-65.)



A PHOSITA would not have been motivated to employ separate regional TSRs for the purpose of monitoring a temperature representative of the entire printhead, as is the end goal described by Dr. Pond, because it would unnecessarily add cost and take up space on the printhead die and/or the flex circuit shown above. (Ex. 2003 ¶86.) As Mr. Dietl points out, in designing printheads the space on the printhead chip and attached flex circuit are very valuable, and a PHOSITA would have been motivated to keep the size of both the chip and flex circuit to a minimum not only to reduce the size of the printhead and related ink cartridge, but also to reduce manufacturing cost and complexity. (*Id.*)

In fact, just like Benjamin, Giere '673 discloses using a single TSR to detect a temperature representative of the entire heater chip, in particular the u-shaped TSR 510 spanning a substantial portion of the chip, as shown in Fig. 5 of that reference.

The combined teachings would have suggested to a PHOSITA interested in monitoring overall printhead temperature to employ a single TSR on the heater chip rather than multiple TSRs each located in a different region separated by ink vias. If a PHOSITA were somehow driven to sample the temperature in areas between ink vias, the solution consistent with the single TSR contact pad of Benjamin's flex circuit would have been to employ one continuous TSR that winds between the vias, providing a single temperature value and requiring only a single temperature input and output. This would also avoid any need for having a device located on the substrate capable of averaging multiple TSR values. (Ex. 2003 ¶87.) Petitioner's assertion that a PHOSITA would have realized that ink vias are insulating is a red herring, because none of the prior art cited by Petitioners showing multiple vias on a single chip suggests an approach of placing a single temperature sensor in each region separated by vias to detect individual regional temperatures. For instance, Petitioners point to U.S. Patent No. 6,527,367 to Yabe as recognizing that ink vias are insulating. Yet, as discussed above at Section II.B.4, Yabe does not disclose temperature sensors between ink vias, nor does it recognize this as a way to monitor temperature representative of the adjacent heater arrays. Yabe instead teaches measuring mean temperature of a printhead (the purported goal of a PHOSITA throughout Ground 1) with sensors in the peripheral region of the die.

Neither Benjamin, Giere '178 or any background prior art cited by Petitioners would have suggested to a PHOSITA that they should detect temperature on a region-by-region basis where regions are separated by ink vias having heater arrays on both sides of the via. (Ex. 2003 ¶85.) Because Benjamin and Giere '673 disclose a TSR that provides a single temperature value for the printhead as a whole, and because the end goal of the combination as articulated by Petitioners is a measurement of the average temperature of the substrate, the manner in which Petitioners suggest combining Benjamin and Giere '673 would have been counter-intuitive to a PHOSITA at the time of the '708 patent. (*Id.*)

The only source that would lead a PHOSITA to the overall printhead structure and the temperature monitoring approach recited in claims 1 and 9 is the '708 patent specification. But that may not be used as a template to pick and choose favorable teachings from otherwise incompatible prior art references. *In re NTP, Inc.*, 654 F.3d at 1299 (cautioning against “reconstruction by using the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.”). Rather than using hindsight reconstruction, the prior art references must be considered in their entirety to fully appreciate what a reference suggests to a POSITA. *In re Wesslau*, 353 F.2d 238, 241 (CCPA 1965). As the *Wesslau* court explained, “[i]t is impermissible within the framework of section 103 to pick and choose from any one reference only as much

of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.” *Id.*

VII. THE PETITION FAILS TO ESTABLISH THAT CLAIMS 4 AND 13 WOULD HAVE BEEN OBVIOUS IN VIEW OF BENJAMIN, GIERE ’673, AND PARISH (GROUND 2)

Ground 2 relies on the same arguments as Ground 1, and Petitioners further argue that a PHOSITA would have found it obvious to use a specific type of thermal sensor recited in dependent claims 4 and 13 in view of Parish. Those dependent claims include the limitations of corresponding independent claims 1 and 9. Therefore, the Ground 2 challenge also fails for at least the same reasons discussed above relative to Ground 1.

VIII. THE PETITION FAILS TO ESTABLISH THAT ANY OF CLAIMS 1-3, 5-12, AND 14-15 ARE RENDERED OBVIOUS BY GIERE ’178 AND KNOWLEDGE OF A PHOSITA (GROUND 3)

Ground 3 challenges claims 1-3, 5-12, and 14-15 based on Giere ’178 and the knowledge of a PHOSITA.

A. Ground 3 Fails Because It Is Based On Inaccurate Characterizations of Giere ’178

This ground should be rejected out of hand because it relies on the false premise that Giere ’178 discloses four ink feed slots/ink vias located in elongated regions 302, 304, 306, and 308 with heater arrays on both sides of each via. (Pet. pp.

48-50.) Giere '178 discloses no such thing, and Petitioners' interpretation of the reference is directly contrary to its express teachings.

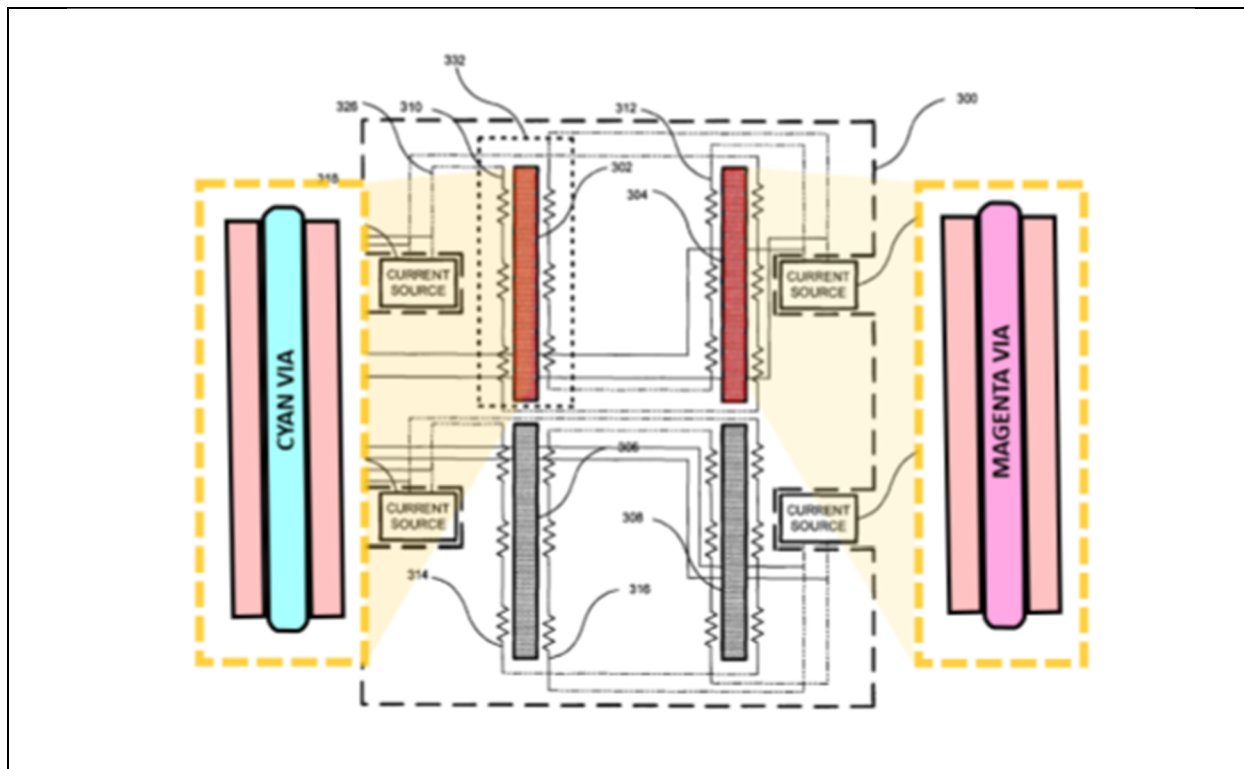
As discussed above, Giere '178 indicates that heaters and nozzles are arranged in the rectangular regions shown in its Fig. 3 without any mention of ink vias in those regions. The only portion of Giere '178 describing the ink feed to ejection chambers states:

Ink is then 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.

(Ex. 1007 col. 3 lns 37-45; Ex. 2003 ¶90.) The description of an "elongated hole" formed in the center of the substrate, also described as a "central slot" in the substrate, would have been readily understood by a PHOSITA to refer to a central slot feeding both the left column (rectangular regions 302 and 304) and right column (rectangular regions 306 and 308) of heaters through a manifold and channels formed in an adjacent barrier layer. (Ex. 2003 ¶91.) The only disclosed alternative is a feed mechanism extending "around the outer edges of the substrate," which would require no ink vias. (*Id.*) Both of these designs were known and common for cartridges having only a single color (as shown in Fig. 1 of Giere '178) at the time that the '708 patent was filed. Giere '178 makes no mention whatsoever of multiple

ink vias on a single substrate or of vias located in the non-central regions 302, 304, 306, and 308. (*Id.*)

Petitioners and Dr. Pond present the following illustration showing their interpretation of Fig. 3 of Giere '178:



(Pet. p. 50; Ex. 1002 ¶283.) That reimagining of Fig. 3 of Giere '178, as if it discloses four separate ink slots/vias with heater arrays positioned along both sides of each slot of Giere '178, is not supported by credible evidence. (Ex. 2003 ¶92.)¹

¹ The fact that Petitioners and their expert present their “annotated” version of Fig. 3 as a way of supplying different ink colors to separate ejector regions is also misleading. Not only does Giere '178 not teach this, Fig. 1 of the reference shows

A PHOSITA would not have followed any of the lines of reasoning set forth in the Petition and Dr. Pond’s declaration attempting to support this interpretation of Fig. 3. (Ex. 2003 ¶¶92.) For instance, the Petition relies on the Declaration of Dr. Pond to draw various conclusions regarding what is supposedly disclosed in Fig. 3. (Pet. pp. 51-53.) A closer look at the testimony of Dr. Pond that Petitioners rely on for Ground 3 shows that the various assumptions that he makes in support of Petitioners’ interpretation of Giere ’178 Fig. 3 are completely unwarranted.

For instance, Dr. Pond reasons that because the rectangular regions are described as including “nozzles and associated firing resistors,” that the regions must include ink ejection chambers, and that if the regions include ink ejection chambers they must also include ink feed slots/vias “because that is the structural arrangement of a typical printhead.” (Ex. 1002 ¶¶270.) That is an unwarranted conclusion, because ink ejection chambers are often separated from ink vias by elongate channels. (Ex. 2003 ¶¶92; Ex. 1002 ¶¶25-30.) This is explicitly discussed by Giere ’178 in its passage describing the center feed approach. (Ex. 2003 ¶¶92.) A PHOSITA would not interpret Giere ’178 as disclosing ink vias contained in each quadrant when the reference does not indicate this in its figures or written text. (Ex. 2003 ¶¶92.) Giere ’178 generally describes that the substrate includes “the structures of a typical

each color of ink in a separate cartridge 110a-d. (Ex. 1007 Fig. 1 and col. 7 lns 1-17.)

printhead” including ink feed slots and ejection chambers but only specifies that the rectangular regions central to Petitioners’ interpretation contain “an array of nozzles and associated firing resistors.” (Ex. 2003 ¶¶92; Ex. 1007 col. 8 lns 45-49.) This further reinforces that that there are no ink vias in the rectangular regions. (Ex. 2003 ¶¶92.)

Dr. Pond also argues that vias would be located within rectangular regions 302, 304, 306, and 308 because ejection chambers are necessarily disposed “very close” to ink feed slots/vias to ensure that ink can refill a chamber quickly. (Ex. 1002 ¶¶270.) However, Fig. 3 is nothing more than a “high level schematic diagram.” (Ex. 1007 col. 1 lns 56-57.) Furthermore, the ejection chambers can refill quickly even when the ink via is at a location removed from the ejection chambers because there is a continuous supply of ink in the connecting elongated channels. (Ex. 2003 ¶¶93.) As one ink droplet is emitted through the nozzle, the pressure differential pulls the next drop from the channel and into the chamber. (*Id.*)

In Paragraphs 272-274 of his Declaration, Dr. Pond contends that the layout of the temperature management system itself reveals that each of the rectangular regions 302, 304, 306, and 308 of Giere ’178 include an ink via. (Ex. 1002 ¶¶272-74.) According to this reasoning, because Giere ’178 discloses sensing temperature on either side of each of the four regions and further discloses that its system can adjust firing resistor drive signals to control substrate temperature, a PHOSITA

would supposedly understand that multiple arrays of firing resistors are located within each region. (*Id.* ¶¶272-73.) Dr. Pond further maintains that a PHOSITA would understand the multiple heater arrays of each region to be separated by an ink via because it is supposedly the insulating effect of the via that presents the need to measure temperature on each side of the four regions. (*Id.* ¶¶273-74.)

Dr. Pond's reasoning is 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." (*Id.* col. 8, lns 47-49 (emphasis added); (Ex. 2003 ¶95.) The text that Dr. Pond quotes relates only to temperature management in general, and nothing that Dr. Pond cites from Giere '178 actually indicates that ink vias would be located within rectangular regions 302, 304, 306, and 308. (*Id.*) 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, let alone multiple heater arrays separated by an ink via. (*Id.*) Nor is there any discussion of "independent heater arrays on either side of each region" or of a temperature monitoring system tailored to such a design. (*Id.*)

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.) Furthermore, a PHOSITA would appreciate the operational benefits of the disclosed temperature monitoring system in the context

of the substrate structure that Giere '178 does disclose. (*Id.*) In particular, a PHOSITA understands that each array of firing resistors generates heat that contributes to substrate temperature in the adjacent regions. The temperature sensor 310 extends through two outer regions between a single heater array (302 or 304) and a substrate edge, and the temperature of each outer region is impacted mainly by the corresponding adjacent heater array. (Ex. 2003 ¶96.) Temperature sensor 312 extends through a central region between both heater arrays 302 and 304 where the temperature is affected by heat generated by both adjacent arrays. (*Id.*) Because the temperatures of the outer and central regions can differ, monitoring those regions separately provides useful data and Giere '178 provides a way to achieve this. (*Id.*) Temperature sensors 314 and 316 similarly provide temperature data for the regions separated by heater arrays 306 and 308, which may differ from the data detected from the other regions.

As Mr. Dietl explains, this temperature monitoring scheme provides additional utility by generating temperature data on the side of the array near the ink feed (310 and 314 in the case of edge feed or 312 and 316 in the case of a center feed) and separate temperature readings on the side 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). (Ex. 2003 ¶96.) This makes the chip readily adaptable to both of the disclosed ink supply approaches. (*Id.*) Thus, the layout of the temperature monitoring system

disclosed in Giere '178 makes perfect sense in the context of what the reference actually discloses and would not have suggested a different chip design in which each region has two independent heater arrays supplied by an intervening ink via. (*Id.*)

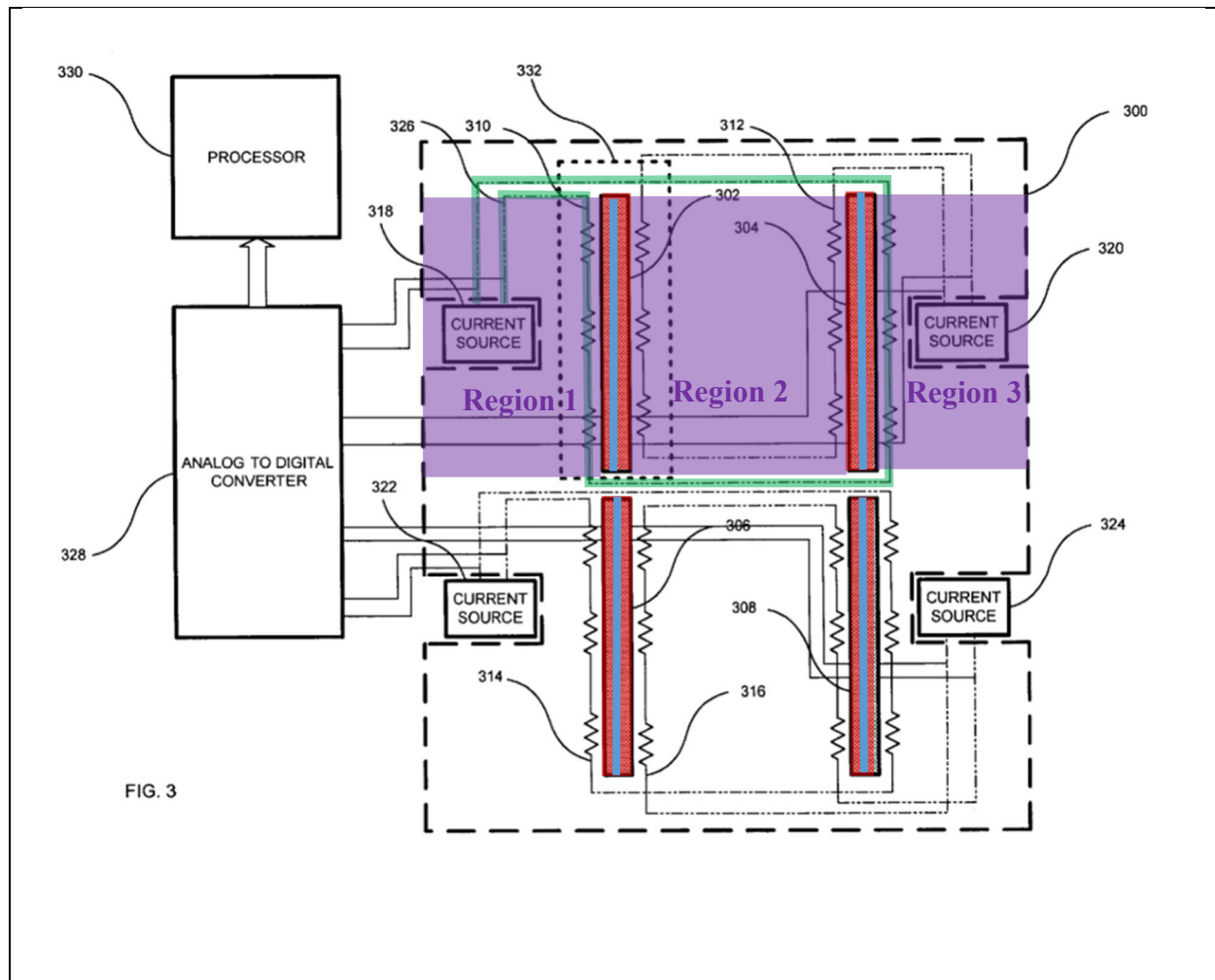
Petitioners may not advance an inaccurate, embellished reading of Giere '178 through the artifice of expert opinion testimony purporting to interpret the reference based on the “knowledge of a PHOSITA.” Conclusory arguments and expert testimony, unsupported by any corroborating evidence, may not be used to compensate for shortcomings in the prior art. *K/S HIMPP*, 751 F.3d at 1365–67; *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 one via at the center of the substrate, or its failure to make any mention of ink vias in regions 302, 304, 306, and 308 that are explicitly disclosed to be occupied by heaters and associated nozzles. A PHOSITA would interpret the reference based on what it actually discloses, not as a result-based argument created solely to mimic the elements of the '708 patent claims.

Further, Petitioners' cursory attempt to explain that, if they are wrong in their interpretation, the alleged structure would have been obvious because a PHOSITA would have filled in the gaps by general knowledge of "the basics of inkjet printing technology" and general teachings of other prior art (Pet. p. 54) is not adequately articulated and is a clear attempt to argue that the claimed configuration is present without fulfilling the requirements of establishing inherency. To invoke inherency to establish the existence of a claim limitation in the prior art for an obviousness analysis, "the limitation at issue necessarily must be present, or the natural result of the combination of elements explicitly disclosed by the prior art." *Par Pharm.*, 773 F.3d at 1195–96. The Petition does not, and cannot, meet this burden.

Neither the center feed nor the edge feed embodiments of Giere '178 would have been viewed by a PHOSITA as relevant to the invention claimed in the '708 patent because they do not have multiple parallel ink vias having heater arrays placed along both longitudinal sides of the vias. (Ex. 2003 ¶97.) Nor does either embodiment disclose placing a single temperature sensor in each region between adjacent vias operable to sense a temperature representative of the adjacent heater arrays, as is further recited in independent claims 1 and 9. (*Id.*)

B. Ground 3 Fails Because The Theory Does Not Meet The Challenged Claims Even Under Petitioner's Inaccurate Characterizations of Giere '178

Even if the printhead of Giere '178 had disclosed or was redesigned to include ink vias and two heater arrays in each region as Petitioners argue, this would not meet the claims of the '708 patent. Claim 1 calls for “a region disposed adjacent each heater array,” 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.” (Ex. 1001 col. 8 lns 23-40.) Claim 9 is similar. (Ex. 1001 col. 8 ln 66 through col. 9 ln 10.) If Giere '178 had left and right ink vias [blue below] with heater arrays [red] on both sides dividing the printhead die into 3 regions [purple below] as Petitioners and their expert suggests (or six regions if the bottom half of the chip is considered), TSR 310 [green] would extend 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.) Because the TSR 310 would extend through both regions 1 and 3, it would be incapable of distinguishing between the temperature of Region 1 (to the left of area 302) and Region 3 (to the right of area 304). (Ex. 2003 ¶98.) According to Petitioner's argument, regions 1 and 3 are isolated by insulating vias and their heater arrays are independently driven, and thus there is 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. Similarly, the configuration would not be fabricated by “positioning a single temperature sensing element disposed *within each region*, wherein the temperature sensing element is *operable to sense a temperature representative of the heater arrays adjacent to the region*” as in claim 9. (Ex. 2003 ¶98.)

For at least the above reasons, Ground 3 must be rejected because it depends on a grossly inaccurate depiction of the prior art that still does not satisfy all limitations of any of the challenged claims.

IX. THE PETITION FAILS TO ESTABLISH THAT ANY OF CLAIMS 1-3, 5-12, AND 14-15 WOULD HAVE BEEN OBVIOUS IN VIEW OF GIERE '178 AND YABE (GROUND 4)

A. Ground 4 Fails To The Extent That It Depends On The Same Inaccurate Characterizations of Giere '178

To a large extent, Ground 4 is based on the same incorrect reading of Giere '178. (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 incorporates 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 discussing alleged motivations to combine Giere '178 and Yabe, Dr. Pond spends several more

paragraphs arguing that the references are analogous art because both describe sensing temperature in heater chips having multiple vias. (Ex. 1002 ¶¶ 416 – 423.) Paragraphs 416 through 419 repeat the erroneous assumption of Ground 3 that Giere '178 discloses multiple vias in a single chip. (*Id.* ¶¶416-419.) Then Dr. Pond argues that Yabe is analogous art because it describes a means for efficiently measuring and controlling temperature of a heater board with plural ink vias and was given the same patent classification. (*Id.* ¶¶420-425.)

Petitioners and Dr. Pond appear to also argue in the alternative that this combination would render the '708 claims obvious even if Giere '178 does not disclose a substrate having multiple parallel ink vias. (Pet. p. 99; Ex. 2003 ¶101.) After acknowledging that Giere '178 could be interpreted to not disclose the multi-via structure that he envisions (*see* Ex. 1002 ¶¶ 373, 382, 400), Petitioners and Dr. Pond reason that a PHOSITA would nevertheless have arrived at the claimed design by “applying [Giere '178's] temperature management system to printheads having a plurality of ink vias and adjacent heater arrays, as taught by Yabe, to maintain high print quality.” (Pet. p. 98; Ex. 1002 ¶ 436.)

Petitioners rely on Dr. Pond to argue that a PHOSITA would have been motivated to incorporate ink vias with multiple heater arrays as in Yabe into Giere '178 because Yabe describes advantages of having more nozzles and discharging more ink droplets from a printhead with high precision and at a faster rate. (Ex. 1002

¶¶426-435.) Dr. Pond further argues that Giere '178 also provides express motivation to incorporate the heater arrangement of Yabe because it too relates to improving print quality. (*Id.* ¶436.) He then asserts that Giere '178 allegedly “accommodates” a plurality of ink supply ports, an assertion that is based on nothing more than his ability to render a graphical mock-up of Fig. 3 showing the locations of added vias and heater arrays. (*Id.* ¶437; Ex. 2003 ¶102.)

Dr. Pond also contends that it would have been obvious to include multiple ink vias each with two columns of heater arrays because other prior art also showed such an arrangement, and that there would have been a reasonable expectation of success in adding Yabe’s ink feed slots and associated heater arrays to Giere '178 because Giere '178 describes structures of a typical printhead and acknowledges that modifications could be made. (*Id.* ¶¶438-439.) Finally, Dr. Pond again reiterates his incorrect portrayal of Giere '178’s substrate as supposedly containing multiple parallel ink vias with associated heater arrays on each side of each ink via, repeating his earlier opinions that temperature sensor layout alone somehow indicates that each region includes such a via and heater array structure. (*Id.* ¶440-442.)

These assertions generally amount to an argument that the Giere '178 and Yabe references both have multiple ink vias, and that Giere '178 would be understood or would have been modified to have heater arrays on each side of each via because more nozzles would be advantageous. (Ex. 2003 ¶104.) A PHOSITA

would not interpret Giere '178 as disclosing the multiple ink via structure in the first place, and would not have followed any of the obviousness rationales that start from the erroneous assumptions regarding the substrate structure disclosed in Giere '178. (*Id.*) To the extent that Ground 4 is based on Petitioner's inaccurate reading of Giere '178, it must be rejected.

B. Ground 4 Fails Because The Proposed Combination Would Involve Extensive Redesign That Does Not Result In The Subject Matter of the Challenged Claims

The alternative argument that a PHOSITA would have combined the temperature management system of Giere '178 while redesigning the central ink feed system of Giere '178 to incorporate the via and heater array structures of Yabe also lacks any merit. (Pet. p. 98; Ex. 1002 ¶ 436.) As Mr. Dietl explains, that theory is not faithful to the teachings of either reference. (Ex. 2003 ¶105.) Petitioners' primary justification for this theory is that Giere '178 describes generic print quality benefits of a general "temperature management system." (Pet. p. 98; Ex. 1002 ¶436-437; Ex. 2003 ¶105.) Yet Dr. Pond's selection of Giere '178's single-via temperature management system ignores his own acknowledgement that "Yabe discloses a means for efficiently measuring and controlling the temperature of the heater board of a printhead having plural ink vias with associated heater arrays on either side so as to maintain high quality printing." (Ex. 2003 ¶105; Ex. 1002 ¶422.) Given 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 four-quadrant design and temperature management system of Giere '178 is entirely arbitrary, as emphasized by Mr. Dietl. (Ex. 2003 ¶105.)

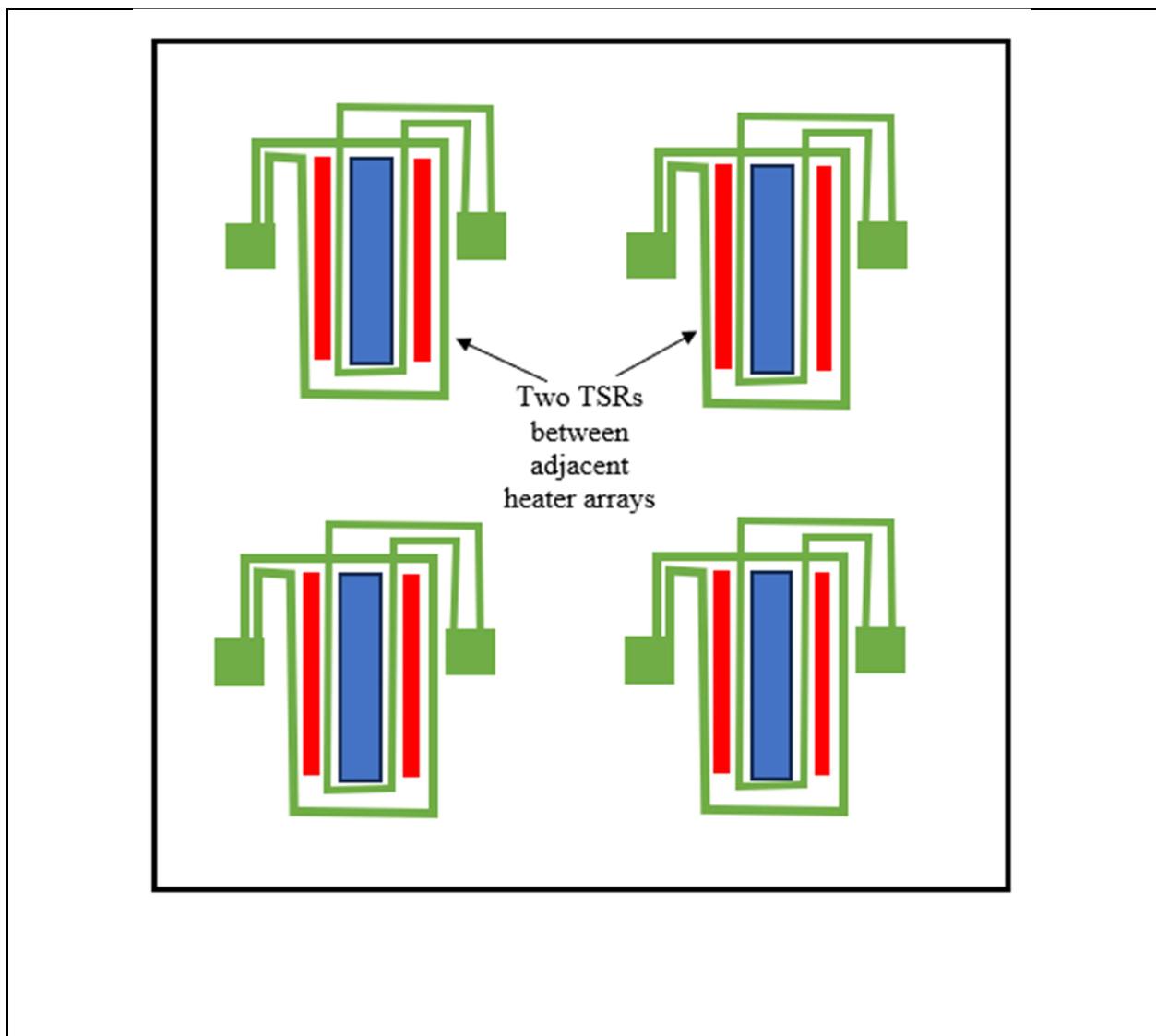
Another problem with Petitioner's combination of Giere '178 and Yabe is that, as explained by Mr. Dietl, Dr. Pond's proposed combination in Ground 4 would involve redesigning every aspect of Giere '178's substrate and related components except the layout of its temperature sensors. (Ex. 2003 ¶106.) Dr. Pond provides only a general mock-up of Fig. 3 illustrating where the additional vias and heater arrays would be located, but fails to address any of the practical considerations associated with adding ink vias, heaters, nozzles, and all accompanying structures (ejection chamber walls, ink channels between ejection chambers and ink vias, drive transistors, logic cells, address lines, power and ground busses, *etc.*). (Ex. 2003 ¶106.)

Furthermore, Mr. Dietl explains why Dr. Pond's proposed modifications to Giere '178 are inconsistent with the temperature management principles of that reference. (Ex. 2003 ¶107.) Giere '178's system provides for separately sensing each side of multiple ink ejector arrays located on opposite sides of a single central ink via or between edge feed ink supply mechanisms. (Ex. 2003 ¶¶73 and 107-108.) 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 could measure temperature along the ink feed side and the opposite side of each heater array. (Ex. 2003 ¶107)

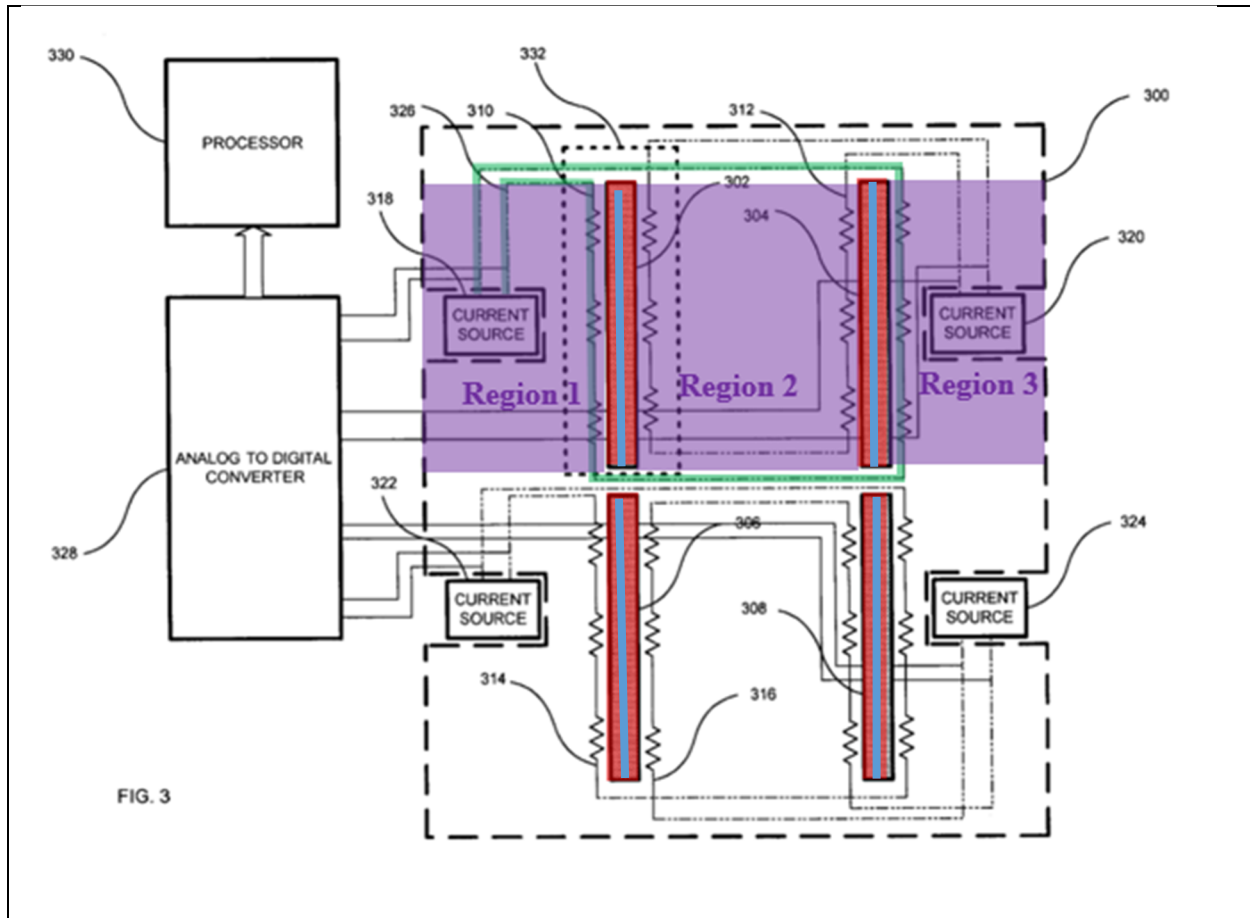
A PHOSITA would have had no reason to keep the TSRs of Giere '178 in place while reconfiguring almost every other aspect of the printhead substrate because this would defeat the purpose of Giere '178's temperature sensing scheme. (Ex. 2003 ¶¶73 and 107-108.) Giere '178 recognizes that “[i]n general, the quantity of ink drops ejected from a printhead nozzle will change as the temperature of the structure surrounding the ink ejection chamber associated with the nozzle changes” and that “localized heating of the substrate can occur from firing nozzles at a greater frequency in a particular region of the printhead.” (Ex. 1007. col. 5 lns 20-23 and 44-46, emphasis added.) The placement of temperature sensors along both sides of each heater array comports with this stated emphasis on monitoring the temperature surrounding the ink ejection chambers. (Ex. 2003 ¶108.) Therefore, if a PHOSITA

were to have redesigned Giere's ink vias and heaters, they would have done so without making corresponding changes to the temperature sensors consistent with the objective of monitoring both sides of each heater array according the principles of Giere '178's actual design. ((Ex. 2003 ¶108.) The resulting structure would have two temperature sensors between each pair of adjacent heaters, as shown in the simplified illustration below:



(Ex. 2003 ¶108.) The temperature sensors [green] extending along the sides of each heater array [red] adjacent the ink vias [blue] in a 4-quadrant design based on Giere '178 therefore would not meet the requirement in the '708 patent claims of only a single temperature sensor in each region between adjacent heater arrays. (*Id.*) Dr. Pond does not even attempt to explain why a PHOSITA would deploy TSRs, originally designed and located to monitor both sides of the single heater array of each region, to now monitor different areas in the proposed modification of Giere '178 Fig 3, nor could he justify why a PHOSITA would arrive at this modification without use of hindsight. (Ex. 2003 ¶108.)

The arrangement that Dr. Pond suggests in which the temperature sensor layout of Giere '178 is not altered when other structural features around it are changed would also not meet the claims of the '708 patent for the reasons discussed above regarding Ground 3. Modifying the structure of Giere '178 as Dr. Pond proposes to include left and right ink vias that divide the upper half of the printhead die into 3 regions [purple below] would result in the same TSR 310 [green below] extending through both the region to the left of the left-hand ink via (“Region 1” below) and the region to the right of the right-hand ink via (“Region 3”).



(Ex. 2003 ¶109; Ex. 1007 Fig. 3.) Therefore, even Dr. Pond’s hypothetical redesign of Giere ’178 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 of the ’708 patent. (Ex. 2003 ¶109.) The TSR extending through Regions 1 and 3 is incapable of distinguishing between the temperatures of the heater arrays in Region 1 from the temperature of the heater arrays in Region 3, which may be very different due to the insulating effect of the ink vias between them. (Ex. 2003 ¶109.) The same

is true of temperature sensor 314 extending through the outer regions of the lower half of the substrate. (*Id.*)

For at least these reasons, Ground 4 must be rejected.

X. THE PETITION FAILS TO ESTABLISH THAT CLAIMS 4 AND 13 WOULD HAVE BEEN OBVIOUS IN VIEW OF GIERE '178 AND PARISH (GROUND 5)

Ground 5 relies on the same arguments as Ground 3, and Petitioners further argue that a PHOSITA would have found it obvious to add a specific type of thermal sensor recited in dependent claims 4 and 13 in view of Parish. Those dependent claims include the limitations of corresponding independent claims 1 and 9. Therefore, the Ground 5 challenge fails for at least the same reasons discussed above relative to Ground 3.

XI. THE PETITION FAILS TO ESTABLISH THAT CLAIMS 4 AND 13 WOULD HAVE BEEN OBVIOUS IN VIEW OF GIERE '178, YABE, AND PARISH (GROUND 6)

Ground 6 relies on the same arguments as Ground 4, and further argues that a PHOSITA would have found it obvious to add a specific type of sensor of dependent claims 4 and 13 in view of Parish. The Ground 5 challenge therefore fails for at least the same reasons discussed above relative to Ground 4.

XII. CONCLUSION

For the reasons described above, and because Petitioners have not shown a reasonable likelihood that any of the challenged claims are unpatentable, the Board should deny institution.

Respectfully submitted,
FITCH EVEN TABIN & FLANNERY LLP

Dated: October 25, 2023

By: /Mark A. Borsos/
Timothy P. Maloney
Registration No. 38,233
tim@fitcheven.com

Mark A. Borsos
Registration No. 50,479
mborsos@fitcheven.com

120 South LaSalle Street
Suite 2100
Chicago, Illinois 60603
(312) 577-7000
(312) 577-7007 (fax)

CERTIFICATE OF WORD COUNT

The undersigned hereby confirms that the foregoing Preliminary Response 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 Preliminary Response contains 12,872 words, calculated by the word-processing system used to prepare it.

Dated: October 25, 2023

By: /Mark A. Borsos/
Mark A. Borsos
Registration No. 50,479
mborsos@fitcheven.com

120 South LaSalle Street
Suite 2100
Chicago, Illinois 60603
(312) 577-7000
(312) 577-7007 (fax)

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'S PRELIMINARY RESPONSE was served this 25th day of October, 2023, by e-mail upon the following:

Dion M. Bregman (Reg. No. 45,645)
Amanda S. Williamson (Reg. No. 73,683)
Jason E. Gettleman (Reg. No. 55,202)
dion.bregman@morganlewis.com
amanda.williamson@morganlewis.com
jason.gettleman@morganlewis.com
CanonSlingshotIPRs@morganlewis.com

Petitioners have consented to service by electronic means.

Respectfully submitted,
FITCH EVEN TABIN & FLANNERY LLP

Dated: October 25, 2023

By: /Mark A. Borsos/
Mark A. Borsos
Registration No. 50,479
mborsos@fitcheven.com

120 South LaSalle Street
Suite 2100
Chicago, Illinois 60603
(312) 577-7000
(312) 577-7007 (fax)