

October 10, 2023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CANON U.S.A., INC. and	)	
CANON INC.,	)	
	)	Case IPR2023-00313
Petitioners,	)	
	)	Patent No.
vs.	)	7,594,708
	)	
SLINGSHOT PRINTING LLC,	)	
	)	
Patent Owner.	)	

The deposition of STEPHEN F. POND, Ph.D.,
taken in the above-entitled case, before
Suzanne Thalji, CSR and Notary Public in and for
the County of Cook and State of Illinois, on
October 10, 2023, at 9:07 a.m., at
110 North Wacker Drive, Suite 2800, Chicago,
Illinois.

October 10, 2023

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October 10, 2023

I N D E X

WITNESS

STEPHEN F. POND, Ph.D.

EXAMINED BY

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MR. FORGHANY

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E X H I B I T S

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October 10, 2023

(Witness sworn.)

STEPHEN F. POND, Ph.D.,

having been first duly sworn, was examined and
testified as follows:

EXAMINATION

BY MR. BORSOS:

Q. Good morning, Dr. Pond.

A. Good morning.

Q. You understand that we are taking your
deposition today and that you are under oath to
tell the truth --

A. Yes.

Q. -- and nothing but the truth?

A. Yes.

Q. And do you also understand that we are
here discussing two IPRs relating to patents owned
by Slingshot?

A. Yes.

Q. And is one of those IPRs related to
U.S. Patent No. 7,594,708?

A. Probably. At least the '708 part of it
I remember.

Q. And if you recall --

A. Barkley.

1 Q. -- that relates to a sensing
2 temperature on a printhead? Does that sound
3 correct?

4 MR. FORGHANY: Objection as to form.

5 A. Yes.

6 MR. BORSOS: I am going to have a
7 document marked as Exhibit 1 for this
8 deposition.

9 (Pond Deposition Exhibit 1 was
10 marked for identification.)

11 BY MR. BORSOS:

12 Q. Dr. Pond, does the document that's been
13 marked as Exhibit 1 to this deposition appear to
14 be a copy of your declaration relating to
15 IPR2022-0313?

16 A. Yes.

17 Q. And have any of the opinions expressed
18 in this declaration changed between when it was
19 submitted and the present day?

20 A. No.

21 MR. FORGHANY: Objection as to form.

22 BY MR. BORSOS:

23 Q. So is it fair to say that you stand by
24 everything that you stated in this declaration?

1 A. Yes.

2 (Pond Deposition Exhibit 2 was
3 marked for identification.)

4 BY MR. BORSOS:

5 Q. You have now been given a document
6 marked Exhibit 2. Does this appear to be the '708
7 patent at issue in your declaration marked as
8 Exhibit 1?

9 A. Yes.

10 Q. Now, if you turn to Claim 1 at the end
11 of the '708 patent --

12 A. Okay. I'm there.

13 Q. Do you see that Claim 1 refers to a
14 chip for use with a printing device?

15 A. Yes.

16 Q. In your understanding what does a chip
17 mean?

18 MR. FORGHANY: Objection as to form.

19 A. In this context the chip is a
20 semiconductor die that has been fabricated as part
21 of a printing device, a semiconductor die.

22 BY MR. BORSOS:

23 Q. And when you use the word die, what
24 does that refer to?

1 A. It refers to a rectangular piece
2 of usually silicon that has been cut from a wafer
3 of silicon. When the individual circuits are cut
4 from the piece of -- from the wafer, that process
5 is called dicing the wafer, and the little
6 rectangles that result -- that are used are called
7 die.

8 Q. And so is it fair to say that the chip
9 refers to a single piece of semiconductor
10 material?

11 MR. FORGHANY: Objection as to form.

12 A. I think so, yes.

13 BY MR. BORSOS:

14 Q. And if you look a little further in
15 Claim 1, the claim refers to a plurality of ink
16 vias arranged parallel to one another, correct?

17 A. Yes.

18 MR. FORGHANY: Objection to form.

19 BY MR. BORSOS:

20 Q. And does the term ink via have a
21 particular meaning within the printing industry?

22 MR. FORGHANY: Objection as to form.

23 A. It does within the inkjet industry that
24 fabricates printheads on substrates. So within

1 the inkjet industry it has meaning.

2 BY MR. BORSOS:

3 Q. Okay. And what is the meaning of an
4 ink via within the inkjet printing industry?

5 A. A via in its most fundamental meaning
6 is an opening with a long edge beside the drop
7 generator chambers that feed ink to those
8 chambers.

9 Q. Does the term ink via refer to a hole
10 through the substrate?

11 MR. FORGHANY: Objection as to form.

12 A. That's one version.

13 BY MR. BORSOS:

14 Q. Okay. Is there another version of a
15 via that you can describe?

16 MR. FORGHANY: Objection as to form.

17 A. There can be an outer edge of the
18 substrate where ink can be fed from, and that
19 outer edge is an ink via also.

20 BY MR. BORSOS:

21 Q. And --

22 A. There are other -- that's a second one.

23 Q. So is it accurate to say that in your
24 opinion an outer edge of the chip can be referred

1 to as a via?

2 A. Yes.

3 MR. FORGHANY: Objection as to form.

4 BY MR. BORSOS:

5 Q. And are you aware of any printed
6 publications in which an outer edge of a chip is
7 referred to as an ink via?

8 A. I can't think of a reference to give
9 you at this moment, no.

10 Q. And you don't recall any references
11 discussed in your declaration that referred to an
12 ink via as an outer edge of a silicon substrate;
13 do you?

14 A. Not discussed in my declaration.

15 Q. Would a person skilled in the art
16 understand that the term ink via refers to a
17 structure that allows ink to pass from one side of
18 the chip to the other?

19 MR. FORGHANY: Objection as to form.

20 A. That's one of the meanings, yes.

21 BY MR. BORSOS:

22 Q. And are there any other meanings that
23 you can think of?

24 A. It's possible to feed ink from the

1 edges of the substrate.

2 Q. But in that situation ink is passing
3 from one side of the substrate or one face of the
4 substrate to the other face of the substrate,
5 correct?

6 A. It doesn't have to. It can come from
7 outboard of the edges.

8 Q. What I'm getting at is this. Do you
9 know of any use of the term ink via to refer to
10 channels or passages that would convey ink
11 parallel to the surface of the silicon chip?

12 MR. FORGHANY: Objection as to form.

13 A. Only one case can I think of.

14 BY MR. BORSOS:

15 Q. And what is that case?

16 A. It's a case where there's a trench
17 formed in the silicon substrate that doesn't go
18 all the way through to the bottom, and the heater
19 arrays are aligned along the edges of that trench
20 as if it were a through via, but ink is fed along
21 the trench from a set of holes, not a full slot
22 that feeds the full depth of the substrate.

23 That's a patent -- I can't remember
24 right now the assignee. I could find it, but I

1 can't remember it. I think Hitachi, but I'm not
2 sure.

3 Q. And do you know for a fact that the
4 term ink via is used to describe that structure?

5 A. I can't remember.

6 Q. In that device that you're describing,
7 the structure you're referring to, the ink via, is
8 below the surface of the silicon substrate,
9 correct?

10 MR. FORGHANY: Objection as to form.

11 A. Yes. The general principle of a roof
12 shooter thermal inkjet printhead, that narrow
13 construct of all the world of printing, you want
14 the ink to be fed from an edge that's at the same
15 plane as the heaters themselves, plus or minus
16 insulation layers. So you want the ink to come
17 from an edge. That implies some depth below that
18 edge where the ink has come from. So in general
19 what's important is the ink feed edge.

20 BY MR. BORSOS:

21 Q. Okay. And to your knowledge is the
22 term ink via ever used to describe structures that
23 are built on top of the silicon surface, channels
24 or passages through, let's say, a thick film layer

1 that's applied to the chip?

2 MR. FORGHANY: Objection as to form.

3 A. The first part of your question I
4 didn't get. To my knowledge is -- what term?

5 BY MR. BORSOS:

6 Q. Is the term ink via ever used to
7 describe passages that are built above the surface
8 of the silicon chip?

9 A. Yes. For other styles of inkjet
10 printheads other than roof shooters, that happens.

11 Q. And they use the term ink via to
12 describe such structures?

13 A. Sometimes.

14 Q. Okay. Can you recall a specific
15 printed publication that would use that
16 terminology in a side shooter?

17 MR. FORGHANY: Objection as to form.

18 A. I would have to find it. Xerox, where
19 I did most of my personal thermal inkjet work,
20 used edge shooter technology primarily, and the
21 ink was fed from above rather than below, and so
22 it was channeled along the surface. And we had
23 the equivalent of an ink via, but I don't know
24 that we used that word. We might have called it

1 an ink chamber or an ink reservoir, but we might
2 have called it a via.

3 Certainly the hole down through the
4 silicon to get to the upper surface of the heater
5 portion, that hole was called a via.

6 BY MR. BORSOS:

7 Q. If you look further in Claim 1, you'll
8 see that the claim refers to a heater array
9 disposed adjacent each longitudinal side of the
10 ink vias?

11 A. Yes, I see that.

12 Q. And can you describe in your own words
13 what you understand that to refer to?

14 A. For the thermal inkjet printing
15 process, each -- the thermal inkjet printing
16 process is a set, an array, of individual elements
17 that eject ink under the control of the system.
18 Each of those individual drop generator elements
19 has within it a heater, a resistor which is heated
20 by driving current through it, and so it is called
21 a heater. And those heaters are positioned very
22 close to the ink supply from an ink feed edge.

23 So the two longitudinal sides of the
24 ink via are the ink feed edges. The longitudinal

1 side is a feed edge, and the heaters are
2 positioned in some almost straight line. It
3 doesn't have to be, but it's mostly a straight
4 line along that feed edge, a very short distance,
5 a couple hundred microns at most, away from that
6 feed edge.

7 Q. The next portion of the claim refers to
8 a region disposed adjacent each heater array,
9 wherein only one region is disposed between two
10 adjacent ink vias.

11 A. Yes.

12 Q. Is that accurate?

13 A. Well, that's a claim. I don't know
14 whether it's accurate or not. It's a statement.

15 Q. Right. I was just asking whether my
16 reading of that claim language was accurate.

17 A. Well, it has this word region that's
18 used a couple of times, which to my mind is a
19 confusing formulation, but it is what it is.

20 Q. Can you expand on that statement and
21 explain why you believe the term region is
22 confusing?

23 MR. FORGHANY: Objection, misstates the
24 prior testimony.

1 A. Well, it says a region disposed
2 adjacent each heater array. Well, there are two
3 heater arrays. There are two edges. We were just
4 told before that that there are heater arrays
5 adjacent the two longitudinal edges, but now it's
6 saying that there's a region disposed adjacent
7 each heater array, wherein only one region is
8 disposed between two adjacent ink vias and
9 disposed between two adjacent ink vias, but up
10 until that sentence we haven't heard about a
11 second ink via. It talked about a via. Now it's
12 saying two adjacent ink vias.

13 Well, at any rate, so that formulation
14 to me, it didn't build the picture very well.

15 Q. All right. Let's take a closer look at
16 the language earlier in Claim 1. The second line
17 of Claim 1 refers to a plurality of ink vias,
18 correct?

19 A. Yes, you're right.

20 Q. And so would a plurality refer to --

21 A. Okay.

22 Q. -- two or more?

23 A. No. You're right.

24 Q. Okay.

1 A. That's a decent antecedent for the two
2 adjacent ink vias, between two adjacent ink vias.
3 If you have a plurality, then you're bound to have
4 two of them be adjacent.

5 Okay. So what's your question?

6 Q. ^ Check question was why you viewed the
7 language leading to the region to be confusing.

8 MR. FORGHANY: Objection, misstates the
9 testimony.

10 A. I didn't --

11 BY MR. BORSOS:

12 Q. Well, just looking back at the --

13 A. It is what it is. I mean, I just said
14 when I read it, my brain was confused by the "a
15 region" and the "one region."

16 Q. Okay. And now that you've looked back
17 at the earlier parts of the claim, is that
18 confusion alleviated?

19 MR. FORGHANY: Same objection.

20 A. Well, it's hard for me to unlearn what
21 I've learned subsequently about this, so I'm not
22 confused.

23 BY MR. BORSOS:

24 Q. The last portion of Claim 1 refers to a

1 single temperature sensing element disposed within
2 each region, correct?

3 A. Yes, it says that.

4 Q. Now, can you turn to Figure 1 of the
5 '708 patent, and is it fair to say that Figure 1
6 here shows a temperature sensor labeled 120 that
7 is positioned around three ink vias?

8 MR. FORGHANY: Objection as to form.

9 A. The three ink vias are contained within
10 the loop of the temperature sensor 120. They're
11 within it.

12 BY MR. BORSOS:

13 Q. And is this type of configuration a way
14 in which the average temperature of an entire die
15 was measured by a temperature sense resistor?

16 MR. FORGHANY: Objection as to form.

17 A. It would be that after some period of
18 time.

19 BY MR. BORSOS:

20 Q. And can you tell me why you qualify
21 that with the phrase "after some period of time"?

22 A. Well, the ink vias that are shown in
23 the drawing, the cyan, magenta, and yellow ink
24 vias, represent rather significant thermal

1 barriers on this plane on which this printhead has
2 been formed, so that if heat is added, as I know
3 it would be during printing, as a PHOSITA would
4 know, by pulsing heaters somewhere along these
5 heater arrays, it will take some time for that
6 heat to be thermally conducted out of the region
7 between the vias and shared around the whole chip.

8 So that sensor will -- eventually the
9 whole silicon substrate itself will achieve
10 thermal equilibrium, and at that point in time,
11 that sensor will tell you what that thermal
12 equilibrium temperature is.

13 Q. In your opinion does this patent
14 describe the phenomenon of ink vias acting as
15 thermal barriers to be something that was known in
16 the prior art?

17 A. I think it says it, but I can't
18 remember where.

19 Q. Can you turn to column 2, line 11.

20 A. All right. Yes, I see that sentence
21 there. "The ink vias 202, 204, and 206 act as a
22 thermal barrier between the colors."

23 Q. And so is it fair to say that the '708
24 patent recognized that the ink vias act as thermal

1 barriers?

2 A. Yes.

3 Q. Does that passage recognize that this
4 was known in the prior art?

5 MR. FORGHANY: Objection as to form.

6 A. I think it does in the sense that it --
7 that explanation, that sentence, is given in the
8 background of the invention section, and it's
9 during the discussion of Figures 1 and 2 which it
10 labels as prior art, and so I think in that
11 context it's saying -- it's giving us prior art
12 teachings, and so it's saying that that idea was
13 known. The patent is saying that.

14 BY MR. BORSOS:

15 Q. Can you explain to me how the passage
16 conveys the idea that the insulating properties of
17 the vias were known prior to the '708 patent
18 rather than conveying that the inventors of the
19 '708 patent recognized the insulating properties
20 of the ink vias?

21 MR. FORGHANY: Objection as to form,
22 asked and answered.

23 A. I'm inferring it from the fact that
24 that sentence and the last sentence of that

1 paragraph are being given in connection with the
2 heater chip shown in Figure 2, which is prior art.
3 I'm assuming that the author, the inventor, is
4 telling us what Figure 2, the prior art, is
5 teaching.

6 BY MR. BORSOS:

7 Q. And how can you distinguish between
8 things that the inventors recognized versus things
9 that were well known in the art at that time?

10 MR. FORGHANY: Objection as to form.

11 A. Well, it's been my experience that when
12 the inventor has invented something, they tell
13 you.

14 BY MR. BORSOS:

15 Q. This isn't talking about an invention
16 at this point; is it? It's talking about
17 properties of a prior art device, right?

18 MR. FORGHANY: Objection as to form,
19 compound, asked and answered.

20 A. He's setting the stage for his
21 invention. He's giving the background of the
22 invention. To me that section of a patent -- when
23 a PHOSITA reads that section of a patent, the
24 PHOSITA is being taught what was known, what's the

1 context, and then we're going to talk about what
2 we have invented.

3 Right now we are talking about what
4 came before, what the background is, and that's
5 part of that discussion. Usually it says why what
6 came before was inadequate. It usually says that.

7 BY MR. BORSOS:

8 Q. And this passage at column 2, lines 11
9 through 15, can be describing an inadequacy of the
10 prior art that was recognized by the inventors
11 without stating that that inadequacy was known as
12 part of the prior art, correct?

13 A. I don't see it that way, no.

14 Q. Okay. And the basis for your viewpoint
15 is the inferences that you described earlier?

16 MR. FORGHANY: Objection,
17 argumentative, misstates the record.

18 A. I think the inventor who is writing
19 this paragraph takes it as a well-known fact that
20 ink vias that pierce the substrate, fully pierce
21 the substrate represent thermal barriers to heat
22 flow. That was a well known -- any PHOSITA at
23 this point in time would have known that, and he's
24 just restating that.

1 BY MR. BORSOS:

2 Q. Is there any particular language that
3 leads you to believe he's stating that this
4 insulation property of ink vias was well known?

5 MR. FORGHANY: Objection as to form.

6 A. The specification text does not use the
7 word well known.

8 (Pond Deposition Exhibit 3 was
9 marked for identification.)

10 BY MR. BORSOS:

11 Q. Dr. Pond, you now have in front of you
12 a document that's been marked as Exhibit 3 to this
13 deposition. Can you confirm that that is U.S.
14 Patent No. 7,384,113 to Benjamin, et al.?

15 A. Yes, that's what the document is.

16 Q. And do you recall discussing this
17 document in your declaration?

18 A. I did discuss this document in several
19 places in my declaration.

20 Q. Can you turn to Figure 25A of the
21 Benjamin '113 patent. Can you explain to me what
22 25A is showing?

23 MR. FORGHANY: Objection as to form,
24 calls for a narrative.

1 A. Well, I would like you to point me to
2 where in my declaration you want me to expound on.
3 I explain aspects in different places. Do you
4 have a particular place in my declaration you want
5 to go over?

6 BY MR. BORSOS:

7 Q. We can get to that in a minute. I
8 would like to just discuss the elements that are
9 shown in this figure first. Is it fair to say
10 that the upper portion of Figure 25A is part of a
11 flex circuit of a printing device?

12 MR. FORGHANY: Objection as to form,
13 foundation.

14 A. Everything is part of a flex circuit,
15 the whole structure labeled 2000.

16 BY MR. BORSOS:

17 Q. Okay. And can you describe generally
18 what a flex circuit is intended to do in a
19 printing device?

20 MR. FORGHANY: Objection as to form,
21 relevance.

22 A. In a roof shooter thermal inkjet
23 device, do you mean?

24 BY MR. BORSOS:

1 Q. Yes. Let's discuss roof shooter
2 thermal inkjet devices.

3 A. All right. The flex circuit is a means
4 of interfacing -- it's an interfacing tool between
5 a place in the printer where signals are presented
6 and places on the roof shooter printhead die
7 itself, chip itself, where those signals are
8 received and sent to various functions on the chip
9 itself.

10 Q. And so the chip, which we agreed
11 earlier is the silicon substrate, would be
12 positioned in the area shown by a box at the
13 bottom of this --

14 A. The thing that looks like a single-edge
15 razor blade.

16 Q. And it would connect to the contacts
17 2006 on both sides, correct?

18 MR. FORGHANY: Objection as to form.

19 A. The thermal inkjet chip would be bonded
20 to those fingers 2006.

21 BY MR. BORSOS:

22 Q. And so the portion with all of the
23 circles at the top of this drawing which are
24 labeled with letters and numbers, for instance,

1 E2, GD2, F2, those are all contact points on the
2 flex circuit that connect to the chip through
3 those fingers 2006, correct?

4 A. Those circles are called by Benjamin
5 contact areas. They are meant to connect to the
6 printer.

7 Q. And so those contact areas convey
8 signals between the chip and a portion of the
9 printer that's separate from the flex circuit,
10 correct?

11 MR. FORGHANY: Objection as to form.

12 A. Some contact areas are by direction.
13 They take information from the chip to the contact
14 area, and others are going only from the printer
15 to the chip.

16 BY MR. BORSOS:

17 Q. So let's talk specifically about TSR
18 and TSR RT. Can you explain what those contact
19 areas are intended for in this design?

20 A. The TSR stands for thermal sensitive
21 resistor, and TSR RT stands for thermal sensitive
22 resistor return. So a thermal sensitive resistor
23 is a resistance in a circuit having current, and
24 so the two paths to the two circuit areas, TSR and

1 TSR RT, are helping to form that current path with
2 a TSR that's located on the chip.

3 Q. Is it accurate to say that TSR is an
4 input of current to the chip and TSR RT is an
5 output from the chip to the printer?

6 A. Yes, although I don't believe
7 functionally there's a difference.

8 Q. But either way these are two ends of
9 the current going to and from the temperature
10 sense resistor?

11 A. That's how I interpret it.

12 Q. And so is this indicative that there is
13 a single temperature sense resistor for the
14 printhead die?

15 A. Probably.

16 Q. Are you aware of any other contacts
17 shown in 25A that would relate to the temperature
18 sensor?

19 A. No, but there is a way you could use it
20 to sense different areas on the chip but --

21 Q. Please explain.

22 A. You could pulse heaters in different
23 areas and watch it and learn about different
24 regions from the single output.

1 Q. And would that involve some logic
2 circuitry that's not shown here?

3 MR. FORGHANY: Objection as to form.

4 A. No.

5 BY MR. BORSOS:

6 Q. The contacts TSR and TSR RT simply
7 provide a current path to a temperature sense
8 resistor, correct?

9 MR. FORGHANY: Objection as to form.

10 A. That's the way I understand it.

11 BY MR. BORSOS:

12 Q. And so how is the actual temperature of
13 the printhead die determined?

14 A. Well, a PHOSITA would look at this and
15 interpret it that the resistance value or the
16 voltage drop -- essentially a current is applied
17 to the TSR, TSR RT loop, and then the system looks
18 at the voltage drop that has occurred given that
19 current going through. And then the system has
20 been taught by lookup tables or some other
21 algorithm how that voltage relates to the
22 temperature of the TSR. So the system recognizes
23 a voltage and considers it a temperature of the
24 TSR.

1 Q. And when you say the system looks at
2 the change in voltage and uses lookup tables and
3 so forth, what part of the printer are you talking
4 about?

5 A. The printer will have a portion of its
6 control system that is devoted to temperature
7 management, and that will have some hardware and
8 software and firmware associated with it as a
9 subset of the overall printer controller, and that
10 portion of the printer controller will perform the
11 function I just said.

12 Q. And so this would be something that's
13 not on the chip but, rather, connected to the chip
14 through this flex circuit, right?

15 MR. FORGHANY: Objection as to form,
16 misstates the record.

17 A. Well, here we are talking about
18 Benjamin '113.

19 BY MR. BORSOS:

20 Q. Yes.

21 A. And Benjamin '113 is silent about
22 whether it includes any on-chip temperature
23 control circuitry or firmware. So with just the
24 disclosure of Benjamin '113, I think a PHOSITA

1 would assume what I just talked about is off chip.

2 Q. If it was on chip, would there be any
3 reason to have the contacts TSR and TSR RT?

4 A. Yes.

5 Q. Okay. And does that mean that the on-
6 board component would measure the voltage that's
7 based on the current provided by TSR and TSR RT?

8 MR. FORGHANY: Objection as to form.

9 A. So now you're asking me a hypothetical,
10 that if I put circuitry on the chip, how it would
11 operate? Is that what you're asking me?

12 BY MR. BORSOS:

13 Q. I'm asking you whether -- in a
14 hypothetical situation where a temperature sensing
15 device is managed by something on the chip, would
16 it be necessary to have TSR and TSR RT?

17 MR. FORGHANY: Objection as to form.

18 A. I don't think it would be necessary.

19 BY MR. BORSOS:

20 Q. If you look at Figure 25B, does this
21 also show a flex circuit that includes contacts
22 TSR and TSR RT?

23 A. Yes.

24 Q. And are there any other contacts that

1 you're aware of that would relate to temperature
2 sensing?

3 MR. FORGHANY: Object as to form.

4 A. I can't remember what the C does. I
5 have to see if it says what the C contact does. I
6 think it's associated with the controller but --
7 well, I assume that the C contact is the contact
8 area referred to in column 79, lines 57 through
9 58, where it says, "Control signal contact area is
10 configured to receive a signal for controlling the
11 internal operation of the printhead die, e.g. the
12 CSYNC signal."

13 So it's conceivable that that
14 contributes in some way that I couldn't say, but
15 I'm just saying that's conceivable that that has
16 something to do with a mode of thermal management
17 and then the ID -- the ID contact which -- what is
18 that one called? That's ID -- the ID contact we
19 learned from Benjamin has information about the
20 temperature setpoint for that particular device.

21 BY MR. BORSOS:

22 Q. Would that ID contact convey any
23 information about the temperature sensed on the
24 chip?

1 A. Not to my knowledge.

2 Q. Can you look at the paragraph in column
3 79 starting at line 60.

4 A. "Temperature sense resistor contact
5 area," that one, that --

6 Q. Yes.

7 A. Okay. What was your question?

8 Q. Does that passage indicate that
9 Benjamin '113 is determining a temperature of the
10 entire printhead die?

11 MR. FORGHANY: Objection as to form.

12 A. Well, it says "determine a temperature
13 of the printhead die."

14 BY MR. BORSOS:

15 Q. So is it your understanding that that
16 refers to a single temperature reading coming from
17 this temperature sense resistor?

18 A. At any one moment, yes.

19 Q. And is there anything in Benjamin '113
20 that would indicate that the temperature sensors
21 detect specific regions of the die rather than the
22 temperature of the die as a whole?

23 A. Nothing that I could point to.

24

1 (Pond Deposition Exhibit 4 was
2 marked for identification.)

3 BY MR. BORSOS:

4 Q. Dr. Pond, you now have in front of you
5 a document that's been marked as Exhibit 4 to this
6 deposition. Is it accurate that Exhibit 4 is U.S.
7 Patent No. 6,612,673 to Giere, et al.?

8 A. Yes.

9 Q. And I'm not sure if I'm pronouncing
10 that right but --

11 A. No one knows.

12 Q. Present purposes, should we agree to
13 just refer to it as Giere?

14 A. I would say Giere but --

15 Q. Fair enough.

16 A. -- I don't know.

17 Q. It won't matter for the transcript.

18 A. He's not here.

19 Q. Can you turn to Figure 3 of Giere '603.
20 Now, is it accurate to say that Figure 3 shows an
21 ink cartridge with a flex circuit similar to the
22 one that we discussed in the Benjamin reference?

23 A. It's a flex circuit, but it's different
24 from the Benjamin flex circuit.

1 Q. Fair enough. But can we agree that
2 there are certain similarities like electrical
3 contacts that are shown in the area of the arrow
4 308 and then a printhead that's on the bottom
5 after the flex circuit bends?

6 MR. FORGHANY: Objection as to form.

7 A. Yes.

8 BY MR. BORSOS:

9 Q. I believe that the printhead would be
10 310?

11 A. Yes, the printhead is 310.

12 Q. Just so that I am not mischaracterizing
13 anything, the structure shown by 310 generally is
14 a printhead, but the reference numeral 310, if you
15 look at column 3, is specifically indicating a
16 nozzle or parallel rows of nozzles on nozzle
17 member 306? That's discussed in the last
18 paragraph of column 3.

19 MR. FORGHANY: Can you read back the
20 last question.

21 (Question read.)

22 MR. FORGHANY: Objection as to form,
23 compound.

24 A. So is there a question pending for me?

1 I don't know what it is if there is one.

2 BY MR. BORSOS:

3 Q. Just so that we have a clear record,
4 can we agree that the reference numerals 310 and
5 306 relate to a nozzle member and rows of nozzles,
6 but that rectangular area is the printhead with a
7 silicon chip underneath that nozzle member?

8 MR. FORGHANY: Objection as to form.

9 A. Yes. I think you have to fold in
10 Figure 4, which is right below Figure 3, and
11 realize that what we're looking at in Figure 3 is
12 the nozzle member 306. Because of the particular
13 design of this printhead, it's carrying with it
14 the silicon substrate 410, and together those two
15 things, the nozzle member and the barrier layer
16 412 and the silicon substrate 410, we would call
17 the printhead device.

18 BY MR. BORSOS:

19 Q. Okay. And Figure 5 is a depiction of
20 the silicon substrate 410, correct?

21 A. Yes.

22 Q. Does Figure 5 show an opening that
23 extends through the silicon substrate 410?

24 MR. FORGHANY: Objection as to form.

1 A. I don't believe so.

2 BY MR. BORSOS:

3 Q. And so does this appear to you to be a
4 silicon chip where ink is supplied at the outer
5 edges of the chip?

6 A. Yes. This is an edge fed -- the ink
7 feed edge is on the outer edge of the silicon chip
8 where the heater resistors and ink chambers and
9 nozzles are located as illustrated in Figure 4.

10 Q. Can you tell me what element 510 is?

11 A. 510 is a thermal sense resistor or a
12 temperature sensing resistor. Either TSR phrase
13 seems to be interchangeable.

14 Q. And does that temperature sense
15 resistor 510 detect a temperature of the chip as a
16 whole?

17 MR. FORGHANY: Objection, form.

18 A. It detects the temperature of where it
19 is placed, and that temperature of where it is
20 placed changes over time and eventually comes to
21 equilibrium at which time the sensor will read the
22 same as the chip would read.

23 BY MR. BORSOS:

24 Q. In your opinion how many ink vias are

1 there for the chip shown in Figure 5?

2 MR. FORGHANY: Objection as to form.

3 A. Two.

4 BY MR. BORSOS:

5 Q. Okay. And can you describe the
6 placement of those ink vias?

7 A. You can sort of see them in Figure 3
8 where the indicator from the 310 label goes to the
9 rectangle and we have -- we mistakenly thought
10 that was the chip, but it turned out that that was
11 instead the nozzle row.

12 That double line right where that 310
13 arrow ends is conveying a slit, and it's where the
14 ink is. It's underneath the nozzle material 306.
15 It's coming up around the edges between the outer
16 edge of the chip and an inner edge of a plastic
17 manifold that the chip has been thrust down into.

18 So the via is a wall of silicon and a
19 wall of plastic, and the feed edge is the edge of
20 the silicon, and there are two of them, one on
21 both sides.

22 Q. So let's focus on, in Figure 5, the ink
23 feed edge to the right.

24 A. All right. The side where the 530

1 arrow points.

2 Q. Yes. Is it fair to say that your
3 opinion is that that edge constitutes an ink via
4 within the meaning of the '708 patent?

5 A. Yes.

6 MR. FORGHANY: Objection to form.

7 BY MR. BORSOS:

8 Q. Does Giere '673 show a heater array
9 disposed along each side of that right ink feed
10 edge?

11 A. No.

12 Q. Same question with the ink feed edge to
13 the left, which is where arrow 520 points
14 generally.

15 A. And the question is?

16 Q. Does that show a heater array on each
17 side of that left ink feed edge?

18 A. No, but it does show it along one side
19 of the feed edge.

20 Q. Is there anything in Giere '673 that
21 describes detecting a temperature of multiple
22 regions of the die using temperature sense
23 resistor 510?

24 MR. FORGHANY: Objection as to form.

1 A. Not using 510. It does detect multiple
2 regions using other of its sensors.

3 BY MR. BORSOS:

4 Q. Can you generally tell me what those
5 other sensors are used for?

6 A. Apparently Giere is aware of the
7 operation of a printhead having hot spots because
8 of the way the data is presented to the printhead,
9 and so apparently that's a problem they want to
10 look out for, and so he has positioned some
11 sensing means in different places along the
12 vertical direction of the printhead, along the
13 long direction of the printhead, to detect these
14 hot spots.

15 Q. And how do the temperature sensors used
16 to detect those hot spots differ from temperature
17 sense resistor 510?

18 A. I'm not sure. I don't remember the
19 detail of how they're made.

20 (Recess taken.)

21 (Pond Deposition Exhibit 5 was
22 marked for identification.)

23 BY MR. BORSOS:

24 Q. Dr. Pond, you have in front of you a

1 document marked as Exhibit No. 5. Is this U.S.
2 Patent No. 6,565,178 to Giere, et al.?

3 A. Yes.

4 Q. In preparing for your deposition today,
5 did you have any change to how you viewed this
6 reference relative to your discussion and your
7 declaration marked as Exhibit 1?

8 MR. FORGHANY: Objection as to form.

9 A. I did in the sense that I realized that
10 I should have explained more fully what I was
11 saying, and so I did -- I did wish I had been more
12 fulsome in my explanation.

13 BY MR. BORSOS:

14 Q. Can you expand upon that answer?

15 A. Yes. I say at one point that a PHOSITA
16 would realize that the vias of Giere '178's
17 Figure 3 are in the centers of his rectangular
18 areas of heaters and nozzles, 302, 304, 306, and
19 308, and the reason that a PHOSITA would realize
20 that or one of the many reasons a PHOSITA would
21 realize that was that the ink vias, the feed
22 edges, have to be very, very close to the heaters
23 and nozzles, and I left it at that.

24 I should have gone on to say at most a

1 couple hundred microns away is what very close
2 means, and a PHOSITA would have understood that as
3 general knowledge in the roof shooter inkjet
4 field. And I looked for things that would
5 corroborate that view, and I found some things
6 that corroborate that view that I considered.

7 In fact, I wrote about it in a book on
8 inkjet technology that I wrote 23 years ago. So
9 that corroborates that concept that they need to
10 be very close. So, yes, I had those thoughts.

11 Q. So is it your opinion that in Giere
12 '178, each of the rectangular regions, 302, 304,
13 306, and 308, of Figure 3 contains an individual
14 ink via?

15 A. Yes.

16 Q. Can you turn to column 3 at the
17 paragraph beginning at line 34.

18 A. I'm there, yes.

19 Q. Do you see in the fourth line of that
20 paragraph, so column 3, line 37, there is a
21 sentence that says, "Ink is then fed to the
22 various ink ejection chambers either through an
23 elongated hole formed in the center of the bottom
24 of the substrate 'center feed,' or around the

1 outer edges of the substrate, 'edge feed'?"

2 A. I see that sentence.

3 Q. Is it your understanding that that
4 describes two options for the feeding of ink --

5 A. It's a generalized statement and
6 it's -- it's not accurate, but it's a generalized
7 statement.

8 Q. How is it inaccurate?

9 A. Well, it's conveying the idea that
10 the -- the edge feed idea is kind of unambiguous.
11 The edges are where -- are the edges of the chip,
12 but the center feed concept is -- it's not in the
13 center of the chip. It's in the center of the
14 heater arrays is where the feed edge needs to be.
15 And the heater arrays are quite often not centered
16 on the chip. They're to one side or the other if
17 it's a monochrome chip, or they're multiple heater
18 arrays in a polychrome chip, and so there would be
19 multi vias, and they're not in the center of the
20 chip. They're in the center of the heater arrays.

21 So the word center is what is
22 misleading. It's sort of -- I think it would have
23 been better to say -- within the interior of the
24 chip is the more accurate way of saying it rather

1 than center.

2 Q. So are you saying that this discussion
3 of center feed at column 3 of the '178 patent is
4 inconsistent with your interpretation of Figure 3?

5 A. It's not inconsistent. It's just that
6 he is speaking to a different configuration than
7 what's in Figure 3. He's speaking to one
8 particular configuration, not all configurations.

9 Q. And can you tell me why you believe
10 based on the '178 patent that those rectangular
11 areas, 302, 304, 306, and 308, include ink vias
12 rather than simply heater arrays that are adjacent
13 to a central ink via?

14 A. Well, I go over that in my declaration.
15 So let me find the place in my declaration where I
16 discuss that. It's discussed in some different
17 places, but mostly it's in Ground 3, which would
18 be page 163. Let me find that.

19 So on page 163 of my declaration,
20 starting with the discussion of the limitation,
21 "a plurality of ink vias arranged parallel to one
22 another, each of the ink via having two
23 longitudinal sides.'" So starting with that, I
24 have an extensive discussion of why I believe

1 that. If you would like me to read that, I'll be
2 happy to go through and read it for you.

3 Q. Sure. Let's go through that piece by
4 piece.

5 A. Okay. So at first I point out that the
6 '708 patent illustrates that prior art heater
7 chips included a plurality of ink vias arranged
8 parallel to one another, so that and just general
9 PHOSITA knowledge in the inkjet area knows that as
10 a start, that it's a common thing to have -- a
11 well-known thing to have multiple parallel vias in
12 a chip and that's --

13 Q. To stop right there, are you indicating
14 that you have used the '708 patent to interpret
15 the meaning of Figure 3 of Giere '178?

16 MR. FORGHANY: I'm sorry. What was the
17 question?

18 A. No.

19 MR. FORGHANY: Can you repeat the
20 question.

21 (Question read.)

22 MR. FORGHANY: Objection, form,
23 misstates the prior testimony.

24 A. Not to interpret; just to set the stage

1 that it's common knowledge. It's PHOSITA
2 knowledge. The '708 admits that as well.

3 BY MR. BORSOS:

4 Q. Can you tell me what you're referring
5 to as being common knowledge from the '708 patent?

6 A. That you can have a plurality of ink
7 vias arranged parallel to one another, each ink
8 via having two longitudinal sides.

9 Q. And can you explain the relevance of
10 that piece of information to Figure 3 of Giere
11 '178?

12 A. Because, as I'm going to later explain,
13 the rectangular areas 302, 304, 306, and 308 are
14 such a plurality of vias arranged parallel to one
15 another.

16 Q. And go on and explain to me why 302,
17 304, 306, and 308 represent vias.

18 A. Okay. So Giere's Figure 3 shows a
19 high-level schematic diagram of an embodiment of
20 the temperature measurement system implemented
21 upon an embodiment of a printhead. As Giere '178
22 explains, the printhead substrate 300 includes the
23 structures of a typical printhead such as ink feed
24 slots, in plural, ink feed slots, it says, ink

1 ejection chambers, firing resistors, et cetera.

2 So I previously pointed out that a
3 PHOSITA would understand that ink feed slots,
4 which is what Giere '178 says in words, are
5 synonymous with ink vias, as both are elongated
6 holes formed in the substrate for allowing ink to
7 pass from an ink reservoir to ink ejection
8 chambers.

9 And Giere '178 discloses printheads
10 include an elongated hole formed in the center of
11 the bottom of the substrate. That's just the
12 passage we were reading before that you wanted me
13 to read.

14 So the idea of an ink feed slot as an
15 elongated hole is present -- is something a
16 PHOSITA can read in Giere '178, and Giere says
17 that his Figure 3 holds plural of such slots in
18 his -- in his column 8, lines 45 through 47. So
19 he says that.

20 And then I go on to say that in my
21 opinion Giere's ink feed slots are located in the
22 elongated regions 302, 304, 306, and 308 of
23 substrate 300 as colored in orange in the figure I
24 have replicated in my declaration. And in support

1 of this, Giere states that these regions 304
2 through 308 each include an array of nozzles and
3 associated firing resistors for ejecting ink.

4 So in my opinion because Giere '178
5 describes these regions as including nozzles and
6 associated firing resistors, these regions must
7 also include ink ejection chambers because you
8 have to have that around the heaters because, as
9 Giere explains, typical inkjet printheads have
10 nozzles and firing resistors co-located with ink
11 ejection chambers.

12 So again I quote where Giere says that
13 at column 2, line 59 through column 3, line 4.

14 Q. Let's pause there. Up to this point,
15 has any of the information that you have gone over
16 indicated a specific placement of ink vias within
17 the regions 302, 304, 306, or 308?

18 A. Yes, the fact that the heaters -- the
19 heaters, the nozzles are there informs us that the
20 ink feed edges will be there as well, and if the
21 ink feed edges are there, then the vias are there.
22 The ink feed edges have to be very close to those
23 nozzles and heater resistors.

24 Q. And how do you know that Giere '178 is

1 not describing areas 302 and 304 as containing
2 heater arrays with a central ink via between those
3 rectangular regions 302 and 304?

4 A. Well, although the drawing is not to
5 scale, just the fact of the long, skinny
6 rectangular shape of the areas 302 and 304 convey
7 a sense of scale to me, as well as the fact that
8 the thermal sense resistors have been placed on
9 the area in between those rectangles.

10 That says to me as a PHOSITA that the
11 area in between the rectangles is where the power
12 drivers and the addressing logic is going to be,
13 and it would not be an ordinary or suitable place
14 to put an ink via. The ink vias naturally,
15 ordinarily belong inside those rectangles.

16 Q. Can you explain to me how those
17 rectangles or anything else in Figure 3 conveys a
18 sense of scale?

19 A. The long, skinny nature of the
20 rectangle conveys to me the picture all PHOSITAs
21 have in their heads of what a column of inkjet
22 nozzles and heaters looks like laid out on a
23 printhead. That's what it looks like.

24 Q. Okay. So that would be consistent with

1 Figure 3 showing rectangular boxes 302 and 304 as
2 an area containing heaters and nozzles, correct?

3 A. It's consistent with that, and then
4 that leads to the via -- the ink feed edge being
5 nearby.

6 Q. Nearby.

7 A. Very close.

8 Q. Okay. And is there any reason why that
9 ink feed edge would necessarily need to be within
10 that box, the rectangle 302 or the rectangle 304?

11 A. It's the only ordinary, sensible place
12 to put it.

13 Q. What about midway between 302 and 304?

14 A. That's too far away.

15 Q. How do you know?

16 A. The short edge of the rectangular box
17 is conveying the at most length away that the via
18 could be, and really it's half the width of that
19 rectangular box since I believe there are heater
20 arrays on both sides of the rectangle. Then the
21 scale for where the ink via could be is about half
22 the narrow dimension of the rectangle, which in
23 the middle is the sensible place.

24 Q. And what do you base that conclusion

1 on?

2 A. On general knowledge that in order to
3 achieve acceptable drop repetition frequency, the
4 supply of ink to refill after a drop is fired has
5 to be within one or two jet spacings away from the
6 heater resistor, so that for a 300-spot-per-inch
7 device, the rule of thumb -- that's 85 microns of
8 separation. That's the scale of the inkjet
9 processes going on. Two or three times 85 microns
10 is the most it can be. So that says maybe 240
11 microns away for a very slow frequency.

12 If it's at 600 spots per inch, that's
13 42 microns. So two or three is 80 to 120 microns
14 away. And that's something that's been learned
15 since the mid to late '80s that has been standard
16 practice for a roof shooter thermal inkjet device,
17 as I say in my textbook, Inkjet Technology and
18 Product Development Strategies, that I wrote in
19 2000.

20 In my chapter on printhead design, it
21 makes note of that, and this material in this
22 textbook that I wrote is the material that I used
23 to use to teach my new engineers. This is the
24 kind of PHOSITA knowledge that they acquire in

1 that first year or two working on inkjet. It's
2 very standard.

3 Q. And this textbook that you're referring
4 to as you wave around a document, was this
5 referred to in your declaration?

6 A. No.

7 Q. Is there anything in Giere '178 that
8 indicates the measurements of the edges of the
9 chip shown in Figure 3?

10 A. I think the rectangles showing where
11 the heaters, the nozzles are is the best scale
12 indicator he provides, and I think the rest of the
13 chip has a representative scale based on that.

14 Q. So just to be clear, is there anything
15 in Giere '178 that describes the measurement of
16 the upper and lower edges of the chip shown in
17 Figure 3?

18 A. There are no words that describe it.

19 Q. And is there anything in Giere '178
20 that indicates a measurement of the vertical
21 edges, the left and right edges of the chip shown
22 in Figure 3?

23 MR. FORGHANY: Objection to form.

24 A. There are no words that say it.

1 BY MR. BORSOS:

2 Q. When we looked at column 3 of Giere
3 '178 earlier, we saw that they referred to the
4 possibility of an edge feed, correct?

5 A. Yes.

6 Q. Is it your opinion that Figure 3 is
7 inconsistent with an edge feed?

8 A. Yes.

9 Q. And what leads you to that conclusion?

10 A. Firstly, the edge is too far away --

11 Q. And how --

12 A. -- from the place where the heaters and
13 nozzles are, which are along the long edges of 302
14 through 308 rectangles. So the outer edges -- the
15 outer long edge -- well, first of all, the short
16 edge, I've never seen an edge feed from a short
17 edge of a column of -- so those edges we can
18 discount as never having been done.

19 Q. And when you refer to a short edge, can
20 you tell me what you're referring to?

21 A. The short edge of the rectangle 302,
22 for example, the edge that's adjacent -- the edge
23 of the chip that's adjacent the short edge of
24 rectangle 302.

1 Q. In other words, in Figure 3 the top and
2 bottom boundaries of the chip?

3 A. If we want to view it vertically --
4 yes, if we want to orient it that way, yes. The
5 top and bottom of the chips totally never seen
6 before. The left and right edges are too far
7 away -- first of all, they're too far away from
8 the long edges of the rectangles for ink refill to
9 be sensible and ordinary.

10 Secondly, Giere has put his current
11 source connections along those edges. That would
12 be totally incompatible with feeding ink over top
13 of a current source.

14 Thirdly, Giere has put thermal sense
15 resistors between his heaters and those left and
16 right edges. That would also be inconsistent and
17 not ordinary for a PHOSITA to do for an ink feed
18 edge. So for at least those three reasons, yes, I
19 think Figure 3 is incompatible with edge feeding.

20 Q. Let's go back to the issue of distance.
21 What is your understanding of the distance between
22 304 and the right side edge of the chip shown in
23 Figure 3?

24 A. Between 304 and the right side edge of

1 the chip, it's about six times -- six to eight
2 times farther away than the width of the area of
3 the heaters and nozzles indicated in 304, six to
4 eight times away.

5 Q. And what can you conclude from that
6 about the absolute distance?

7 A. At least 4000 microns, maybe more.

8 Q. And what do you base that number on?

9 A. I'm giving the rectangles at least 600
10 microns wide, and I'm saying six times that would
11 be 3600, and I'm rounding it up a little bit, so
12 3600 to 4000 microns.

13 Q. How do you conclude that the box 304 is
14 600 microns wide?

15 MR. FORGHANY: Objection, misstates the
16 testimony.

17 A. I'm giving each row of drop generators
18 a couple hundred microns, and I'm giving the ink
19 feed a couple hundred microns. So I'm giving it
20 200, 200, 200 of width.

21 BY MR. BORSOS:

22 Q. So your opinion that the box 304 is 600
23 microns wide is based on the assumption that it
24 includes two columns of drop generators and an ink

1 via, correct?

2 MR. FORGHANY: Objection as to form,
3 misstates testimony.

4 A. Yes.

5 BY MR. BORSOS:

6 Q. And your opinion that the ink via is
7 contained in box 304 is based on the distance of
8 box 304 from the edge of the chip, correct?

9 MR. FORGHANY: Objection as to form.

10 A. No.

11 BY MR. BORSOS:

12 Q. Okay. What do you base your opinion
13 that the box 304 contains an ink via on?

14 A. That the ink feed edge has to be very
15 close, within a couple hundred microns, of the
16 heater array.

17 Q. And how do you know the scale of the
18 chip drawn on Figure 3?

19 A. It's a thermal inkjet -- it's supposed
20 to represent a thermal inkjet chip. I know the
21 dimensions of thermal inkjet chips. A PHOSITA
22 knows how big thermal inkjet devices, drop
23 generators, feed lines, all that stuff -- that's
24 common knowledge to a PHOSITA --

1 Q. Okay.

2 A. -- to me as a PHOSITA.

3 Q. And what is the size of a thermal
4 inkjet chip?

5 A. Typically, they have a certain length
6 based on how many nozzles are in the row, so that
7 can vary. There can be 100. There can be 750.
8 And it could be anywhere from a quarter of an inch
9 to inch and a half long. So that dimension can be
10 something in the neighborhood of 6000 microns to
11 30,000 microns. Then the width of the chip
12 depends on how many ink vias there are, how many
13 heater arrays there are per ink via. The
14 addressing scheme has to do with how much logic
15 has to be fit in. There have to be power drivers
16 for everybody.

17 So that's based on just the number
18 and -- number of heater arrays and the number of
19 vias there are. And then the addressing lines
20 trade off with the complexity of the logic,
21 whether you have shift registers or you don't and
22 how many addressing lines.

23 So typically I would say a rule of
24 thumb would be that you would have about 700

1 microns per heater array in width plus 200 microns
2 per via. That would be a ballpark, a PHOSITA
3 ballpark.

4 Q. Is there any information in Giere '178
5 that indicates the width of the chip in Figure 3?

6 A. The rectangles, the 304, 302, 306, 308,
7 give me, a PHOSITA, a sense of the chip, because
8 he says those are typical inkjet components. He
9 uses that word typical. A chip contains the
10 typical components of a thermal inkjet chip. So
11 I'm thinking PHOSITA typical, ordinary, the way --
12 you know, this patent was filed -- this patent was
13 filed in 2001 for Giere. There had been 20 years
14 of thermal inkjet development before this patent.
15 So there's a lot of PHOSITA knowledge.

16 Q. So are your assumptions about the
17 relative scale of the boxes 302, 304, 306, and 308
18 based on an assumption that those boxes are drawn
19 to scale relative to the perimeter of the chip
20 that's drawn in Figure 3?

21 MR. FORGHANY: Objection, misstates the
22 testimony, asked and answered.

23 A. I don't think to scale, no. I think
24 they're just -- they're representative, though.

1 They're not just made up out of thin air. There's
2 a sense of the real thing conveyed by it, but it's
3 not to scale.

4 BY MR. BORSOS:

5 Q. So, Dr. Pond, if the boxes 302, 304,
6 306, and 308 in Figure 3 are not drawn to scale,
7 how can you draw a conclusion about their distance
8 from a hypothetical central ink feed edge?

9 A. I think they're representative of what
10 they contain. I don't think they're drawn to
11 scale because I don't believe we know -- for
12 example, the length would be dictated by the
13 number of drop generators in each heater array,
14 and since he doesn't say what that number is for
15 his Figure 3, it's not anchored in a number like
16 how many jets times the jet spacing, but, on the
17 other hand, he's drawn it not as a blob but as a
18 long, skinny rectangle.

19 And to me he's conveying to a PHOSITA
20 here is where your heater arrays and ink feed is.
21 I am going to show you where I am going to put my
22 thermal sense resistors around those places to
23 sense different regions.

24 Q. Let's look at column 8 of Giere '178.

1 A. All right.

2 Q. I believe this was referenced in your
3 declaration. Starting at line 47 of column 8 --

4 A. Where is the reference in my
5 declaration that you are asking about?

6 Q. I believe that this is what you pointed
7 to earlier but that's --

8 A. All right. Column 8, line what?

9 Q. Forty-seven.

10 A. Forty-seven. Okay. "Although not
11 shown in FIG. 3 for ease of illustration,
12 substrate 300 includes the structures of a typical
13 printhead..." that sentence? Yes, it's in my
14 declaration.

15 Q. And then it says, "Regions 302, 304,
16 306, and 308 each include an array of nozzles and
17 associated firing resistors for ejecting ink,"
18 correct?

19 A. Yes.

20 Q. Is there any indication there that
21 regions 302, 304, 306, and 308 also include ink
22 feed slots?

23 MR. FORGHANY: Objection to form, asked
24 and answered.

1 A. Yes, because the ink via is part and
2 parcel of the drop generator. He is saying that
3 those regions have the drop generators in them,
4 and part and parcel of that is very close ink
5 refilling, within the same scale of those drop
6 generators, and so if they're there, the feed is
7 there. He doesn't say it in words, but that's the
8 fact of thermal inkjet.

9 BY MR. BORSOS:

10 Q. So there is nothing in Giere '178 that
11 indicates that the ink vias are contained in
12 regions 302, 304, 306, and 308?

13 A. Yes. He says for ejecting ink, for
14 ejecting ink. The whole mechanism and hardware
15 for ejecting ink is there in 302 and 304 and 306
16 and 308, and part of that is the ink refill.

17 Q. So do inkjet printheads generally
18 contain drive transistors that cause the ejectors
19 to heat and eject ink?

20 A. Generally they do.

21 Q. Is it your opinion that the drive
22 transistors would be contained in those regions
23 302, 304, 306, and 308?

24 A. No.

1 Q. Why not?

2 A. Because they're not part of the
3 ejecting ink mechanism.

4 Q. They cause the ink ejector to heat up,
5 correct?

6 A. They can, but they're not necessary for
7 that.

8 Q. What else would cause the ink ejector
9 to heat?

10 A. An off-chip pulse. Drivers don't have
11 to be there.

12 Q. But an off-chip pulse could be used to
13 eject ink in your opinion?

14 A. Yeah.

15 Q. And would that off-chip pulse come from
16 something that's within regions 302, 304, 306, or
17 308?

18 A. The off-chip pulse comes from off chip.

19 Q. So your answer is no?

20 A. It's in the printer. Yes. It's no.

21 Q. So that device that heats the actuator
22 could be from an area that's not within regions
23 302, 304, 306, or 308 in your opinion, correct?

24 MR. FORGHANY: Objection, form,

1 misstates the testimony.

2 A. Ask me the question a little more
3 slowly.

4 BY MR. BORSOS:

5 Q. Can the device that causes the firing
6 resistors be located outside of regions 302, 304,
7 306, and 308?

8 A. Yes.

9 Q. So how is that consistent with your
10 conclusion that 302, 304, 306, and 308 must
11 include all of the elements required to eject ink?

12 A. I don't see that it's inconsistent.
13 Essentially what I'm saying is that within the 302
14 we have the guts of the drop generators. It's
15 where the heaters and nozzles, ink chambers, ink
16 feed is. That's it. That's why they're long and
17 skinny that way.

18 Q. So is it your conclusion that an ink
19 via is part of the, quote, drop generator, end
20 quote?

21 MR. FORGHANY: Objection, misstates
22 testimony.

23 A. Ink feeding is part of the drop
24 generator design -- region, part of the drop

1 generator region. As I say in my textbook that I
2 waved around before -- if you want an explanation,
3 it's on page 120 of my textbook where I show the
4 schematics of a roof shooter drop generator, and
5 this refill region is what we're talking about
6 right here. That's part and parcel of the
7 architecture of the drop generator.

8 Where it is, how long that distance is
9 between the heater and the ink supply is all a
10 part of the PHOSITA knowledge that goes into
11 reading these patents.

12 MR. FORGHANY: Because this is a
13 deposition, your gestures with your hands
14 aren't going to be transcribed. Can you just
15 for the record confirm what you were pointing
16 to when you were saying that?

17 THE WITNESS: I was pointing to Figure
18 4.19 of the book that I wrote in -- that was
19 published in the year 2000 entitled Inkjet
20 Technology and Product Development Strategies
21 by Stephen F. Pond, published by Torrey Pines
22 Research in Carlsbad, California, copyright
23 of 2000, Torrey Pines Research.

24 And the diagram or the figure that

1 I just showed shows the heart of the roof
2 shooter architecture that's called a drop
3 generator.

4 MR. BORSOS: All right. Fine. Let's
5 mark that as an exhibit.

6 (Pond Deposition Exhibit 6 was
7 marked for identification.)

8 BY MR. BORSOS:

9 Q. And am I to assume that this is your
10 only copy of the document?

11 MR. FORGHANY: I have --

12 A. Well, you take the exhibits back,
13 right --

14 BY MR. BORSOS:

15 Q. Yes.

16 A. -- when we're done? I'll just put it
17 in the pile.

18 Do you want to look, compare them?

19 Q. Yes.

20 MR. FORGHANY: Here is another copy for
21 the reporter.

22 THE WITNESS: What is this one for?

23 MR. FORGHANY: Just another copy.

24 MR. BORSOS: You can keep that.

1 THE WITNESS: We don't need it. I'm
2 going to have the marked one until the
3 deposition is done, and then it will go into
4 the record.

5 BY MR. BORSOS:

6 Q. All right, Dr. Pond. I believe that
7 you were referring to Figure 4.19 in the document
8 that's been marked as Exhibit 6; is that correct?

9 A. Just now, yes, I was.

10 Q. And you believe that this would inform
11 a person of ordinary skill as to what is included
12 in a drop generator?

13 A. Yes, yes.

14 Q. So your conclusion is that the drop
15 generator includes the heater, the barrier layer
16 around it, the nozzle, the refill region, and the
17 ink via that goes to the ink supply; is that
18 accurate?

19 A. Well, that's part of the refill region.

20 Q. Okay. So you believe that the ink via
21 is part of the refill region?

22 A. Yes.

23 Q. And that's based on this textbook that
24 you wrote?

1 A. No. It's based on PHOSITA knowledge,
2 common knowledge, ordinary knowledge in the
3 thermal inkjet region. I captured it in this
4 book, but it's not based on that book.

5 Q. Does the '178 patent to Giere refer to
6 a drop generator?

7 A. I don't believe so.

8 Q. So when it says at column 8, line 47
9 through 49 that regions 302, 304, 306, and 308
10 each include an array of nozzles and associated
11 firing resistors for ejecting ink, does that
12 indicate that all of those elements you referred
13 to as a drop generator are included in areas 302,
14 304, 306, and 308?

15 MR. FORGHANY: Could you read back the
16 question.

17 (Question read.)

18 A. I believe that those words, typical --
19 structures have a typical printhead such as ink
20 feed slots, ink ejection chambers, firing
21 resistors, et cetera, and then go on to position
22 aspects of that, the heater resistors and the
23 nozzles, as conveying typical drop generators.

24 BY MR. BORSOS:

1 Q. And is it accurate that those typical
2 structures of printheads such as ink feed slots,
3 ink ejection chambers, firing resistors,
4 et cetera, are described by Giere '178 as being on
5 substrate 300?

6 A. Yes.

7 Q. Does Giere '178 say that all of those
8 structures are within regions 302, 304, 306, and
9 308?

10 A. I believe he means that when he says
11 for ejecting ink.

12 Q. Firing resistors are for ejecting ink,
13 right?

14 A. Well, nozzles too, but, see, I think
15 the word include -- when he says regions 302, 304,
16 306, and 308 each include, I think that meaning is
17 like the word comprise in a patent. It means
18 they're there. That's not the only thing that's
19 there. The other typical structures of a
20 printhead are there.

21 He's just further elaborating for the
22 reader some of the typical structures, and I think
23 the reason he includes the heater in his
24 elaboration where he uses the word include, firing

1 resistors, is to further clarify where the heat
2 sources are. The heat sources are there in 302,
3 304, 306, and 308. So I think he does that to
4 alert the PHOSITA that the heat sources are in
5 those rectangles.

6 Q. So when you say that the word include
7 means that there could be other things there, is
8 there anything in Giere '178's description that
9 states that regions 302, 304, 306, and 308 include
10 an ink via?

11 A. I think the fact that he says typical
12 printhead structures means that the ink via will
13 be included.

14 Q. Is the term typical printhead
15 structures used in the sentence describing what is
16 included in regions 302, 304, 306, and 308?

17 MR. FORGHANY: Objection as to form.

18 A. In this particular case, because of his
19 elaboration, except for the et cetera -- he's got
20 this et cetera there. Except for that ambiguity,
21 I think all that stuff is in 302, 304, 306, and
22 308. The ink feed slots, the ink ejection
23 chambers, the firing resistors, and the nozzles
24 are the components of the drop generators. He's

1 saying that the drop generators are in 302, 304,
2 306, and 308. To me as a PHOSITA, that's what it
3 says.

4 BY MR. BORSOS:

5 Q. How can you conclude that all of those
6 structures mentioned as included but not shown on
7 substrate 300 are specifically within regions 302,
8 304, 306, and 308 rather than somewhere else on
9 substrate 300?

10 A. Because that long, skinny rectangle is
11 the classic shape and location of all those things
12 in countless thermal inkjet printheads, and a
13 PHOSITA would look at that figure and see those
14 rectangles for what I just said.

15 Q. So the region including the nozzles of
16 an inkjet printhead could be broadly represented
17 as a long, skinny rectangle, right?

18 A. It would be, yes.

19 Q. And could the area that just includes
20 the heaters be represented as a long, skinny
21 rectangle?

22 A. Yes, it is in some of these patents.
23 We see heater arrays, just a rectangle.

24 Q. So a long, skinny rectangle is

1 consistent with a depiction of heaters that are in
2 a row or column without depiction of an ink via,
3 correct?

4 A. I don't know what that question means.

5 Q. Can you depict a column of heaters as a
6 long, skinny rectangle without showing the ink
7 via?

8 MR. FORGHANY: Objection as to form.

9 A. Yeah. It's done in the '708 patent,
10 separate box for the heater arrays and a different
11 oval shape for the slots. It can be done, yes,
12 but I am saying that whenever you see the long,
13 skinny rectangle for the heater array, the ink via
14 edge is going to be right next to it, absolutely
15 right next to it on a scale of 100 microns.

16 BY MR. BORSOS:

17 Q. In Figure 3 of Giere '178, do you know
18 how wide the nozzles are?

19 MR. FORGHANY: Objection as to form,
20 asked and answered.

21 A. No, I don't.

22 BY MR. BORSOS:

23 Q. Do you know how wide the heater
24 resistors are?

1 A. No, I don't.

2 Q. Is there any indication of how wide the
3 ink via is?

4 A. No.

5 Q. So how can you conclude that the
6 rectangles 302, 304, 306, and 308 would be too far
7 from a central ink feed edge to properly operate?

8 A. I thought you already asked me that.
9 Didn't you ask me that about an hour ago or hour
10 and a half ago?

11 Q. You really haven't explained it.

12 A. Yes, I did. I explained to you that
13 those rectangles, the width of them, in my opinion
14 contain the drop generators on two sides with the
15 ink via between.

16 Q. But --

17 A. And then I know and a PHOSITA knows
18 that an ordinary inkjet printer will print 300 to
19 1200 dots per inch. That's ordinary, normal.
20 Giere doesn't tell us that. So because he doesn't
21 say what resolution his exemplary printhead is
22 meant to represent, we don't know how to estimate
23 those dimensions within that range, but that's
24 only a range between 85 microns -- 83.3 microns

1 for the 300-per-inch device and 23 microns for the
2 1200-dot-per-inch range.

3 So we don't know how to estimate what's
4 being conveyed for the width of that region 302
5 absolutely, but we do know how to estimate it in
6 the range of 600-ish microns, maybe down to 500,
7 somewhere in that range, based on ordinary thermal
8 inkjet printhead practice when Giere was written
9 and when Barkley was written.

10 Q. So is it accurate to say that your
11 conclusion that the ink vias are contained in
12 regions 302, 304, 306, and 308 depends on a
13 particular resolution of the device in Figure 3,
14 the boxes 302, 304, 306, and 308, drawn to a
15 particular scale relative to the illustrated chip
16 300 and the relative dimensions of the length and
17 width of each of boxes 302, 304, 306, and 308
18 being accurately drawn to scale?

19 MR. FORGHANY: Objection, misstates
20 prior testimony, compound.

21 A. No. All that stuff -- you had too many
22 definitive adjectives and adverbs in there. No.

23 BY MR. BORSOS:

24 Q. So we can agree that there are no

1 dimensions for nozzles and heaters described in
2 Giere '178, correct?

3 A. Only in the general sense that he's
4 describing a printer -- an ordinary inkjet
5 printer. He shows a picture of one. He talks
6 about them, and we know as PHOSITAs the range that
7 that means that exist. There are no thermal
8 inkjet printers that have nozzles small -- at this
9 point in time, there were none that had nozzles
10 smaller than some number. There were none that
11 had nozzles bigger than some number that a PHOSITA
12 would carry around with him. So within that range
13 a PHOSITA could understand this drawing; outside
14 that range, no.

15 Q. But doesn't that assume that the
16 drawing is to scale?

17 A. No. It assumes it's representative. I
18 know it can't be to scale because I know that
19 these rectangles, if drawn to scale, wouldn't fit
20 on this page. So I know -- because my -- part of
21 the problem with microelectronic devices is
22 they're impossibly tiny, and our ordinary
23 understanding of dimensions and scales doesn't
24 help us enough.

1 For example, this piece of paper, the
2 thickness of that piece of paper is 75 microns.

3 So when I say that this via, the via inside here,
4 is probably a couple hundred microns, I'm talking
5 about only three sheets of paper thickness.

6 So to draw that in real life, you can't
7 get the ink and pen to write that skinny. So,
8 yes, these kinds of rectangles are representative.
9 They convey the picture -- long and skinny is a
10 truth. They are much longer than they are skinny,
11 but in truth they're way much longer than they are
12 skinny. So this isn't accurate from that point of
13 view, and a PHOSITA wouldn't need it to be
14 accurate for that point of view to understand
15 what's going on.

16 Q. Well, given all that, how could a
17 PHOSITA conclude that the ink vias must be within
18 those rectangular regions 302, 304, 306, and 308
19 because, otherwise, they would be too far from an
20 ink feed edge?

21 A. Because a PHOSITA would look at this
22 drawing and see the long and skinny shapes and
23 recognize them to represent two drop generators on
24 both sides of a via. He would just look at this,

1 and his ordinary knowledge would say that's what
2 they are.

3 He would see it as a four-color
4 printhead, four regions, cyan, magenta, yellow,
5 and black. It's an old but ordinary layout of a
6 multicolor chip. He would look at that, and he
7 would think to himself Giere wants to show us how
8 to thermally sense a printhead that's got multiple
9 regions. That's what he'd do. That's my
10 testimony.

11 Q. So really it's not the distance from
12 the ink feed edge that leads you to your
13 conclusion but, rather, that a rectangular shape
14 in your mind shows an ink via with two arrays of
15 drop generators?

16 A. They're both together. They're not
17 separable ideas. The reason that it's long and
18 skinny is because the ink feed edge has to be so
19 close and the array of heaters is long. So the
20 length comes from the row of heaters, which comes
21 from how many jets you want to print with. The
22 skinny part comes from -- drop generators aren't
23 very big, and the ink via has to be very close.
24 So the combination gives you a long, skinny

1 region. It just falls out of the physics and
2 engineering.

3 Q. An ink via on its own is a long, skinny
4 region, right?

5 A. Only because that's the most cost-
6 effective thing. You could make it a giant wide
7 ink via and waste all your money of your wafer
8 processing.

9 Q. So you could have a big hole in the
10 center of Figure 3 that was actually forming two
11 ink feed edges that would be very close to 302 and
12 304, correct?

13 A. And be a very wasteful, extraordinary
14 thing to do. No PHOSITA would do that.

15 Q. Well, we don't know the actual
16 dimensions of this chip, and you admitted that
17 it's not drawn to scale. So how do we know how
18 wasteful that would be?

19 MR. FORGHANY: Objection as to form,
20 hypothetical.

21 A. Well, let's go back to what you just
22 said. You said one via in the middle of this
23 whole thing, right? Is that what you just said,
24 one big via in the middle?

1 BY MR. BORSOS:

2 Q. Sure, or two vertical vias in --

3 A. Or two vertical vias?

4 Q. One between 302 and 304 and one between
5 306 and 308, either one.

6 A. Well, I'm also informed by the way
7 Giere has drawn his temperature sense resistors.
8 That's also part of what you take from Figure 3.
9 So he has drawn -- for example, sense resistor
10 312, he's drawn that to lay on the surface of the
11 chip to the right-hand edge of 310 region and to
12 the left-hand edge of the 304 region.

13 So I don't -- I can't envision an ink
14 via being brought close to the edges of those two
15 regions without disrupting or ruining or removing
16 his sensor 312. So I don't think that fits --
17 that's not functional with his invention here.

18 Q. Are you saying that it's impossible to
19 position a temperature sense resistor between an
20 ink feed edge and a heater?

21 MR. FORGHANY: Objection to form,
22 misstates prior testimony.

23 A. Not impossible. Not done but not
24 impossible.

1 BY MR. BORSOS:

2 Q. When you say "not done," what is your
3 basis for that statement?

4 A. Well, the whole purpose of doing the
5 thermal sensing would be messed up because you're
6 putting -- you're putting the -- you would be
7 putting the temperature sensor in the hottest
8 place of the printhead, and so it would not be
9 representative of very much of the rest of the
10 printhead. It's right where the heat is
11 generated.

12 Generally speaking, it works -- well, I
13 don't -- it works better if the temperature sensor
14 is at least a little ways away from the hot spot
15 of the printhead. I'm not sure that the
16 temperature sensor could even tolerate it, but
17 let's say it could tolerate the hot -- that
18 temperature. It would be dominated by what was
19 happening at the moment of the heater firing, and
20 I think it would be hard to do an algorithm based
21 on that information rather than information from a
22 bigger part of the silicon.

23 Q. What leads you to believe that Giere
24 '178 is describing a temperature sensor that

1 detects an average temperature for the die rather
2 than a very specific part of the die?

3 A. I don't think I said that it did an
4 average temperature for the die. I think he
5 says -- these are regions. So this place where --
6 312, for example, in between 302 and 304, that
7 region is very similar to Barkley's region or to
8 Giere's '673's region between his heater arrays.
9 It's the same thing to a PHOSITA.

10 Q. Now, you said that the design shown in
11 Figure 3 is a typical printhead design for four
12 colors, right?

13 A. I said it's an older design, but it's a
14 known design.

15 Q. And so you're aware of other references
16 that show four colors set up in quadrants on a
17 chip?

18 A. Yes. I brought them with me if you'd
19 like to see them. One of the oldest references
20 for a multicolor printhead does just that. This
21 Chan reference from Hewlett-Packard does that.

22 MR. FORGHANY: Let me pass out the --

23 A. If you'd like to see it, it's filed
24 September 1987. It's one of the oldest multiple

1 color printheads that exists.

2 MR. FORGHANY: I can hand it to you.

3 MR. BORSOS: Yes.

4 MR. FORGHANY: I took a copy of
5 everything he brought today.

6 THE WITNESS: What is this?

7 MR. FORGHANY: I copied everything you
8 brought today.

9 THE WITNESS: Shall I introduce them
10 all?

11 MR. FORGHANY: Let the attorney decide
12 that.

13 A. Sort of easier to see is Drake, and
14 Drake is one of my favorites because he was at
15 Xerox and he worked for me. Look at Drake's
16 picture. You want to see Drake's picture? And
17 Drake was filed November 29, 1989. So that
18 structure is a known structure, and certainly it's
19 well known at Xerox. So anybody who has worked on
20 inkjet at Xerox would know this structure.

21 See, the interesting thing about Chan
22 if you're looking through it is the ink comes from
23 the back into four different vias from the back
24 side. There are drop generators on both sides of

1 the via, and it's four color. And that one
2 doesn't even have the power drivers. You were
3 asking me before do the power drivers have to be
4 there. That one they come from off chip, so
5 that's even an off-chip thing. It's got
6 everything, and it's 1987.

7 BY MR. BORSOS:

8 Q. Are you aware of anything in Giere '178
9 that indicates that the chip shown in Figure 3 is
10 a four-color device?

11 A. Well, Giere discusses at surprising
12 length -- I was surprised when I reviewed it how
13 many column inches he spends talking about the
14 problem of color printing and how you have to make
15 sure your drop sizes are correct for each color so
16 that you don't have hue shifts and other changes
17 and whatnot.

18 So at least up until -- really all the
19 way up through column 6, he's heavily invested in
20 color printing and then in the -- in that place
21 where he does mention the center feed and the edge
22 feed, just below that in paragraph -- on column 3,
23 paragraph 50 through 65, he talks about all the
24 different ways color printing can be done, the

1 different arrangements of printheads and print
2 cartridges you can have.

3 And then finally he references the
4 Axtell patent in column 8, lines 30 through 35.
5 He references and incorporates by reference the
6 Axtell patent, and the Axtell patent shows a
7 four-color printhead arrangement.

8 And so from all of that I think he
9 is -- this patent is directed at thermal sensing
10 in a printhead and especially a color printhead.

11 Q. Doesn't Giere '178 show separate
12 cartridges for each color?

13 A. In his Figure 1 he does, but then he
14 goes on to talk about all those other options, and
15 for Figure 3 his language describing it is an
16 embodiment rather than the embodiment or the
17 Figure 1 embodiment. He doesn't say that.

18 Q. So where does he state that there are
19 multiple color vias on a single chip?

20 MR. FORGHANY: Objection as to form.

21 A. I don't think he ever says those words.
22 A PHOSITA knows that a multicolor printhead has
23 multiple vias.

24 BY MR. BORSOS:

1 Q. But to be clear, does Giere '178 ever
2 state that there is a multicolor printhead?

3 A. Yes, he does.

4 Q. Where?

5 A. In column 3, line -- starting at line
6 50 -- starting at line 56 he says, "In a printer
7 with two cartridges, one cartridge can contain
8 black ink with the other cartridge being a tri-
9 compartment cartridge containing the base color
10 cyan, magenta and yellow inks, or
11 alternatively" -- so that has three --
12 "alternatively, two dual-compartment cartridges
13 may be used to contain the four color inks." So
14 those two have two. "In addition, two
15 tri-compartment cartridges may be used to contain
16 six base color inks...." So those there have
17 multicolor printheads.

18 Q. Isn't he referring to cartridges there,
19 not a chip?

20 A. Well, you can't have it both ways. If
21 you're going to take his language to mean -- when
22 he talks about the monochrome version having the
23 chip in it, you have to take his language to mean
24 that the tri-color cartridge has the tri-color

1 chip in it. They're not built in any other way.
2 It's the word cartridge. You have to decide what
3 you're going to allow the word cartridge to mean.

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

6 A. Not impossible.

7 Q. Okay. Have you ever seen that in
8 practice?

9 MR. FORGHANY: Objection as to form.

10 BY MR. BORSOS:

11 Q. Let me give you an example. Have you
12 ever seen a cartridge with a chip for black ink
13 and a chip for color ink?

14 A. Not a cartridge. That word cartridge
15 is an important word.

16 Q. So are you indicating that you have
17 seen a printhead with two separate chips, one for
18 black and one a tri-color chip?

19 A. Yes.

20 Q. But you have never seen those two chips
21 on a single cartridge?

22 A. No, because a single cartridge -- a
23 print cartridge, the printhead is disposable.
24 It's thrown away when the ink is spent. And I

1 have never seen them throw away two chips like
2 that.

3 MR. FORGHANY: Whenever you are done
4 with this line of questioning, I would ask
5 that we take a lunch break but no rush,
6 whenever you're done with the topic.

7 BY MR. BORSOS:

8 Q. Is there anything in this passage here
9 indicating that a single chip would include black
10 plus magenta, cyan, and yellow?

11 A. Any one in what passage?

12 Q. In the passage on column 3, lines 51
13 through 65 of Giere '178.

14 MR. FORGHANY: I'm sorry. Could you
15 just repeat the question for me.

16 (Question read.)

17 MR. FORGHANY: Objection as to form.

18 A. Well, the sentence starting around line
19 54 -- or I guess it's line 59, "...or
20 alternatively, two dual-compartment cartridges may
21 be used to contain the four color inks."

22 So within those two component
23 cartridges, one has a color and one has black.
24 And then he goes on to say, "In addition, two

1 tri-compartment cartridges may be used to contain
2 six base color inks, for example, black, cyan,
3 magenta, yellow," and so forth. So in that
4 configuration one of the three color devices will
5 have black ink in it.

6 Q. Correct, but there is no indication
7 that a four-quadrant design as you have discussed
8 with respect to Figure 3 is discussed in column 3,
9 lines 51 through 65, right?

10 A. Not there. That reference is in the
11 Axtell reference. The reference to the four is in
12 Axtell, which is column 8 something, which we --
13 which is column 8, lines 30 through 36. That
14 reference has the four-color printhead, and it's
15 incorporated in Giere '178.

16 MR. BORSOS: Okay. I think that is a
17 good point to take a lunch break.

18 (Whereupon, a luncheon recess was taken
19 from 12:03 p.m. to 1:08 p.m., after
20 which time the proceedings resumed as
21 follows:)

22 (Pond Deposition Exhibit 7 was
23 marked for identification.)
24

1 STEPHEN F. POND, Ph.D.,
2 having been previously sworn, was examined and
3 testified further as follows:

4 EXAMINATION (Resumed)

5 BY MR. BORSOS:

6 Q. Dr. Pond, you now have in front of you
7 a document that's been marked as Exhibit No. 7,
8 and that is U.S. Patent No. 6,527,367 to Yabe; is
9 that correct?

10 A. Yes, I have it.

11 Q. And was this a reference that you
12 discussed in your declaration with respect to the
13 '708 patent?

14 A. Yes, it is.

15 Q. Can you tell me at a high level what
16 the purpose of temperature sensing in Yabe is?

17 MR. FORGHANY: Objection as to form.

18 A. Well, I believe he is mostly concerned
19 with a failure mode of failure to discharge
20 because of bubbles being created in the printhead,
21 because of excessive heat of the printhead. So he
22 wants to monitor the temperature so he can
23 forecast that that failure mode might be coming.

24 BY MR. BORSOS:

1 Q. And is that the same reason that Giere
2 '673 marked as Exhibit 4 monitors temperature of a
3 printhead?

4 MR. FORGHANY: Objection as to form,
5 foundation.

6 A. It's one of the reasons that anyone
7 monitors the temperature of a thermal inkjet
8 printhead, including Giere.

9 BY MR. BORSOS:

10 Q. So is it fair to say that the reason
11 for monitoring temperature in Yabe is also similar
12 to the reason for monitoring temperature in
13 Benjamin '113 marked as Exhibit No. 3 to this
14 deposition?

15 A. I think as I explained in my
16 declaration in the background section, there are
17 various kinds of temperature-related failure
18 modes, soft and hard failure modes. And all of
19 the temperature management systems contemplate
20 doing something about those failure modes,
21 including Yabe and Benjamin and Giere '673, '178.
22 So they all have those failure modes as part of
23 their reason for operating a temperature
24 management system.

1 Q. And in your opinion does Yabe disclose
2 a printhead chip with multiple ink vias?

3 A. Yes.

4 Q. And those ink vias are all parallel to
5 one another, right?

6 A. Yes.

7 Q. And what is Yabe attempting to measure?

8 MR. FORGHANY: Objection as to form.

9 A. He is measuring various places on the
10 silicon substrate as being representative of
11 what's happening to the silicon substrate. So he
12 has sensors placed on the substrate, which he is
13 using as representative of the substrate.

14 BY MR. BORSOS:

15 Q. Is it of an average temperature of the
16 substrate?

17 A. I am trying to see whether Yabe had
18 multiple embodiments. That's what I can't
19 remember. Let's see. He's got -- he has the
20 embodiment of Figure 12 where he has multiple
21 sensor locations. So that's not an average --
22 those are telling him in this case of the Figure
23 12 five different temperatures.

24 Q. And in the embodiment shown in

1 Figure 12, are any of those temperature sensors
2 placed in a region between ink vias?

3 A. Between ink vias?

4 Q. Correct.

5 A. Not directly, no.

6 Q. And what do you mean by "not directly"?

7 A. They're above one end of each ink via
8 as drawn.

9 Q. Okay. So they are not between ink
10 vias?

11 MR. FORGHANY: Objection as to form.

12 A. Not as I understand what you mean, no.

13 BY MR. BORSOS:

14 Q. Let's take a look at the embodiment of
15 Figure 14. Do you know how many temperature
16 sensors are shown in the embodiment of Figure 14
17 of Yabe?

18 A. I think it's one.

19 Q. That would be element 102?

20 A. Yes.

21 Q. And is that positioned in a region
22 between ink vias?

23 A. No.

24 Q. And in Figure 15 do you know how many

1 temperature sensors there are?

2 A. I think there's one.

3 Q. And, again, that's element 102?

4 A. Yes.

5 Q. And is that positioned in a region
6 between ink vias?

7 A. No.

8 Q. Do you recall whether Yabe acknowledges
9 that ink vias can insulate one region of a
10 printhead die from another region?

11 A. I believe that statement -- at least a
12 statement that has that effect is in Yabe, yes.

13 Q. Okay. And do you recall where that is?

14 A. No, I don't. I can find it, but I
15 don't recall where it is. It might take me a
16 while.

17 In the column 5 starting around line
18 27, Yabe is describing -- he says, "With the
19 structure having a plurality of elongated ink
20 supply ports, it becomes possible to keep the
21 temperature distribution on the base plate as
22 uniform as possible in the arrangement direction
23 of ink supply ports with the minimum sub-heater
24 number without causing the heat transfer to be

1 impeded by the presence of a plurality of ink
2 supply ports...."

3 So "impeded by the presence of a
4 plurality of ink supply ports" is conveying the
5 idea that the supply ports impede the heat. I
6 think there's something more, but this is what I
7 remember.

8 Can I look through my declaration? I'm
9 sure I must have said it in my declaration.

10 Q. Yes, you can go ahead and look.

11 A. Well, in my declaration I quote Exhibit
12 8, and let me make sure that's Yabe. Okay. So in
13 my declaration on page 255, paragraph 421, I quote
14 Yabe at column 3, lines 17 through 27, "'it is
15 found that in the mode of the side shooter
16 recording head, a plurality of ink supply ports
17 provided for the heater board demonstrate the heat
18 insulating characteristic against the heater board
19 material, and that this condition is the factor
20 that should be taken into consideration with the
21 problems described above,'" et cetera.

22 And then it goes, "'In other words,
23 depending on the layout of the diode sensors and
24 sub-heaters, the heat radiating action and the

1 heat conduction of the heater board are
2 deteriorated by the presence of the plural ink
3 supply ports that shows the heat insulating
4 characteristics.'" "

5 So that was down to column 27, yeah. I
6 can't remember if there's any other passages. You
7 want me to continue looking for other passages?

8 Q. I think we can move on.

9 The passage that you just described in
10 your opinion acknowledges that ink vias can
11 insulate the temperature of one region from
12 another region on a silicon chip; is that fair to
13 say?

14 A. Well, ink supply ports in Yabe is
15 equivalent to ink vias, and those ink supply ports
16 are heat insulating. So it says that. So --
17 well, that's what it says.

18 Q. And acknowledging that, Yabe's solution
19 for measuring temperature is to place temperature
20 sensors above the ink vias rather than between ink
21 vias, right?

22 MR. FORGHANY: Objection as to form.

23 A. His embodiments that we just discussed
24 earlier, Figures 12, 14, and 15, are configured

1 that way.

2 BY MR. BORSOS:

3 Q. Are you aware of anything in Yabe that
4 suggests placement of a temperature sensor between
5 ink vias?

6 A. I can't remember it.

7 Q. If you would like to review the patent
8 to make sure, you can.

9 A. Well, I would say that he says for
10 his -- from his point of view, it's preferable --
11 he uses the word preferable -- to -- he says -- in
12 column 4 on line 29 through line 34, he says, "On
13 the other hand, it is preferable to arrange means
14 for detecting the temperature of base plate in the
15 vicinity of end proportions in the longitudinal
16 direction on one side of the base plate."

17 So the use of the word preferable and
18 vicinity leaves open the idea that maybe they
19 could be at a different place -- he prefers them
20 in the vicinity of the end.

21 Q. Do you believe that to suggest actual
22 placement between ink vias?

23 A. It's a possibility. It's an open --
24 he's leaving it as an open possibility. He is not

1 overtly suggesting it.

2 Q. Is there anything else in Yabe that you
3 believe might suggest placement of a temperature
4 sensor between ink vias?

5 A. Well, he repeats that same formulation
6 of preferable again in column 4 down at line 39
7 through 43. So he says that again there. Let's
8 see what his throwaway sentence says at the end.
9 I don't see anything more, but that doesn't mean
10 that if I spent more time, I couldn't find
11 something similar to what I've already said, the
12 preferable statement.

13 (Pond Deposition Exhibit 8 was
14 marked for identification.)

15 THE WITNESS: You're content to move
16 on?

17 MR. BORSOS: Yes.

18 Q. You should now have in front of you a
19 document marked as Exhibit 8 to this deposition,
20 and that is U.S. Patent No. 6,382,773 to Chang,
21 et al. Is that accurate?

22 A. Yes.

23 Q. If you look at Figure 1, does this
24 appear to show a printhead chip with three

1 parallel ink vias?

2 A. Yes.

3 Q. And you can refer to column 1, line 42
4 which discusses --

5 A. "Refer to FIG. 1"?

6 Q. Figure 1, yes. Does the element
7 referred to as reference numeral 103 appear to be
8 a temperature sensor?

9 A. Yes, the dark black line surrounding.

10 Q. And so does this Chang patent suggest a
11 single temperature sense resistor circumscribing
12 three parallel ink vias?

13 MR. FORGHANY: Objection, form,
14 foundation.

15 A. It depicts a temperature sensing
16 resistor that runs around the outer perimeter of
17 the inkjet chip.

18 BY MR. BORSOS:

19 Q. And what would be the purpose of such
20 temperature sense resistor?

21 A. I don't know. Did I discuss Chang in
22 my declaration? I don't even remember whether I
23 discussed this in my declaration. Let's see if I
24 can find it. It sort of looks like the prior art.

1 Are you asking me about something I said in my
2 declaration?

3 Q. No. I will represent that this was
4 cited in your declaration.

5 A. You'll do what?

6 Q. Represent that this was cited in your
7 declaration. You can see at the bottom that it's
8 referenced as Exhibit 1016 to the IPR petition.

9 A. I just don't remember in the context
10 that I cited this other than it looks like the
11 patent's prior art No. 1 but -- Figure 1, but I
12 don't remember where in my declaration I cited it.

13 So if you want to save time, you should
14 tell me where I cited it since I don't have my
15 laptop to do a find and type.

16 Q. Again, I am not asking about specific
17 statements from your declaration.

18 A. Oh.

19 Q. I am just asking you whether this
20 appears to show a single temperature sense
21 resistor for a chip that includes multiple ink
22 vias.

23 A. Yes, I agree with that
24 characterization.

1 Q. So do you agree that that was a known
2 construction as of this time period?

3 MR. FORGHANY: Objection as to form.

4 A. Yes. It was filed in 2000, and I
5 believe it's very reminiscent of Barkley applicant
6 admitted prior art, Figure 1. They're very
7 reminiscent of each other.

8 BY MR. BORSOS:

9 Q. So Figure 1 of the '708 patent?

10 A. Of the '708 patent.

11 Q. And similar to Benjamin '113 which was
12 marked as Exhibit 3, there is a single input and
13 output for this temperature sensor, correct?

14 A. Well, this one is not quite the same as
15 that, no. This one is showing one input for the
16 temperature sensor.

17 Q. So explain to me the difference.

18 A. Between what?

19 Q. Between Benjamin '113 and Chang '773.

20 The Benjamin reference shows --

21 A. I remember what it looks like.

22 Q. -- two contacts, right? If we look
23 back at Figure 25A or 25B --

24 A. Yes, I understand.

1 Q. -- there's TSR and TSR RT?

2 A. Yes.

3 Q. Whereas, in Chang there is TSR and GND?

4 A. Yes.

5 Q. Can you explain to me the difference
6 between those two setups?

7 A. Well, you also notice in the figure
8 from Benjamin '113 you were just referring to with
9 the contact area locations, there were a bunch of
10 GD contact areas on that --

11 Q. Okay.

12 A. -- on Figure 25.

13 Q. Yes.

14 A. Those are ground -- those contact areas
15 are used to apply ground potential to something on
16 the chip, and the shorthand that Benjamin has used
17 is GD for ground. This Chang disclosure is using
18 GND as a short for ground. So the difference
19 between these two is Benjamin is providing a
20 closed loop for her sensor, TSR and TSR RT. She
21 is controlling both of her TSR sensor ends,
22 whereas Chang apparently is only controlling one
23 end of his TSR and the other end he is letting go
24 to ground.

1 Q. You are not suggesting that the GD in
2 Benjamin Figure 25 is associated with the
3 temperature sensor; are you?

4 A. I don't think so. She doesn't say.

5 Q. So you believe that GND is different
6 from TSR RT in that Benjamin's TSR RT does not go
7 to ground, but otherwise it's similar in that it
8 is the opposite end of the temperature sensor from
9 what's labeled as TSR?

10 MR. FORGHANY: Objection, form,
11 compound, foundation.

12 A. Well, it's been a long time since I
13 looked at this patent. So I don't know what Chang
14 says about the ground in Figure 1. Let's see if
15 he'll say anything about it.

16 He says it's prior art, and then he
17 refers to a whole bunch of other references.
18 Let's see. Chang is the Taiwanese inkjet people.
19 So I don't know what -- I don't know what more to
20 say about what's going on in Figure 1 because not
21 only does he not say -- he also says it's prior
22 art. So it's from something else somewhere else.
23 So I don't know how to conjecture beyond I think
24 GND has to mean ground in the convention of those

1 letters.

2 BY MR. BORSOS:

3 Q. Okay.

4 A. Oh, I see. I referred to Chang back in
5 the background section, as just background prior
6 art.

7 Q. Can you turn to page 251 of your
8 declaration, which has been marked as Exhibit 1.
9 In Section 6 you will see that you opined that
10 Giere '178 discloses "'a single temperature
11 sensing element disposed within each region.'"

12 Is it safe to say that you were
13 referring to a region between two ink vias?

14 A. A region between what?

15 Q. Two ink vias.

16 A. Well, this is claim -- okay. So this
17 is in the Giere '178 in view of Yabe, and so the
18 plurality of ink vias in Giere are the ink
19 regions -- for example, ink feed regions 302 and
20 304 arranged parallel to each other.

21 Q. In paragraph 406 you say, "Additionally
22 or alternatively, it is my opinion that Yabe
23 combined with Giere178 in the manner described in
24 Section XIV.A.6 below," which you also refer to as

1 the Giere '178-Yabe combination, "also discloses
2 this limitation." Is that accurate?

3 A. I believe what I have said is accurate.

4 Q. Isn't paragraph 406 in Section XIV.A.6?

5 A. In XIV, Claim 1 is A. So the word
6 below is wrong.

7 Q. Okay. So you meant to say in this
8 section?

9 A. I don't remember what I meant to say
10 right now. Yes, I think I should have said in
11 this section instead of below.

12 Q. Is there a discussion here of how Giere
13 '178 and Yabe would be combined?

14 A. In the motivation to combine section,
15 it describes it, but let me see if I can point out
16 to you -- I only say it in words. I don't see
17 that I give you a drawing that combines Yabe and
18 Giere '178 on, for example, his Figure 3 or,
19 conversely, takes Giere '178's temperature sensors
20 and puts them on a Yabe drawing. I say in words
21 that those combinations -- a PHOSITA would easily
22 make those combinations, but I don't show you a
23 drawing.

24 Q. So is paragraph 429 of your declaration

1 part of your discussion of how Yabe and Giere '178
2 would be combined?

3 A. Well, I think the purpose of paragraph
4 429 is to just make the point that Giere '178 and
5 Yabe have the similar parallel via structure,
6 which then would make it straightforward for a
7 PHOSITA to realize they could be combined.

8 MR. FORGHANY: I just want to clarify
9 and represent that your report, Dr. Pond, on
10 265 is where you stopped looking for it.
11 That's what you are referring to as an
12 illustration that you put in there titled --
13 you were looking for it earlier. I want to
14 show you I think that's where you are
15 referring to, page 265.

16 THE WITNESS: 265? So I never got to
17 it in my looking? Oh, yes. Okay. And
18 that's in my -- that's still in this
19 motivation to combine discussion. So it
20 looks like I put those details in the
21 motivation to combine discussion rather than
22 under the claim element part.

23 BY MR. BORSOS:

24 Q. So going back to paragraph 429, you

1 indicate that Yabe suggests adopting the structure
2 of a so-called side shooter type.

3 A. Yes.

4 Q. Can you explain what you mean by that?

5 A. Canon -- each pioneer in the field of
6 thermal inkjet started off with their own jargon,
7 and Hewlett-Packard's jargon for a device where
8 the ink is shot perpendicular to the heater
9 resistor, they called it a roof shooter. That
10 very same geometry, Canon for whatever reason
11 called it a side shooter. I don't know why they
12 did that.

13 But you can see right there in that
14 sentence, it says, "'it is considered effective to
15 adopt the structure of the so-called side shooter
16 type where ink droplets are discharged in the
17 direction perpendicular to the heater board which
18 is the base plate having the heat generating
19 resistive elements for use of ink discharges
20 formed therefor.'"

21 So there were two geometries that were
22 prevalent, one where the ink was shot out along
23 the plane of the heater resistor, out the edge of
24 the device, and that was called an edge shooter,

1 and then there was another -- in those figures
2 from my book that we were just looking at, the
3 other configuration was shot vertically from the
4 heater.

5 And Canon called the one where the ink
6 went out the edge -- they considered that normal,
7 the normal -- the ordinary direction to shoot the
8 drop. And if they shot it perpendicular to that,
9 it was off to the side in their minds. So they
10 called it a side shooter.

11 Also you notice in this sentence the
12 word board. That's a semiconductor substrate, not
13 a printed circuit board. It's also part of their
14 jargon to call the silicon a board. So some of
15 what's going on in this terminology has the
16 Japanese to English translation issues. Maybe the
17 side shooter does as well. I don't know the
18 genesis of the word side shooter. They're the
19 only ones that call it that. Nobody else does.

20 Q. So, in other words, this discussion is
21 not intended to indicate that Yabe and Giere have
22 a different configuration in terms of the
23 direction in which ink is discharged?

24 A. No, absolutely not, and you can't

1 really have the '708 invention with anything other
2 than this geometry. So they're all the same. I
3 should say purported invention, I guess.

4 (Pond Deposition Exhibit 9 was
5 marked for identification.)

6 THE WITNESS: Are we done with '708?

7 MR. BORSOS: I think so.

8 THE WITNESS: I will just put it here
9 for the time being.

10 BY MR. BORSOS:

11 Q. Dr. Pond, you now have Exhibit 9 in
12 front of you, and can you confirm that that's a
13 copy of your declaration in IPR2023-00312 related
14 to U.S. Patent No. 7,484,823?

15 A. Yes. It's my declaration for the IPR.

16 Q. And I would like to direct your
17 attention to discussion of Ground 4, which begins
18 at page 242 of this declaration.

19 A. Yabe in view of Giere '673.

20 Q. Now, is it fair to say that this
21 combination of references starts with the
22 printhead die of Yabe, and you argue that the
23 temperature sensors would be replaced with the
24 temperature sensor described in Giere '673?

1 A. Yes.

2 Q. And is it your position that one of
3 ordinary skill in the art would have placed the
4 temperature sense resistor of Giere '673 in a
5 region between two vias on the Yabe chip?

6 A. Yes.

7 Q. You indicate at paragraph 460 that a
8 PHOSITA would have recognized that such a
9 placement would not accurately report the mean
10 temperature of the entire printhead die which you
11 state Giere '673 attributes to meaningfully
12 regulating operational temperature. Is that
13 accurate?

14 MR. FORGHANY: Objection as to form.

15 A. Yes.

16 BY MR. BORSOS:

17 Q. And do you agree with your statement
18 here that Giere '673 attributes the reporting of
19 the temperature of the entire printhead die to
20 meaningfully regulating operational temperature?

21 A. Well, I would have to go back and look
22 at your '673 again. I stand by my statement here.
23 I say Giere '673 attributes to meaningfully
24 regulating the operational temperature of his die.

1 So the sensor meaningfully regulates the
2 temperature of the '673 die.

3 Q. If a PHOSITA were interested in
4 accurately reporting the mean temperature of the
5 entire printhead die of a multi-via chip, why
6 wouldn't they use a temperature sense resistor
7 such as Figure 1 of the '708 patent which goes
8 around the periphery of the area containing the
9 ink vias?

10 MR. FORGHANY: Objection as to form,
11 foundation.

12 A. Well, as I explained in the background
13 section leading into my declaration, the thermal
14 management control design has price points
15 associated with it. There are more sophisticated
16 versions of temperature management control, and
17 that surrounding sensor that we saw in the prior
18 art Figure 1 and that we saw in Chang earlier
19 would be okay for one level of sophistication of a
20 thermal management system.

21 Where it would fall short is in the
22 timing, the timing of the control. So with only
23 the one sensor like that for the perimeter of the
24 chip, you can't control the drop size -- you can't

1 modulate the drop size in as short of time
2 intervals as if you had more sensors, particularly
3 ones in each region. So the PHOSITA would make a
4 choice based on cost reasons and throughput
5 reasons how sophisticated to be.

6 BY MR. BORSOS:

7 Q. Are you aware of any portion of Giere
8 '673 that suggests monitoring temperature of two
9 or more regions that are each between ink vias?

10 A. He has a version of it in his
11 temperature recorders. They're in between two ink
12 vias. They're in different places, different
13 regions of his chip, and he cares about knowing
14 the temperature at those different places. That's
15 not his 510 sensor. That's his more overall
16 region sensor. But he does have other sensors
17 that convey what I'm talking about, the concept of
18 layers of sophistication at play.

19 Q. Are those recorders that are discussed
20 in Giere '673 temperature sense resistors?

21 A. I don't know what they are exactly. He
22 doesn't say.

23 MR. BORSOS: All right. We can go off
24 the record.

1 (Recess taken.)

2 MR. BORSOS: I am just going to go back
3 on the record and say I have no further
4 questions.

5 EXAMINATION

6 BY MR. FORGHANY:

7 Q. I'll be relatively short. I just want
8 to clarify a couple things, Dr. Pond.

9 Earlier in the deposition today, the
10 other attorney was asking you questions about a
11 person of ordinary skill in the art's
12 interpretation of Figure 3 of Giere '178. Do you
13 recall that?

14 A. Figure 3, yes.

15 Q. And there was a discussion about
16 whether or not Figure 3 would convey to a person
17 of ordinary skill in the art that there was an ink
18 via disposed within each of those four regions.
19 Do you recall that discussion?

20 A. Yes.

21 Q. And you had been talking specifically
22 about a section in column 3, if I could direct you
23 to what was previously marked as Exhibit 5.

24 A. Yes.

1 Q. And looking at column 3 --

2 A. All right.

3 Q. -- you had pointed out that on lines 55
4 through 65, that that textual disclosure of what
5 is a polychrome cartridge, let's say, or a tri-
6 compartment cartridge, you interpret that part of
7 the specification as disclosing a cartridge that
8 would have multiple ink vias?

9 A. Yes. I'm interpreting that because the
10 very first sentence says, "Color inkjet imaging
11 devices commonly employ a plurality of print
12 cartridges" -- print cartridge, that then he is
13 carrying the word cartridge on down -- when he
14 talks about a tri-compartment cartridge, he means
15 a tri-compartment print cartridge, and a tri-
16 compartment print cartridge has a printhead device
17 that would have ink vias for each of the colors
18 that it contains and so forth for the dual-
19 compartment cartridge as well. It would have ink
20 vias for each of the two inks that it contains.

21 Q. And specifically the statement I
22 believe you said was the PHOSITA knows that poly
23 means more than one via. Why is that the case?

24 A. Well, the word poly isn't here. He

1 uses the word tri-compartment and two tri-
2 compartments, and somewhere there is the word
3 dual, two dual compartments. So in this paragraph
4 he doesn't use the word poly, but those tri and
5 dual convey to a PHOSITA that we're talking about
6 printhead devices that can jet inks of those
7 colors, and that means that they have heaters --
8 they have drop generator arrays and ink supply
9 edges that supply those different inks so they can
10 jet those different colors.

11 Q. I guess another way of rephrasing my
12 question is is it possible for a center-fed
13 configuration to be a tri-compartment cartridge?

14 A. Not a single center fed, no.

15 Q. So in this example the paragraph in
16 column 3 that's talking about edge fed or center
17 fed would be a different embodiment than the
18 preceding paragraph that's referring to a
19 polychrome cartridge?

20 A. Yes.

21 Q. You also mentioned something about the
22 timing of Giere '178 informed your opinion about
23 what a person of ordinary skill in the art would
24 interpret from that rectangular shape in Figure 3.

1 Could you explain that a little bit, why the
2 timing of when Giere '178 was filed --

3 A. What I was saying is that back in 2001
4 a PHOSITA would have recognized those four areas
5 as being a four-color configuration that was
6 practiced early in thermal inkjet, and they would
7 recognize that shape as being that, and then I
8 brought up the references that confirm what I'm
9 saying in the sense that it's in the general
10 knowledge package of inkjet PHOSITA and that
11 was --

12 Q. We can get to those a little bit later.

13 A. All right.

14 Q. I just wanted to clarify the timing.

15 So do you have an opinion about
16 whether, in around 2000, monochrome or polychrome
17 cartridges were more conventional?

18 A. There are price points involved and in
19 the price points -- in the most routine, ordinary
20 price points, the common thing would be to have a
21 tri-color color cartridge and a monochrome black
22 cartridge. In the little bit higher end kind of
23 printer that Axtell is talking about in the
24 reference in Giere to Axtell, you would have a

1 four-color printhead in a wide bed plotter.

2 Q. Isn't it true that polychrome
3 cartridges really didn't become conventional until
4 the late '90s?

5 A. Well, the word conventional I'm having
6 a hard time with. Polychrome itself have been
7 there from the very beginning. The four slots
8 with replaceable ink containers came later. So
9 the small little printhead with -- a throwaway
10 printhead having three colors in it goes back to
11 the beginning of thermal inkjet, but the gang of
12 four large arrays with ink supply supplying them
13 is the late -- is the late -- mid to late '90s for
14 that concept.

15 Q. So just to rephrase and for clarity
16 purposes, so the configuration of four -- region
17 configuration shown in Figure 3 of Giere '178 was
18 conventional from the mid '90s to the 2000s?

19 MR. BORSOS: Objection.

20 A. For Figure 3 of '178?

21 BY MR. FORGHANY:

22 Q. Yes.

23 A. No. That was more conventional up
24 until then, and then after then the configuration

1 of Axtell would have been more common.

2 Q. Could you clarify what "then" is?

3 A. '95-ish. After '95 then the Axtell
4 configuration would have been more common. I
5 mean, you still saw the one that is in -- the
6 configuration of Giere '178 is also shown in a
7 patent by Conta to Olivetti which was filed in
8 2002. So it was still there. It's just a
9 question of which is more popular and which is
10 not.

11 A PHOSITA knows about them all, and my
12 point about Figure 3 in Giere '178 is that
13 configuration is one of the multicolor, poly-color
14 configurations a PHOSITA would recognize.

15 Q. And --

16 A. It's not the only one. It's one of
17 them.

18 Q. And so going back to the patent you
19 just referenced --

20 A. This one (indicating).

21 MR. FORGHANY: Why don't we go ahead
22 and mark that as an exhibit. I think the
23 last one was nine.

24

1 (Pond Deposition Exhibit 10 was
2 marked for identification.)

3 THE WITNESS: Okay. That's marked as
4 Exhibit 10 now.

5 BY MR. FORGHANY:

6 Q. How did this inform your opinion about
7 disclosures in Figure 3 of Giere '178?

8 A. This patent, which is U.S. 7,008,047,
9 filed March 2002 has several configurations of
10 multicolor, center-fed, two-side heater where the
11 layouts are similar to the rectangles of Giere
12 '178, including such figures as Figure 2, which
13 has the same appearance to me as the Figure 3 in
14 Giere '178.

15 So when I see Giere or a PHOSITA sees
16 Giere '178, it's logical to think of that as a
17 four-color printhead with four regions of drop
18 generators or four arrays of drop generators in
19 those regions 302, 304, 306, and 308 as is shown,
20 for example, in this patent, Exhibit 10.

21 Q. And you also mentioned there was
22 other patents that -- what is the next one you --

23 A. Earlier than that, one of the very
24 earliest multicolor inkjet patents is Chan.

1 You want to mark this as an exhibit?

2 MR. FORGHANY: Why don't we mark that
3 as Exhibit 11.

4 (Pond Deposition Exhibit 11 was
5 marked for identification.)

6 A. Exhibit 11 is a patent, U.S. 4,812,859,
7 and it was filed in September 1987, and it shows
8 four color regions of an inkjet printhead that are
9 fed by slots behind. They have jets on both
10 sides, drop generators on both sides of each of
11 the feed slots or vias, and again this is
12 something well known to PHOSITAs. It's one of the
13 earliest Hewlett-Packard multicolor designs. So
14 that's the second one.

15 And then the third one --

16 MR. FORGHANY: Why don't we mark that
17 as Exhibit 12.

18 A. -- I brought with me is Moritz -- no,
19 not Moritz. Drake. Did we already mark Drake?
20 Drake already disappeared from -- oh, no, here it
21 is. I'm sorry. I have it here.

22 (Pond Deposition Exhibit 12 was
23 marked for identification.)

24 A. So that's Exhibit 12, and Exhibit 12 is

1 U.S. Patent 5,030,971, filed in 1989, and this is
2 another roof shooter configuration where the ink
3 is fed to four regions in this quad design where
4 ink is -- where the heater arrays exist along the
5 edges of the vias. And, again, it informed a
6 PHOSITA that the Figure 3 of Giere '178 is a
7 familiar design.

8 BY MR. FORGHANY:

9 Q. And Drake, Exhibit 12, that's the same
10 patent that's referenced in your textbook,
11 correct?

12 A. I don't remember whether I referenced
13 this in my textbook or not. I'm sorry. I don't
14 remember. I think I do. I don't remember.

15 Q. Earlier you testified that you worked
16 with the lead inventor?

17 A. Yes. I worked with Donald Drake and
18 William Hawkins, the two inventors. They both
19 reported to me, and this work was well known
20 within Xerox. Any Xerox inkjet person would have
21 been familiar with this work.

22 Q. And you also have another patent?

23 A. I also have patents that get to the
24 issue of what very close means, the ink refill

1 region, what it means in lengths and numbers.

2 Q. Right. I believe you had used the word
3 corroborate. These --

4 A. To corroborate -- in my book, and I
5 think we've already entered in some pages for
6 there where I say that the drop generators are 200
7 to 400 microns in total, and I brought with me
8 some additional patent references from early, from
9 the 1990s, that give those kinds of numbers that
10 show where that understanding of those dimensions
11 can be found in the patent literature so that you
12 don't have to just rely on my say-so. But it's
13 common knowledge. So I did bring those if we want
14 to enter them.

15 MR. FORGHANY: Sure. Why don't we mark
16 the first one.

17 THE WITNESS: Okay. Let's mark them in
18 order of time. So the first one is -- that's
19 going to be Exhibit 13.

20 (Pond Deposition Exhibit 13 was
21 marked for identification.)

22 A. So Exhibit 13 is U.S. Patent 5,519,423
23 to Hewlett-Packard filed in July 1994, and the key
24 point about this one that I'm using to corroborate

1 what I'm saying is the distance between the heater
2 resistors and the ink feed edge in this patent
3 is -- many examples are given, and the dimensions
4 are in the range of 130 to 160 microns for that
5 dimension.

6 BY MR. FORGHANY:

7 Q. And --

8 A. And then the next one is -- that's
9 going to be Exhibit 14, I guess.

10 (Pond Deposition Exhibit 14 was
11 marked for identification.)

12 A. Exhibit 14 is U.S. 5,648,805. It is
13 another Hewlett-Packard, filed in October of 1994,
14 and similar to the Exhibit 13, this one gives
15 various dimensions that were reported and
16 experimented with for the distance between the
17 feed edge and the heater resistor, and it gives
18 those ranges of devices that are successful as 75
19 microns to 270 microns.

20 BY MR. FORGHANY:

21 Q. And for the next patent?

22 A. And then the final one is -- this is
23 going to be Exhibit 15.

24

1 (Pond Deposition Exhibit 15 was
2 marked for identification.)

3 A. So Exhibit 15 is a U.S. Patent
4 5,946,012, also to Hewlett-Packard, filed June of
5 1998, and this patent describes the design
6 parameters that are useful for the distance
7 between the ink feed edge and the resistor, the
8 heater resistor, and finds that a distance of
9 about 55 microns is optimal for very high
10 frequency operation.

11 BY MR. FORGHANY:

12 Q. Now, these disclosures, they are
13 appearing in patents, but your opinion, if I
14 understood it correctly, is that these were well
15 known. Why are these concepts well known?

16 A. These are well known because these
17 devices -- these patents describe devices that
18 Hewlett-Packard actually put into the market, and
19 the success of Hewlett-Packard devices became
20 somewhat the common base of which for thermal
21 inkjet practitioners to come back to.

22 And when I put in my book in 2000 that
23 region would be 200 to 400 microns, I was just
24 capturing this commonly acquired knowledge. It

1 doesn't just come from Hewlett-Packard. It also
2 comes -- some from Lexmark, some from Olivetti in
3 the roof shooter world and a little bit from Xerox
4 and Canon, but I brought these patents because
5 they clearly show this feed length that we have
6 been talking about and make it more clear what I
7 meant when I said that the feed edge needed to be
8 very close to the heater arrays. This puts some
9 numbers to that.

10 Q. And was it a pattern or practice in the
11 industry to be looking at competitor patents?

12 A. Yes. I think all practitioners -- at
13 least I'm well aware that Xerox, Lexmark, Kodak,
14 and Hewlett-Packard routinely looked at each
15 other's patents to learn from them and to inform
16 their practice.

17 Q. How do you know or do you know one way
18 or the other, have an opinion about whether a
19 person of ordinary skill in the art who you
20 defined as someone that has one to two years -- or
21 two years of practical experience would have
22 applied or known about that rule of thumb?

23 MR. BORSOS: Objection to form.

24 A. Yes, they would have. They would have

1 known about it. From my book -- at least at
2 Xerox, at least the PHOSITAs that I personally
3 understand and met, they would know it because it
4 became a common discussion, and I assume my
5 PHOSITAs are typical PHOSITAs.

6 BY MR. FORGHANY:

7 Q. Do you have an opinion about whether or
8 not that rule of thumb would have been applied by
9 the person of ordinary skill in the art during
10 those two years?

11 A. They would have learned it if they were
12 participating -- if they were a PHOSITA that then
13 participated in the design of the drop generator,
14 they would have applied those rules.

15 Q. And you also mentioned that -- oh,
16 going back to the Giere '178, in column 3, for
17 example --

18 A. Did you get my copy? Did you grab my
19 copy or no?

20 Q. No.

21 A. I still have my copy here?

22 Q. Let me know when you found it.

23 A. Here it is. Okay. Where are we in
24 Giere '178?

1 Q. So earlier you were discussing, you
2 know, common synonyms for via with the other
3 attorney. Do you recall that conversation?

4 A. Not really.

5 Q. You mentioned that slot was another way
6 of saying via?

7 A. Yes, slot is, feed, feed slot.

8 Q. And --

9 A. In that Yabe patent there was some
10 other phrase we just -- ink feed, ink feed port.

11 Q. Outlet port.

12 A. Or outlet. The word port is used
13 sometimes.

14 Q. So looking at Giere '178, in column 3
15 starting at line 40 to 45, it says, "In center
16 feed the ink then flows through a central slot in
17 the substrate...." singular.

18 A. Yes, yes.

19 Q. In this embodiment it is referring to a
20 singular ink via centrally disposed on the
21 substrate?

22 A. Yes, that's what it's referring to. It
23 would be a single color -- it would have to be a
24 single color device, and that's a simplification.

1 I think central means in the middle area. It
2 doesn't mean right smack-dab in the center.

3 Q. And the word slot is singular. That
4 conveys to you that it's a single via?

5 A. Yes.

6 Q. In other parts of the patent, Giere
7 '178, it refers to that term in a plural for vias?

8 A. Yes, where he talks about what is in
9 Figure 3, column 8 and line 45, 46, 47. He says
10 feed slots, plural there.

11 Q. And later down in that same paragraph,
12 you were talking with the other attorney about,
13 you know, the sentence -- I believe it starts on
14 line 46, "Regions 302, 304, 306, and 308 each
15 include an array of nozzles and associated firing
16 resistors for ejecting ink."

17 A. Yes. What is your question about that?

18 Q. Each of those nozzles and resistors can
19 be fired independently within each region,
20 correct?

21 A. Yes. It has to be that way to make the
22 image -- to make up the image. In each region
23 each heater is independently fired based on
24 whether or not the image needs to have a drop

1 printed when that nozzle is above the paper at
2 that location.

3 Q. And that's consistent with wanting to
4 control the quantity of ink that's fired on a per-
5 color basis?

6 A. Well, wanting to control on a per-color
7 basis is so that you can achieve a reproducible
8 color gamut. If the amount of ink in the colors
9 varied uncontrollably, the hue would vary
10 uncontrollably. So cyan and yellow make green,
11 but the shade of green would vary unacceptably to
12 the customer.

13 So you want to control the drop size of
14 each color individually, and that's what Giere
15 '178 spends so much time talking about for the
16 first six columns is that issue.

17 Q. And that wouldn't be something you
18 would worry about with a single black cartridge,
19 color?

20 A. Within reason a single black cartridge
21 you would also worry about regions -- so, for
22 example, Giere's '673 that has the memory
23 temperature devices in different regions of his
24 length of heaters, you can still have artifacts in

1 the image coming from the drops being bigger or
2 smaller in different parts of the heater array.

3 So you still care about it, but you're not -- but
4 the human being is not as sensitive to those
5 variations as we are to color shift.

6 So the level of -- I was talking before
7 about temperature management has a bunch of
8 levels. It's more important in the color regime
9 to control temperature than it is in the black,
10 but it's not zero in the black. It's still
11 important to avoid failure modes in the black.

12 Q. And if you can turn to column 9,
13 starting at line 58, it reads, "Yet another
14 embodiment of the temperature compensation system
15 may be used to control a quantity of ink deposited
16 on a region in response to the measured
17 temperature."

18 A. Yes.

19 Q. And so this again would be consistent
20 with the fact that the ink is being deposited on a
21 per-region basis and is controlling the quantity
22 of ink that's being deposited in each of those
23 regions?

24 MR. BORSOS: Objection.

1 A. Yes. In this particular sentence I
2 believe the word region is talking about the
3 printed media, a region on the printed media. The
4 system may be used to control a quantity of ink
5 deposited on a region of the paper, say, in
6 response to the temperature measurement.

7 BY MR. FORGHANY:

8 Q. The word deposited is not referring to
9 being supplied. It's referring to it's being
10 printed on?

11 A. Yes. I'm taking the word deposited --
12 in other words, you may want -- if you know
13 that -- if you know -- if you know the printhead
14 is cold, you may actually try to print a larger
15 drop on that part of the paper so it becomes
16 uniform rather than not compensating for the
17 temperature. If you don't compensate for the
18 temperature, the drops may be too small on that
19 region of the paper.

20 Q. Because a few sentences later it's
21 referring to the regions of the substrate,
22 starting on column 10. Maybe you can read that
23 quickly and just confirm whether that's still your
24 understanding.

1 MR. BORSOS: Objection.

2 A. How far down on column 10?

3 BY MR. FORGHANY:

4 Q. Just till line 10. Is it still your
5 opinion that the word region that appears in
6 column 9 is referring to a region of the medium or
7 paper in light of the fact that the word region is
8 used to describe the substrate 300 in the next
9 column over?

10 MR. BORSOS: Objection.

11 A. Yes. There it says "regions of the
12 substrate." It says that the regions are of the
13 substrate. So in that place -- that's on line
14 about 7. That use of the word region is talking
15 about the places in between his printing element
16 rectangles.

17 BY MR. FORGHANY:

18 Q. And how does that inform your opinion
19 about whether or not Giere '178's regions include
20 an ink via?

21 MR. BORSOS: Objection.

22 A. I can't say that that helps me
23 understand the ink via -- where the ink vias are
24 from that because the regions he is talking about

1 here aren't where the ink vias are in my opinion.
2 The ink vias are in 304, 2, 6, and 8. He is using
3 the temperature he is sensing in these regions
4 between the heater arrays to adjust his drop
5 firing, but I don't get anything particular from
6 those sentences that I don't get from the figure,
7 just from the figure, from the words. I don't get
8 anything from the words.

9 Q. So that description that you just gave
10 about the location of those regions, is it
11 possible -- does that suggest one way or another
12 whether or not the ink vias can be disposed in
13 those same regions outside the region?

14 MR. BORSOS: Objection.

15 A. Well, I already opined in answer to the
16 previous questions that I don't believe that Giere
17 '178 would have placed his resistive elements 310,
18 312, 314, and 316 on a place where the vias are
19 located. So I think they're on a substrate, but
20 then I was asked, well, is it impossible to get
21 close to the edge and so, you know -- I think the
22 plain meaning of Figure 3 to a PHOSITA is the vias
23 are in the rectangles.

24 There are regions between the

1 rectangles. That's where he senses the
2 temperature, and he infers what to do about the
3 drop generators on the two sides of that region
4 from that measurement and then controls his drop
5 size in that manner.

6 BY MR. FORGHANY:

7 Q. Let me rephrase my question. So if as
8 Giere '178 is saying that the temperature is being
9 sensed in the regions between the long
10 rectangles --

11 A. Yes.

12 Q. -- then that's not where the ink vias
13 could be, correct?

14 MR. BORSOS: Objection.

15 A. I don't think so.

16 BY MR. FORGHANY:

17 Q. It's more common --

18 A. It certainly wouldn't be anything any
19 PHOSITA I know would do.

20 Q. Thank you.

21 A. But I don't know this word impossible.
22 Is it impossible? I don't know. That's where I
23 can't --

24 Q. Is it fair to say that would be an

1 unusual --

2 A. It would be unusual, unlikely, probably
3 unworkable.

4 Q. And could Giere '178's -- the middle
5 runs for TSR 310, 312, 314, and 316, could they be
6 traversed if there was a central slot as patent
7 owner suggested?

8 A. Well, the patent owner in their -- in
9 the patent owner's preliminary response, the
10 patent owner drew a single ink via down the entire
11 vertical direction between the four rectangles.
12 Running the via across all of these connecting
13 runs for sensor 312, it ran across the dash -- the
14 dot dot dash line that connects that sensor. It
15 ran across the dot dot dash line for sensor 316
16 and across the dot dot dash line of sensor 310
17 and -- so those three. Well, no, it actually
18 ran -- it ran across all four.

19 So I don't know how you would do that.
20 That's impractical to connect those up across a
21 via. By definition the silicon is not there
22 anymore. I don't know what you would run the via
23 on -- I mean run the lead on. So Giere '178,
24 Figure 3 is incompatible with a central slot down

1 the entire array that crosses all of those sensor
2 runs.

3 Q. Could a shared thermal equilibrium like
4 temperature be achieved rapidly if there was a
5 temperature with sensor on the central slot inward
6 from the two heater arrays?

7 MR. BORSOS: Objection.

8 A. It's just an improbable situation. I
9 just don't know --

10 BY MR. FORGHANY:

11 Q. Let me rephrase.

12 A. I just don't think -- the heat
13 wouldn't -- it would be hard for the heat to flow
14 vertically if you narrowed that silicon that much.
15 So I don't know -- I think you would have hot
16 spots -- you would have severe hot spots, I think,
17 if you did that.

18 Q. So another way to put it would be, you
19 know, if temperature was sensed around the central
20 slot inward from the two heater arrays, would the
21 sensor output reasonably represent the temperature
22 at both heater arrays?

23 MR. BORSOS: Objection.

24 A. I doubt it because the central slot

1 would insulate the heat transfer between the two
2 heater arrays. So one could be hot, and one could
3 be cold, and you wouldn't know it from the sensor.

4 BY MR. FORGHANY:

5 Q. And there was a discussion earlier you
6 had with the other attorney about whether or not
7 what is shown in Figure 3 of Giere '178 is a
8 monochrome or polychrome printhead, and just for
9 the purposes of just this question, if you were to
10 assume that Giere's '178 Figure 3, the printhead
11 that's shown there is a monochrome printhead as
12 patent owner asserts and the ink feeding through
13 would be, you know, four vias that are central to
14 each of the designated nozzle areas, would a
15 person of ordinary skill in the art recognize that
16 the TSR middle runs illustrated must rest on that
17 substrate area?

18 MR. BORSOS: Objection.

19 A. Well, I think a PHOSITA would assume
20 that the TSRs were on a substrate. Otherwise,
21 they have no support and they have nothing to
22 collect the heat to transfer to them, but more
23 than that, another reason that maybe did not come
24 up that I don't think it's a monochrome printhead

1 is that the resistor, heater, drop generator
2 arrays are separated vertically.

3 So there's a white gap between area 302
4 and area 306. So that represents a place that
5 doesn't print. So in order to build up an image
6 on the paper, the paper that advances between
7 scans of the carriage would have to advance that
8 small white space area as well as the large length
9 of the rectangular area in order to complete the
10 printing, and that would virtually halve the
11 printing rate.

12 It would almost cause your printing
13 speed to be half, and that's so impractical, so
14 illogical, I just can't see any ordinary reason
15 for it. A PHOSITA wouldn't do that.

16 BY MR. FORGHANY:

17 Q. And just to reiterate my last
18 question -- I could phrase it differently. The
19 other attorney was asking you about whether or not
20 it's possible that Figure 3 could be a monochrome
21 versus a polychrome printhead configuration, and
22 assuming that it's monochrome, isn't it still
23 possible that it could just be supplying four --
24 it could be all the same color?

1 A. Yes.

2 MR. BORSOS: Objection.

3 A. It could -- if you want to continue to
4 have the Giere '178's thermal sensors, you want
5 that silicon to still be there. You still want to
6 have your ink via in the center of each area. You
7 could supply all four areas with the same color
8 ink.

9 I don't think still you would do that
10 because of the little white spaces vertically
11 between the arrays would make the printhead
12 functionally inefficient, terribly inefficient.

13 BY MR. FORGHANY:

14 Q. So is it fair to say that while you
15 don't think it's likely, your interpretation of
16 Figure 3 is still consistent with what would be a
17 monochrome printhead application?

18 A. Yes, with four vias supplying the same
19 color ink in each via.

20 Q. And the '708 patent claims, they don't
21 require that those plurality of vias be different
22 colors, correct?

23 A. No.

24 Q. And you mentioned earlier that there

1 would be some -- not as significant a color --
2 even in a black cartridge configuration, there
3 would still be a benefit of monitoring the
4 temperature for each of those vias to prevent and
5 preclude artifacts, correct?

6 A. Yes. If you had this configuration
7 with the separated vias, even if it was
8 monochrome, you're still going to have regions
9 that are behaving thermally in a decoupled way
10 because of the thermal isolation caused by the
11 four vias, and so it would still be beneficial to
12 sense the temperature in the regions -- the four
13 regions that Giere '178 does even for a monochrome
14 printer -- printing printhead.

15 Q. And last question is there was a back
16 and forth discussion about the word -- you know,
17 whether you were giving an opinion about the width
18 of the rectangles that are appearing in Figure 3
19 of Giere '178, and at one point I believe the
20 question was posed to you by the other attorney
21 about whether a person of ordinary skill in the
22 art would know that region 332 is 600 microns.
23 And you mentioned that it was -- your response
24 said not to scale, but it was representative.

1 Could you describe what you meant by that?

2 MR. BORSOS: Objection.

3 A. Well, the reason I have to keep
4 returning to saying it's representative rather
5 than to scale, first of all, is because while it
6 is long and skinny, it's not nearly as long and
7 skinny as it should be to represent to scale.

8 So, for example, if it had 100 jets
9 along the edge like Benjamin baseline talks about
10 and it was -- and they were 300 spots per inch,
11 then that length would be 8000 microns. It would
12 be 8300 microns long. And so, on the other hand,
13 it's probably only five or six hundred wide.

14 So it needs to have a length to width
15 ratio of something more like one to 16, and I
16 think this is more like one to 10. If the two
17 regions were joined together, that would be more
18 possibly to scale, but the way it is, it's
19 representative, but it's not to scale.

20 BY MR. FORGHANY:

21 Q. In Figure 3, if you turn to column 1,
22 it's described as a high-level schematic diagram?

23 A. Yes.

24 Q. And is it consistent with -- such high-

1 level diagrams, is it common practice to -- would
2 you expect every component that would be in that
3 region to be displayed in a high-level diagram?

4 MR. BORSOS: Objection.

5 A. No. And one thing that a PHOSITA
6 learns about a thermal inkjet printhead is because
7 of these two hugely different scales of the
8 important features, the features of a drop
9 generator have a scale of 10s and a few hundreds
10 of microns, whereas the chip itself has a scale of
11 10,000s and 20,000s of microns.

12 So it's not possible on a drawing that
13 has to exist on an 8-1/2 by 11 sheet of paper to
14 capture those two scales without having blow-up
15 regions for figures and without having --
16 representing the effects rather than scaling the
17 effects.

18 BY MR. FORGHANY:

19 Q. In Figure 3 I think it's pretty safe to
20 assume that if I were to look at a chip, I'm not
21 going to find those little zigzag lines physically
22 on a chip? Those are symbolic?

23 A. Yes.

24 Q. And what do those little zigzag lines

1 symbolize pictorially?

2 A. They symbolize resistance value,
3 resistance.

4 Q. And so would a long, skinny rectangle
5 symbolize something as well to a person of
6 ordinary skill in the art?

7 A. Yes.

8 Q. So regardless of its dimensions, what
9 would the long, skinny symbol indicate to a person
10 of ordinary skill in the art looking at Giere
11 '178?

12 MR. BORSOS: Objection.

13 A. A PHOSITA would look at that and
14 realize they were looking at the region on the
15 chip where the drop generators were placed and
16 those drop generators -- the nozzles, the heaters,
17 the feed edge, the slot on both sides, that's what
18 they would recognize that rectangle to be.

19 BY MR. FORGHANY:

20 Q. And isn't it true that a centrally
21 disposed slot is typically drawn as an elongated
22 circle?

23 MR. BORSOS: Objection.

24 A. Well, I don't think that's -- I don't

1 think the shape is necessarily significant. I
2 mean, typically they are shown with rounded ends,
3 but I don't consider that to be a -- that's just
4 another style -- it depends on how the slot is
5 formed, what shape that takes, and there's
6 different ways to form them, and I don't take much
7 from that shape of the end. I don't think that's
8 important, I guess.

9 BY MR. FORGHANY:

10 Q. And I will just rephrase my question.
11 So are you aware of the '863 Anderson patent
12 that's cited on the base of the '708 patent?

13 A. The '863 Anderson patent -- oh, the
14 Anderson patent?

15 Q. Yes.

16 A. Okay. I don't know. Do we have that
17 here or not? I think it's in the background
18 section of my declaration.

19 Q. It's Exhibit 1015 of your declaration.
20 I will pull it right now.

21 A. The figure on page 17, is that the
22 Anderson drawing? Yes, page 17 of my declaration,
23 Figure 2 from the Anderson patent. You wanted to
24 ask me about that?

1 Q. Yes. In this diagram 20 is the
2 centrally disposed ink via, correct?

3 A. Yes.

4 MR. BORSOS: Objection.

5 BY MR. FORGHANY:

6 Q. And how does this inform your opinion
7 about what's shown in Figure 3 of Giere '178?

8 A. Well, I think you could very well
9 have -- you could draw a rectangle around
10 Anderson's 22 heater array, his feed slot 20 and
11 his heater array 22, heater nozzle array, draw a
12 rectangle around that, and that would be what I
13 think could be inside 302, 304, 306, and 308.
14 That center portion could be in each of those four
15 places.

16 Q. And this is more detail that's provided
17 than what's in Giere '178?

18 A. Yes.

19 Q. Does this also inform your opinion
20 about whether or not an ink via needs to be close
21 to the heater resistors and nozzles?

22 A. Yes. If you look at it, you'll see
23 that the little rectangles 22 are about their same
24 length away from the feed edges, which are the

1 oval edges of 20. They're very close.

2 Q. At the start of the deposition, you
3 were being asked about whether -- in passages in
4 column 2, line 11 through 15 of the '708 patent,
5 whether that would be -- whether the applicant was
6 referring to something that was in the prior art
7 or something that was, I think as the attorney put
8 it, identifying the drawback of the prior art
9 systems.

10 MR. BORSOS: Objection.

11 A. I don't seem to have the -- did I ever
12 get the '708 patent?

13 MR. BORSOS: It's marked as Exhibit 2.

14 A. Exhibit 2? '708, column 2.

15 BY MR. FORGHANY:

16 Q. Line 11 through 15.

17 A. Line 11 to 15. "The ink vias 202, 204,
18 and 206 act as a thermal barrier between the
19 colors. All the thermal heater arrays...are
20 situated on only one side of their respective ink
21 vias, ensuring that there is only a small amount
22 of thermal crosstalk between the temperature sense
23 resistors."

24 So what's your question about that?

1 Q. So do you recall having a discussion
2 with the other attorney about whether or not that
3 statement is a statement by the applicant
4 admitting that the insulating feature of ink vias
5 was prior art?

6 MR. BORSOS: Objection.

7 A. What I remember is that came up as to
8 whether or not Barkley '708 taught that ink vias
9 were insulating. That's how I thought that came
10 up.

11 BY MR. FORGHANY:

12 Q. So why don't we just start from the
13 beginning then. Regardless of whether or not
14 Barkley is describing this assembly as in the
15 prior art or not, was the insulating feature of
16 ink vias known to a person of ordinary skill in
17 the art at the time of the invention?

18 MR. BORSOS: Objection.

19 A. Yes, it was, regardless of whether
20 Barkley says it here or not.

21 BY MR. FORGHANY:

22 Q. How so?

23 A. It was also in Yabe. It's something
24 that naturally comes out of a thermal analysis of

1 the structure.

2 Q. So how would it naturally come out of
3 it?

4 A. Of a thermal analysis?

5 Q. Yes.

6 MR. BORSOS: Objection.

7 A. In my background section of my
8 declaration, I explain that if you look at the
9 thermal conductivity of silicon compared to water
10 and plastic, that the thermal conductivity of
11 silicon is -- I think the number is in the
12 range -- well, I shouldn't guess, but it's -- oh,
13 this is the '823. I don't remember whether the
14 background section is identical in the '823.

15 Okay. So in my declaration for the
16 '708 IPR patent case, in paragraph 44 I explain
17 that the thermal conductivity of silicon is in the
18 range of 70 to 75 watts per meter degree kelvin,
19 whereas for water the thermal conductivity is .64
20 watts per meter degree kelvin. And for typical
21 manifold plastic, Delrin, the thermal conductivity
22 is .23 watts per meter per degree kelvin.

23 So the ink vias, which are largely
24 water, have a thermal conductivity which is 112

1 times less than the silicon substrate material,
2 and the plastic manifold to which the substrate is
3 sealed has a thermal conductivity that is 315
4 times less than the silicon substrate.

5 So one can see just with the background
6 of a PHOSITA understanding the phenomenon of heat
7 transfer that heat introduced by the heater
8 resistors to fire drops will be conducted more
9 rapidly into the adjacent silicon regions than
10 into the ink supply vias or plastic components.
11 So that's just basic understanding of the
12 engineering involved in heat transfer. That's
13 enough to understand that the vias are insulating
14 as compared to the silicon substrate itself.

15 BY MR. FORGHANY:

16 Q. And so taking that reasoning, do you
17 believe that a person of ordinary skill in the art
18 reading Barkley would believe that Barkley
19 discovered the natural phenomenon of ink via being
20 an insulator?

21 MR. BORSOS: Objection.

22 A. Yes. He would have looked at Barkley
23 and said, okay, yeah, that's right, vias are
24 insulators.

1 BY MR. FORGHANY:

2 Q. So my question was would a person of
3 ordinary skill in the art believe that Barkley
4 discovered that natural phenomenon?

5 MR. BORSOS: Objection.

6 A. Oh, no, no way, no. He wouldn't have
7 believed Barkley discovered it, and Barkley didn't
8 claim anything about it.

9 BY MR. FORGHANY:

10 Q. And do you have an opinion one way or
11 another whether or not a person of ordinary skill
12 in the art as you defined under your definition
13 would have been exposed or understood or learned
14 or come into any kind of contact with this natural
15 phenomenon of heat insulation of ink vias during
16 the course of their two years of working in the
17 inkjet field?

18 MR. BORSOS: Objection.

19 A. Yes. He would if he were involved with
20 the printhead.

21 BY MR. FORGHANY:

22 Q. How so?

23 A. One of the first design problems in
24 looking at a new design is the failure modes to

1 come from overheating. So he would quickly see
2 that heat movement, something he needed to worry
3 about.

4 MR. FORGHANY: Thank you, Dr. Pond.

5 That's all I have.

6 FURTHER EXAMINATION

7 BY MR. BORSOS:

8 Q. I just have a few more questions.
9 Dr. Pond, your counsel directed you to the
10 description of Figure 3 in Giere '178, which at
11 column 1, line 57, I believe, says "Shown in FIG.
12 3 is a high level schematic diagram of an
13 embodiment of the temperature measurement system."

14 A. Yeah. Remind me again where that is,
15 what column?

16 Q. Sure. Column 1.

17 A. Column 1?

18 Q. Towards the bottom at about line 57 or
19 maybe 56.

20 A. Oh, "Shown in FIG. 3 is a high level
21 schematic diagram" --

22 Q. Yes.

23 A. -- "of an embodiment of the temperature
24 measurement system"? Okay.

1 Q. By stating that it's a high-level
2 schematic diagram, could that indicate that it's
3 not intended to show precise placement of parts,
4 just wires and, you know, other features?

5 MR. FORGHANY: Objection as to form.

6 A. I think that it would mean that -- it
7 wouldn't necessarily show the placement of parts
8 and elements that weren't important to
9 understanding his invention.

10 BY MR. BORSOS:

11 Q. Does Giere '178 identify why it places
12 temperature sensors in the manner that it
13 indicates?

14 MR. FORGHANY: Objection as to form.

15 A. He calls them different regions, and a
16 PHOSITA would look at that and understand that the
17 heat behavior would be different -- the thermal
18 behavior would be different in the different
19 regions, but I don't believe that Giere '178 ever
20 fully explains the rationale for every aspect of
21 those sensors.

22 BY MR. BORSOS:

23 Q. If you take a look at Figure 3, we've
24 discussed the rectangular regions 302 and 304

1 quite a bit. If you assume that each of those
2 regions contains an ink via as you have
3 indicated --

4 A. Yes.

5 Q. -- then can you explain to me why the
6 sensor 326 would detect the temperature along the
7 left side of 302 and the right side of 304?

8 MR. FORGHANY: Objection as to form.

9 A. Well, that's one of the things I'm
10 saying. He doesn't tell us -- he does not give a
11 reason for it.

12 BY MR. BORSOS:

13 Q. Can you think of any reason why --

14 A. My thought is --

15 Q. -- a person with skill in the art would
16 have wanted to detect the left-hand side of one
17 via and the right-hand side of another via that
18 are opposite one another?

19 A. My thought of it is it's somewhat
20 similar to the rationale for sensing the central
21 region that informs the two patents we're talking
22 about, that even though there are heaters of
23 different colors on the two sides of that region
24 contributing to the thermal behavior of that

1 region, it's still economical to have one sensor
2 there that sums up the behavior in that area, and
3 my thinking as a PHOSITA is that that same
4 rationale of economy -- he is saying the two
5 outside regions are similar, and I'll just go
6 ahead and combine those sensors and only have one
7 sensor for outside regions, just like I have one
8 sensor for the inside regions.

9 But they do share the thermal behavior
10 of, as you say, heaters along the left side of 302
11 and along the right side of 304, but he doesn't
12 explain that.

13 Q. Would there be any link between the
14 firing of heaters along the left side of region
15 302 and heaters along the right side of 304?

16 A. I think you're asking me is there any
17 thermal link between them. Is that what you're
18 asking me?

19 Q. I'm asking you a more general question.

20 A. Okay.

21 Q. But I think it would lead to a thermal
22 link. So is there anything that you're aware of
23 that would indicate that the firing pattern of the
24 heaters along the left side of area 302, if indeed

1 the structure of Figure 3 is as you have opined --
2 would there be any link between the firing pattern
3 of those heaters on the left of 302 and heaters on
4 the right of 304?

5 A. The firing patterns will be determined
6 by the image that the customer wants to print. So
7 if for sake of understanding we took 302 to be a
8 yellow set of heaters and 304 to be a cyan set of
9 heaters, then there's no link necessarily between
10 the yellow portions of the image and the cyan
11 portions of the image that we could know
12 beforehand, that we as the printer maker could
13 know. So in that sense the firing pattern is
14 something that we can't predict.

15 Q. So if your interpretation of Figure 3
16 is correct, then the area to the left of 302 could
17 be hot while the area to the right of 304 is cool
18 or vice versa, right?

19 A. Yes, that could happen.

20 Q. And this sensor element 326 would be
21 unable to distinguish between whether the left is
22 hot, the right is hot or both are hot, correct?

23 MR. FORGHANY: Objection, form,
24 incomplete hypothetical, foundation.

1 A. Just purely with what is in the Figure
2 3, yes, but realistically the system also does
3 know what the data is. So the temperature
4 management system does know in my little example
5 whether cyan printing has had to happen or not.
6 So it knows more than just the temperature, but
7 just the temperature, you're correct.

8 BY MR. BORSOS:

9 Q. In view of all that, can you think of
10 any logical reason to have the same temperature
11 sensor positioned adjacent the left of region 302
12 and the right of region 304?

13 MR. FORGHANY: Objection, scope,
14 foundation.

15 A. Well, I thought two things about that.
16 I've thought about that. One thing is cost. So
17 there is -- every one of these sensors and all the
18 rest of the system that supports them and uses the
19 data costs money. So it would save money to do
20 it.

21 The second thing I've thought about is
22 what Giere is teaching us is not so much about
23 this practical layout of heater arrays and vias so
24 much as he's teaching us how to deal with four

1 regions, and he is using this layout to create
2 four different regions, and so he wants to teach
3 us -- if I'm a PHOSITA looking into a printhead
4 that has different regions, he's teaching us a way
5 to deal with that. That's what I've thought
6 about.

7 BY MR. BORSOS:

8 Q. And is there anything that's explicitly
9 described in Giere '178 that explains why it would
10 be beneficial to monitor the temperature of a
11 region of a printhead?

12 A. It may just be implied. I can't
13 remember whether he says explicitly. I mean, it's
14 obvious that if different regions are heated
15 differently and you want to do a better job of
16 temperature management, you need to know the
17 temperature in the different places. That's
18 common sense.

19 So beyond that I can't remember -- I
20 can look and read back through him and see if he
21 ever says why a printhead has different regions.
22 It does, but does he say it? I don't know. You
23 want me to do that?

24 MR. BORSOS: I don't think that's

1 necessary.

2 I'm done. Thank you, Dr. Pond.

3 THE WITNESS: Are we done?

4 MR. FORGHANY: We are off the record.

5 (Witness excused.)

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October 10, 2023

1 IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

2 BEFORE THE PATENT TRIAL AND APPEAL BOARD

3 CANON U.S.A., INC. and)
4 CANON INC.,)
5) Case IPR2023-00313
6 Petitioners,)
7) Patent No.
8 vs.) 7,594,708
9)
10 SLINGSHOT PRINTING LLC,)
11)
12 Patent Owner.)

13 I, STEPHEN F. POND, Ph.D., being first
14 duly sworn, on oath say that I am the deponent in
15 the aforesaid deposition taken on October 10,
16 2023; that I have read the foregoing transcript of
17 my deposition, consisting of pages 1 through 156
18 inclusive, and affix my signature to same.

19 Corrections have been submitted
20 No corrections have been
21 submitted

22 STEPHEN F. POND, Ph.D., Deponent

23 Subscribed and sworn to
24 before me this day of
25 , 20__

Notary Public

October 10, 2023

1 STATE OF ILLINOIS)
) SS.
2 COUNTY OF C O O K)

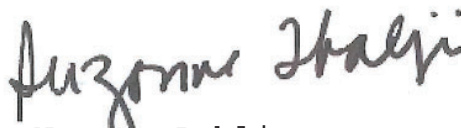
3 I, SUZANNE THALJI, CSR and Notary Public
4 in and for the County of Cook and State of
5 Illinois, do hereby certify that on October 10,
6 2023, at 9:07 a.m., at 110 North Wacker Drive,
7 Suite 2800, Chicago, Illinois, the deponent
8 STEPHEN F. POND, Ph.D., personally appeared before
9 me.

10 I further certify that the said STEPHEN
11 F. POND, Ph.D., was by me first duly sworn to
12 testify and that the foregoing is a true record of
13 the testimony given by the witness.

14 I further certify that the deposition
15 terminated at 3:47 p.m.

16 I further certify that I am not counsel
17 for nor related to any of the parties herein, nor
18 am I interested in the outcome hereof.

19 In witness whereof, I have hereunto set
20 my hand and seal of office this 19th day of
21 October, 2023.

22 
23 Notary Public

24 CSR No. 084-002337 - Expiration Date: 5/31/25