1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 _____

3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4 _____

5 MANUFACTURING RESOURCES INTERNATIONAL, INC.,

6 Petitioner,

7 v.

8 SAMSUNG ELECTRONICS CO., LTD.,

9 Patent Owner.

10 _____

11 IPR2023-01202 (Patent 8,223,311 B2)

12 IPR2023-01203 (Patent 8,842,253 B2)

13 _____

14 Deposition of DR. CARL D. MEINHART

15 Raleigh, North Carolina

16 Tuesday, May 7, 2024

17 9:03 a.m.

18

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20 Job No.: 534990

21 Pages: 1 - 94

22 Reported by: Karen Kidwell, RMR, CRR

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13 Pursuant to Notice of Deposition, before Karen
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15 Carolina.
16
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22

1 A P P E A R A N C E S
2 ON BEHALF OF THE PETITIONER, MANUFACTURING
3 RESOURCES INTERNATIONAL, INC.:
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1 I N D E X

2 WITNESS/EXAMINATION Page

3 CARL DANIEL MEINHART

4 By Ms. Potkay 6

5

6

7 E X H I B I T S

8 Number Description Page

9 Exhibit 1001 United States Patent No. US 27
10 8,223,311, Bates Petitioner Manufacturing Resources
11 International, Inc. Exhibit 1001

12 Exhibit 1003 Declaration of Dr. Carl D. 8
13 Meinhart in Support of Petition for Inter Partes
14 Review, Petitioner Manufacturing Resources
15 International, Inc. Bates Exhibit 1003

16 Exhibit 1004 Carl D. Meinhart Curriculum 18
17 Vitae, Bates Petitioner Manufacturing Resources
18 International, Inc. Exhibit 1004

19

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22

1 E X H I B I T S (Cont'd)

2 Number Description Page

3 Exhibit 1006 Public patent publication, ...68
4 Japanese Patent Application Laid-Open No. 2006-163217, Application number
5 2004-357682, Bates Petitioner Manufacturing Resources
6 International, Inc. Exhibit 1006, also
7 MRI-ITC-1349_0000003973-92

8 Exhibit 1007 United States Patent No. US 80
9 6,493,440 B2, Bates Petitioner Manufacturing Resources
10 International, Inc. Exhibit 1007

11 Exhibit 1008 International Application 36
12 Number WO 2007/116125 A1 date 18 October 2007, Bates
13 Petitioner Manufacturing Resources International, Inc.
14 Exhibit 1008

15

16

17

18 REPORTER'S NOTE: All quotations from exhibits
19 are reflected in the manner in which they
20 were read into the record and do not
21 necessarily indicate an exact quote from the
22 document.

1 P R O C E E D I N G S
2 - - -
3 DR. CARL DANIEL MEINHART
4 being first duly sworn, testified as follows:
5 EXAMINATION
6 BY MS. POTKAY:
7 Q. Good morning, Dr. Meinhart.
8 A. Good morning.
9 Q. Can you please state your full name for
10 the record.
11 A. Carl Daniel Meinhart.
12 Q. And you've been deposed before?
13 A. I have.
14 Q. How many times?
15 A. Six.
16 Q. Given that, I'm assuming you're pretty
17 familiar with the typical ground rules for
18 depositions. I'll try to keep this brief, but for
19 the sake of completeness, we'll just briefly review
20 them, if that's okay.
21 A. Sure.
22 Q. So just please wait for me to finish my

1 question before beginning your answer so the court
2 reporter can get down everything that we're saying.
3 And I will do the same, and wait until you're done
4 answering the question before asking the next one.
5 Sound good?
6 A. Yes.
7 Q. It's helpful for the court reporter if you
8 answer audibly, rather than nodding your head or
9 shaking your head in response to questions. Does
10 that sound okay?
11 A. Yes.
12 Q. If you don't understand a question, please
13 let me know, and I'll try to rephrase it. If you
14 don't ask for a clarification, I'll assume you
15 understood the question. Does that sound okay?
16 A. Yes.
17 Q. Your attorney may object to my questions,
18 but you should still answer them unless your attorney
19 instructs you not to answer. Sound good?
20 A. Yes.
21 Q. And if you need a break, please let me
22 know. Only thing is that if there is a question

1 pending, I would just ask that you complete the
2 answer to that question, and then we can take a
3 break.
4 A. Sounds good.
5 Q. Okay. Thank you.
6 You understand your testimony today is
7 under oath?
8 A. Yes.
9 Q. Is there any reason why you think you
10 might not be able to testify truthfully here today?
11 A. No.
12 Q. When were you retained by MRI?
13 A. I don't know the exact date, but it was
14 somewhere -- late spring of last year. Somewhere in
15 April, May time frame of 2023.
16 Q. And were you retained specifically to work
17 on the IPRs?
18 A. I was retained to consult in this matter,
19 and my primary work has been with these IPRs.
20 (Exhibit 1003 was marked for identification.)
21
22 BY MS. POTKAY:

1 Q. I'd like to hand you Exhibit 1003, which
2 has already been marked as Exhibit 1003 here.
3 Do you recognize this to be your
4 declaration in IPR Number 2023-01202 and
5 IPR 2023-01203?
6 A. Yes.
7 Q. And IPR 2023-01202 concerns U.S. Patent
8 Number 8,223,311; is that right?
9 A. Yes.
10 Q. Okay if I refer to that patent as
11 the '311 patent?
12 A. Yes.
13 Q. And IPR 2023-01203 concerns U.S. Patent
14 Number 8,842,253? That's correct?
15 A. Yes.
16 Q. Okay if I refer to that patent as
17 the '253 patent?
18 A. Yes.
19 Q. Are you aware of a co-pending litigation
20 before the International Trade Commission that
21 involves the '311 and '253 patents?
22 A. I'm aware there is an ITC matter.

1 Q. Have you reviewed any documents concerning
2 that ITC matter?
3 A. I've looked at a document very briefly,
4 but I have not relied on it.
5 Q. Which document was that?
6 A. I don't remember. I don't recall.
7 Q. Was it the expert report of Mr. Flasck
8 submitted in that proceeding?
9 A. I -- I don't recall. I don't -- I don't
10 know.
11 Q. You just know it related to the ITC
12 matter?
13 A. Yes.
14 Q. Have you ever spoken to MRI's expert in
15 that proceeding, Mr. Flasck, regarding the opinions
16 he offered?
17 A. No.
18 Q. Have you reviewed patent owner's
19 preliminary response that was submitted to PTAB in
20 either IPR -- in either the IPR concerning
21 the '311 patent or the '253 patent?
22 A. I think I might have looked at it very

1 briefly.
2 Q. Have you reviewed the PTAB's decision
3 instituting review of the '311 patent?
4 A. I looked at that very briefly as well.
5 Q. When did you look at that?
6 A. Several weeks ago.
7 Q. And have you reviewed the PTAB's decision
8 instituting review of the '253 patent?
9 A. Very briefly.
10 Q. And when did you review that?
11 A. Same time.
12 Q. So I'd like to turn to your declaration --
13 which, again, is marked Exhibit 1003, both in the
14 IPRs in which we've marked the same way today.
15 You describe your background and
16 experience in paragraphs 5 through 12 of your
17 declaration; is that right?
18 A. Yes.
19 Q. And in paragraph 12, you say that you have
20 worked in the field of fluid mechanics and transport
21 for over 33 years?
22 A. Yes.

1 Q. What is fluid mechanics and transport?
2 A. Yes. So fluid mechanics is a study of how
3 fluids move. So it relates to pressures, velocities,
4 flow rates, things of that nature. Transport refers
5 to the process of moving something, and in this
6 context, in regards to fluid motion. Like how does a
7 fluid move something.
8 Q. Does that statement in paragraph 12
9 summarize your expertise?
10 A. My expertise is way beyond what is stated
11 in paragraph 12, but it explains the fluid mechanics
12 and transport part of my expertise. But it's not
13 exhaustive of my expertise.
14 Q. But it was intended to be a summary of it?
15 Or . . .
16 MR. ALEMANNI: Objection. Form.
17 THE WITNESS: Well, it is a closing
18 paragraph to -- to my background. And fluid
19 mechanics is, I would say, the most -- the
20 largest time duration. So for 33 years, I've
21 studied fluid mechanics; so it's reaffirming all
22 the years I've spent studying fluid mechanics

1 and transport.
2 BY MS. POTKAY:
3 Q. Looking at paragraph 6 of your
4 declaration, you note that you served as a summer
5 faculty fellow for NASA Johnson Space Center?
6 A. Yes.
7 Q. And what did that entail?
8 A. Yes. So my first summer after I became a
9 professor, I worked at Johnson Space Center,
10 analyzing fluid mechanics of a urine monitoring
11 system for the astronaut program. I was a finalist
12 to be an astronaut candidate a year earlier, and so
13 it was following up on that career pursuit.
14 Q. You were pursuing a career as an astronaut
15 at that time?
16 A. I was applying to be an astronaut.
17 Q. Looking back at paragraph 6, you next note
18 that you were a research scientist at Ford Motor
19 Company?
20 A. Yes.
21 Q. What did your work at Ford Motor Company
22 involve?

1 A. It involved numerous things. One of the
2 things it involved is analyzing fluid flow over the
3 body of a car, to understand its drag. And another
4 focus I did at Ford was looking at fluid motion
5 inside an engine cylinder, to understand the dynamics
6 and the transport physics of air and fuel inside an
7 engine cylinder.
8 Q. You note next that you served as the chief
9 technology officer at SpectraFluidics Inc.?
10 A. Yes.
11 Q. What was your responsibilities as the
12 chief technology officer?
13 A. Yes. So that was a company I co-founded
14 to analyze chemical detection of -- of explosive
15 molecules in the air. And it also involved fluid
16 mechanics and transport physics.
17 Q. You also mentioned that you were a
18 co-founder at -- it is Pi-MEMS?
19 A. Pi-MEMS, yes.
20 Q. What is that company?
21 A. Yeah, that company was founded based upon
22 research at UCSB for -- for cooling -- electronics

1 cooling.
2 Q. And what was your involvement with
3 Pi-MEMS?
4 A. I didn't have any direct involvement with
5 the company, but I was on the board for a number of
6 years and helped contribute to intellectual property.
7 Q. Are you still on the board there?
8 A. No.
9 Q. What year did you found or co-found
10 Pi-MEMS?
11 A. 2012.
12 Q. And you also note that you're a founder
13 of -- is it Ti-MEMS?
14 A. Ti-MEMS.
15 Q. Ti-MEMS.
16 A. Yes.
17 Q. And what is that company?
18 A. That company was founded to develop
19 titanium structures, that also relate to cooling
20 electronics as well as other endeavors.
21 Q. And what was your involvement with
22 Ti-MEMS?

1 A. I had no formal involvement in the
2 company, but I was an advisor to the company.
3 Q. What year did you found it?
4 A. I think it was 2018, 2019 time frame,
5 although I don't remember exactly.
6 Q. Do Pi-MEMS and Ti-MEMS exist today?
7 A. No.
8 Q. You mentioned that you have served as an
9 industry consultant and expert witness on some
10 subjects listed in paragraph 6. Do you see that?
11 A. Yes.
12 Q. What is fluid diagnostic instrumentation?
13 A. So as I mentioned before, the field of
14 fluid mechanics is a study of pressure, velocity, and
15 flow rate of fluids, and the motion of fluids. Fluid
16 diagnostic instrumentation is instruments designed to
17 analyze fluid motion; so whether it be placement of
18 pressure transducers, whether it be methods for
19 measuring velocity in the flow, things of that
20 nature.
21 Q. You also list here MEMS-based oscillators?
22 A. Yes.

1 Q. What are MEMS-based oscillators?
2 A. Well, the field of MEMS, "M-E-M-S" stands
3 for micro-electromechanical systems. And they are
4 basically tiny micro machines, commonly fabricated
5 out of silicon, glass, or plastics. A MEMS-based
6 oscillator is an oscillator -- in this context --
7 that's fabricated in silicon.
8 It's a very, very small device that's used
9 for timing. For example, timing in a cell phone --
10 they need very accurate timing -- or in a computer.
11 And so these things are designed to resonate at a
12 particular frequency. And it's micro, so it's very
13 easy to put it inside a computer or cell phone or
14 tablet.
15 Q. You also mention in paragraph 6 your
16 experience in using COMSOL Multiphysics simulations?
17 A. Yes.
18 Q. What are COMSOL Multiphysics simulations?
19 A. "COMSOL Multiphysics" is the name of a
20 software that uses the finite element method to solve
21 partial differential equations, which were commonly
22 used to describe motions of fluid, heat transfer,

1 solid mechanics, things of that nature. So it's a
2 tool for analyzing engineering problems.
3 MS. POTKAY: I'd like to mark as
4 Exhibit 1004 what has been submitted as
5 Exhibit 1004 in IPR 2023-01202 and 2023-01203.
6 BY MS. POTKAY:
7 Q. And take your time, Dr. Meinhart, but
8 when -- when you're ready, I'll just ask, do you
9 recognize this document to be your CV?
10 (Exhibit 1004 was marked for identification.)
11 THE WITNESS: I do, yes.
12 BY MS. POTKAY:
13 Q. And your CV is up to date?
14 A. This is not completely up to date.
15 Q. What changes have -- or strike that.
16 What relevant updates are there?
17 A. There are -- some of my expert witness
18 work is not updated, looking at it now. And then
19 also the -- it says here that I'm CEO of Numerical
20 Design, and that's a company I sold since the
21 declaration was submitted.
22 And there's a -- there's several other

1 minor things that haven't been updated --
2 Q. What --
3 A. -- and publications. Sorry.
4 Q. What expert witness work is missing from
5 the list on page 2?
6 MR. ALEMANNI: And I'm just going to
7 instruct you that to the extent that any of
8 that's confidential, I don't know what these
9 matters are, but to the extent that there's
10 something confidential or it's not public
11 record, this transcript is public, so I would
12 caution you to -- to err on the side of
13 discretion in describing those.
14 But you can answer the question.
15 THE WITNESS: Yeah. There -- there's
16 several cases that I've done that relate to cell
17 sorting and cell manipulation that I have not
18 included in here, that I can provide for you if
19 you're -- if you're interested. I think the
20 names of the companies may be confidential.
21 Nothing that relates to electronic -- nothing
22 that relates to electronics cooling or Samsung.

1 BY MS. POTKAY:
2 Q. You mentioned that you were previously the
3 CEO of a company called Numerical Design?
4 A. Yes.
5 Q. And you started in that position in 2012?
6 A. Yes, when I founded it.
7 Q. What did you do there?
8 A. I was the CEO. I ran the company. It was
9 my consulting company.
10 Q. I should have asked a better question. I
11 guess, what -- you answered that it's a consulting
12 company, but what types of matters did you consult on
13 through Numerical Design?
14 A. Yes. Primarily the company was founded to
15 do consulting using COMSOL Multiphysics. That was
16 what it was founded for. And then along the way, we
17 started developing intellectual property as well.
18 And so -- so I wrote patents on a microfluidic
19 device. So it was essentially two-pronged company.
20 Q. You noted that there were several other
21 minor things that had been updated.
22 A. Yes. Publications and -- and then a

1 listing of the end date of certain minor activities,
2 like when certain staff worked in my research group
3 at UCSB, minor things of that nature.
4 Q. Nothing that jumps out?
5 A. Right. They're just several small things
6 that I noticed, but nothing significant.
7 Q. Your declaration and CV don't mention any
8 work with liquid crystal displays; is that right?
9 A. I've done a lot of work with the
10 electronics cooling, and I don't recall if any of
11 that related to LC displays. But the physics of
12 cooling is the same. How one cools devices is very
13 similar.
14 Q. So you don't recall doing any work
15 specific to LCD displays?
16 MR. ALEMANNI: Objection. Form.
17 THE WITNESS: Like I said, I have a lot of
18 work -- a lot of experience in electronics
19 cooling, using different methods for electronics
20 cooling, including using airflow in a confined
21 channel to remove heat from electronic devices.
22 And LCD displays fall within that.

1 BY MS. POTKAY:
2 Q. But just so I understand, you don't recall
3 doing any work specific to LCD displays?
4 A. I -- I don't recall whether the electronic
5 devices were LCD displays, specifically.
6 Q. Do you recall whether they were electronic
7 displays?
8 A. I've worked on many different electronics
9 cooling. I would have to go back and look at my
10 notes from many years ago to -- to determine if they
11 were displays or not.
12 Q. So sitting here today, you don't recall
13 specifically working on cooling of electronic
14 displays?
15 MR. ALEMANNI: Objection. Form.
16 THE WITNESS: As we sit here today, what I
17 can tell you is I've spent many, many years
18 cooling electronics and using the -- many
19 different modes of heat removal, including flow
20 with airflow in channels. And I don't recall
21 specifically if those electronic devices were
22 displays, LCD displays, or other types of

1 similar electronics.
2 BY MS. POTKAY:
3 Q. Your declaration and CV don't mention
4 hands-on experience working with temperature sensors.
5 Is that right?
6 A. Temperature -- working with temperature
7 sensors is utilized in lots of different devices that
8 I've worked on. So it's not -- it's not the major
9 part of the device, but it's a necessary part of the
10 device. And I've worked in many different areas --
11 many different industry companies that utilize
12 temperature sensors, and I've even designed
13 temperature sensors myself for many microfluidic
14 devices. So heat transfer, temperature, fluid motion
15 are all very essential parts of work that I've done.
16 Q. You've not designed a temperature sensor
17 for use in an LCD device?
18 A. I've designed temperature sensors for a
19 variety of microfluidic devices using RTDs and
20 thermal couples, which are very similar to the
21 temperature sensors which would be used in LCD
22 devices.

1 Q. But you've not designed a temperature
2 sensor for use in an LCD device?
3 MR. ALEMANNI: Objection. Form.
4 THE WITNESS: My temperature sensors that
5 I've designed could be used for an LCD device.
6 BY MS. POTKAY:
7 Q. I'm not sure that exactly answers the
8 question. You've not designed a temperature sensor
9 for use in an LCD device specifically?
10 MR. ALEMANNI: Same objection.
11 THE WITNESS: I've used temperature --
12 I've designed temperature sensors, such as I
13 mentioned before, RTD temperature sensors for
14 use in microfluidics. Those exact same
15 temperature sensors can be used for LCD devices.
16 There's no distinction in the physics of how
17 temperature sensors work. It's the exact same
18 technology.
19 BY MS. POTKAY:
20 Q. When did you do the work you're referring
21 to, designing temperature sensors for use in
22 microfluidic devices?

1 A. I've designed them for -- for
2 microfluidics applications like free surface fluid
3 motion, where we had to measure the temperature.
4 I've used temperature sensors for understanding
5 cooling effects, like for thermal ground points.
6 Temperature sensors, you can buy them off
7 the shelf. Thermocouples and RTDs. It's common
8 practice in microfluidics to manufacture your own
9 temperature sensors, because you can manufacture --
10 you can fabricate them directly onto the chip. And
11 it's the same physics.
12 So I would say that I started doing --
13 designing temperature sensors in early 2000 time
14 frame, but I don't have an exact date.
15 Q. You referred to "thermocouples or RTDs"?
16 A. Yes.
17 Q. And what do you mean by that?
18 A. So a thermocouple is a temperature sensor
19 that uses two dissimilar metals and creates a voltage
20 based upon the temperature. An RTD is a
21 collar-resistive thermal device, and that uses the
22 principle that resistance of many metals is a

1 function of temperature. And so by measuring the
2 resistance at a particular location, you can estimate
3 the temperature at that location.
4 Q. Are there considerations for why you may
5 use one versus the other?
6 A. Yes.
7 Q. What might that be?
8 A. Well, one consideration would be in a
9 microfluidic device, it's easier in many ways to make
10 an RTD, because of the fabrication processes
11 involved. Another consideration is whether, when you
12 instrument the sensor, if you want to measure voltage
13 or measure resistance. So a thermocouple will give
14 you voltage; an RTD will give you a resistance
15 measurement.
16 Q. What are the different types of
17 temperature sensors that would have been available to
18 a person of skill in the art designing an LCD system
19 in June 2008?
20 A. There are multiple types of sensors
21 available as of 2008. Without being an exhaustive
22 list, some examples that come to mind are RTDs,

1 thermocouples, and infrared measurements.
2 Q. The temperature sensor that's used to
3 measure the temperature of air would be different
4 than the sensor used to measure the temperature of a
5 physical component?
6 A. Not necessarily.
7 Q. Why do you say "not necessarily"?
8 A. The temperature -- it can be the exact
9 same temperature sensor. You could use an RTD or a
10 thermocouple, and you could place it in an airstream,
11 or -- or you could mount it to a solid body and
12 perhaps fasten it with glue, or some thermal paste.
13 But the temperature sensor itself would not have to
14 be different.
15 MS. POTKAY: I'm going to mark as
16 Exhibit 1001, U.S. Patent Number 8,223,311.
17 (Exhibit 1001 was marked for identification.)
18 BY MS. POTKAY:
19 Q. Take your time, Dr. Meinhart. But do you
20 recognize this as the '311 patent?
21 A. Yes.
22 Q. In looking at Column 8 of the '311 patent,

1 which is at page 15 of Exhibit 1001 --
2 A. Column 8?
3 Q. Yes.
4 A. Okay.
5 Q. And -- and starting at line 60.
6 A. Okay.
7 Q. The '311 patent teaches that "The
8 temperature sensor 52 determines the temperature when
9 the air has absorbed heat as much as possible while
10 passing through the first to third channels." Do you
11 see that?
12 A. I do.
13 Q. And the '311 patent describes that as a
14 result of the temperature measurement, a signal is
15 sent to operate a fan to control airflow through the
16 front channel?
17 A. Where is that last part?
18 Q. We're looking in the same place, starting
19 at line 60 of Column 8.
20 A. Okay. Can you repeat? I -- I lost you.
21 Can you repeat that last part?
22 Q. Sure. The '311 patent describes that

1 the -- as a result of the temperature measurement
2 from temperature sensor 52, a signal is sent to
3 operate a fan to control airflow?
4 A. I'm sorry. What line did you start on?
5 Q. Sorry. I'm not reading directly --
6 A. Oh, okay.
7 Q. -- from the specification.
8 A. Okay.
9 Q. Didn't mean to confuse you.
10 A. Sorry.
11 Okay. So --
12 MR. ALEMANNI: Objection. Form.
13 THE WITNESS: All right. So rephrase your
14 question, please?
15 BY MS. POTKAY:
16 Q. Yes. Do you agree that the '311 patent
17 describes that as a result of the temperature
18 measurement from temperature sensor 52, a signal is
19 sent to operate a fan to control airflow through the
20 front channel?
21 MR. ALEMANNI: Objection. Form.
22 THE WITNESS: Well, what you just read on

1 line 65 is the temperature sensor 52 determines
2 the temperature when the air has absorbed as
3 much heat as possible while passing through the
4 first to third channels.
5 And then you -- you say some other things
6 about a signal, and I'm looking for the text
7 that supports your statement. If you could
8 point me to that text, then I can confirm your
9 statement.
10 BY MS. POTKAY:
11 Q. Do you see in Column 8 where it says "the
12 flow rate controller 51 that controls the cooling fan
13 32 according to a signal transmitted from temperature
14 sensor 52"?
15 MR. ALEMANNI: Objection. Form.
16 THE WITNESS: Okay, yeah. On line 62, it
17 says -- it's -- I think that's where you're
18 reading from -- it says "Temperature sensor 52
19 that measures the temperature of air emerging
20 from the first channel 41 and flow rate
21 controller 51 that controls the cooling fan 32
22 according to a signal transmitted from the

1 temperature sensor 52."
2 Is that what you're referring to?
3 BY MS. POTKAY:
4 Q. That's what I'm referring to, yes.
5 A. Okay.
6 Q. And agreed it describes, starting at
7 line 60, that the cooling fan 32 blows air to the
8 first channel 41?
9 A. Yes. Yes. It says on line 60, "The flow
10 control device 50 includes the cooling fan 32 to blow
11 air to first channel 41." Yes.
12 Q. So the '311 patent describes that as a
13 result of the temperature measurement from
14 temperature sensor 52, a signal is sent to operate a
15 fan to control airflow --
16 MR. ALEMANNI: Objection. Form.
17 BY MS. POTKAY:
18 Q. -- through the front channel?
19 MR. ALEMANNI: Sorry.
20 Objection. Form.
21 THE WITNESS: What -- what it says is:
22 The flow rate control device 50 includes a

1 cooling fan 32 to blow air to the first channel
2 41, the temperature sensor 52 that measures the
3 temperature emerging from the first channel 41
4 and the flow rate controller 51 that controls
5 the cooling of that fan according to a signal
6 transmitted from temperature sensor 52.
7 So yes, so it's saying that there is a
8 flow control device, and it's controlling -- the
9 flow control device includes a fan for blowing
10 air into the channel, and that it does so in
11 accordance to temperature sensor 52.
12 So I think we agree. Okay.
13 BY MS. POTKAY:
14 Q. And as we started reading before we
15 circled back, "the temperature sensor 52" -- as
16 taught on the '311 patent here, and I'm reading
17 directly from the specification -- "determines
18 temperature when the air absorbed heat as much as
19 possible while passing through the first to third
20 channels"?
21 A. Yes.
22 Q. So the '311 patent specification teaches

1 here that the benefit of its temperature sensor is
2 that its location enables the measurement of the
3 maximum temperature. Right?
4 MR. ALEMANNI: Objection. Form.
5 THE WITNESS: Well, the temperature sensor
6 determines the temperature when the air absorbs
7 as much heat as possible while passing through
8 the first to third channel. So it's saying it's
9 measuring a temperature when as much heat is
10 absorbed as possible. It's not referring to the
11 maximum temperature.
12 BY MS. POTKAY:
13 Q. The temperature's going to be higher when
14 more heat is absorbed? Is that right?
15 A. Perhaps.
16 MS. POTKAY: Do you mind if we take a
17 quick five-minute break?
18 MR. ALEMANNI: That's fine.
19 (A recess transpired from 9:44 a.m. until
20 9:54 a.m.)
21
22 BY MS. POTKAY:

1 Q. Welcome back, Dr. Meinhart.
2 Before the break, I asked you whether the
3 temperature is going to be higher when more heat is
4 absorbed. Do you recall that?
5 A. Yes.
6 Q. And you answered "Perhaps."
7 A. Yes.
8 Q. Can you explain what you mean by
9 "perhaps"?
10 A. Yes. So adding heat may cause -- if --
11 let me rephrase.
12 So adding heat to air can increase the air
13 temperature; but also, if the air undergoes some sort
14 of an expansion where the pressure is lower, it may
15 actually have a lower temperature.
16 So heat and temperature are not
17 necessarily a one-to-one correspondence. So in -- in
18 many situations, adding heat to air can increase the
19 temperature, and often does, but not in all
20 situations.
21 Q. I'd like to turn back to your declaration,
22 which is Exhibit 1003, if you still have it in front

1 of you.
2 A. Yes.
3 Q. And turn to paragraph 312, which is at
4 page 140.
5 A. Say that again, please?
6 Q. Please turn to paragraph 312. And if it's
7 helpful, it's at page 140. The page numbers are
8 marked in the bottom right-hand corner.
9 A. I am there.
10 Q. You state your opinion here that
11 "Karppanen discloses the use of temperature sensors
12 to measure the temperature within display casing,"
13 right?
14 A. Yes.
15 Q. Would you agree that Karppanen does not
16 disclose a temperature sensor that is positioned to
17 measure the temperature of air discharged from a
18 front channel?
19 MR. ALEMANNI: Objection. Form.
20 THE WITNESS: I would have to look at the
21 Karppanen reference to know if it does not
22 include something. It's much easier to state

1 whether something is there.
2 MS. POTKAY: We can look at Karppanen.
3 We'll mark this as Exhibit 1008. And this is
4 WO 2007/116125.
5 (Exhibit 1008 was marked for identification.)
6 BY MS. POTKAY:
7 Q. You have reviewed Karppanen in submitting
8 your declaration, right?
9 A. That is correct.
10 Q. And you're offering fairly extensive
11 opinions about this reference?
12 A. Yes.
13 So -- so can you rephrase your question,
14 please?
15 Q. Sure. You agree that Karppanen does not
16 disclose a temperature sensor that is positioned to
17 measure the temperature of air discharged from a
18 front channel?
19 MR. ALEMANNI: Objection. Form.
20 THE WITNESS: So in that same paragraph,
21 312, what I say, I quote Karppanen when I say,
22 quote, "connected" -- temperature transducers

1 are, quote, "connected to the control unit in
2 the device casing." That control unit controls
3 the operation of circulation fans based upon
4 measurements of temperatures in accordance with
5 a predetermined control logic.
6 So my analysis -- I use the knowledge of a
7 POSA at the time. And based upon my analysis,
8 it would be obvious that one could readily place
9 the temperature sensor near the exit.
10 I don't know if Karppanen specifically
11 does that. I would have to read Karppanen -- or
12 I don't know if Karppanen specifically does not
13 do that. I'd have to read the reference in
14 detail to know for sure. But my testimony is
15 that a POSITA would know to put a temperature
16 sensor near the exit.
17 BY MS. POTKAY:
18 Q. Your opinion is that Karppanen does not
19 state where the transducers are positioned within the
20 display casing, right?
21 A. Say that again?
22 Q. If I understood correctly, your opinion is

1 that Karppanen does not state where the transducers
2 are positioned within the display casing?
3 A. I would have to review it to know for
4 sure. But what I can tell you is that Karppanen does
5 use pressure sensors to maintain the temperature of a
6 display in the casing 50. The exact placement of
7 temperature sensors for Karppanen, I would have to
8 review the document and see where they specifically
9 state locations of temperature sensors.
10 Q. If you turn to paragraph 155 of your
11 declaration, which is at page 77.
12 A. Okay.
13 Q. Is it correct that your opinion is that
14 Karppanen does not explicitly state where the
15 transducers are positioned within the display casing?
16 A. Yes. 155 says while Karppanen does not
17 explicitly state where the transducers are positioned
18 within a casing, since Karppanen -- Karppanen is
19 attempting to regulate the temperature of the display
20 to prevent damage, placing a transducer display
21 element to sense its temperature directly is at least
22 implicit to Karppanen.

1 So they implicitly disclose it, but does
2 not explicitly state where they are.
3 Q. Karppanen implicitly discloses what?
4 A. Yeah. So -- so Karppanen implicitly
5 discloses that the temperature element -- let me
6 rephrase.
7 Paragraph 55 says "While Karppanen does
8 not explicitly state where the transducers are
9 positioned within display casing, since Karppanen is
10 attempting to regulate the temperature of the display
11 element to prevent damage, placing a transducer on
12 the display element to sense its temperature directly
13 is at least implicit to Karppanen."
14 So Karppanen implicitly says that the
15 transducer could be placed near the display element.
16 Q. Well, this says "placed on the display
17 element"?
18 A. Yes, "placed on the display element," yes.
19 Q. So your opinion is that placing a sensor
20 on Karppanen's display element directly, to sense its
21 temperature, would have been obvious to a person of
22 skill in the art?

1 A. Yes, because it's implicitly disclosed by
2 Karppanen.
3 Q. Looking back at Karppanen, which is
4 Exhibit 1008, Karppanen's system includes a display
5 casing 50 and a device casing 60, right?
6 A. Can you show me where you are, please?
7 Q. I'm just at the abstract right now.
8 A. Okay.
9 Q. You agree that Karppanen's system includes
10 a display casing 50 and a device casing 60?
11 A. Yes.
12 Q. Turning to Column 9 of Karppanen.
13 A. Okay.
14 Q. And looking at line number 9, Karppanen
15 teaches that "a circulating airflow running through
16 the device and display casing is generated with the
17 help on which the temperature of the casings is
18 maintained within desired limits," right?
19 A. Yes.
20 Q. And Karppanen goes on to teach that "The
21 circulating airflow rinses the surface of the parts
22 that warm up, such as that of the display element?

1 A. Yes.
2 Q. And Karppanen's referring there to the
3 physical parts of its system, right?
4 A. And the function. The airflow rinses the
5 surface of the parts.
6 Q. And Karppanen teaches that "the heat
7 transfers effectively from warming-up components
8 directly to the airflow"?
9 A. Yes.
10 Q. And again, Karppanen's referring to the
11 physical components of its system warming up here?
12 A. And the way the heat is transferred, yes.
13 Q. Karppanen goes on to say "In the device
14 and display casing are placed transducers (not shown
15 in the figures) that measure the temperature and are
16 connected to the control unit in the device casing of
17 the information board"?
18 A. Yes.
19 Q. And if we read on, Karppanen says "With
20 the help of the internal cooling air circulation
21 generated with circulating fans, the temperatures of
22 the inner parts of the display casing and the device

1 casing can be standardized and the heat can be
2 effectively transferred away from the inside of the
3 casings." Right?
4 A. Yes.
5 Q. Again, Karppanen refers here to the
6 temperatures of the inner parts of the display casing
7 and the device casing?
8 A. Yes.
9 Q. Meaning the physical components of the
10 display casing and the device casing?
11 MR. ALEMANNI: Objection. Form.
12 THE WITNESS: Yes. What he's saying is
13 that the temperatures of the device case --
14 display casing and device casing can be
15 standardized, and the heat can be effectively
16 transferred away.
17 So he's talking about stabilizing
18 temperatures of two physical components, display
19 casing and device casing, and -- and talking
20 about the heat being transferred away from the
21 inside of the casings.
22 BY MS. POTKAY:

1 Q. And he refers to the inner parts of the
2 display casing and device casing, right?
3 A. Well -- so the -- so they're referring to
4 the inner parts of the display casing and the device
5 casing.
6 Q. Referring specifically to the temperatures
7 of the inner parts of the display casing and the
8 device casing here, right?
9 A. Yes. And the heat being transferred away
10 from the inside of the casing. So talking about the
11 temperatures as well as the heat being transferred
12 away.
13 Q. Karppanen's focused here on maintaining
14 the temperature of the casings?
15 A. Standardizing --
16 MR. ALEMANNI: Objection. Form -- sorry.
17 I didn't hear the question.
18 Objection. Form.
19 THE WITNESS: So Karppanen talks about
20 standardizing the -- the temperatures of the
21 inner parts of the display casing and the device
22 casing.

1 BY MS. POTKAY:
2 Q. Inner parts meaning the physical
3 components?
4 MR. ALEMANNI: Objection. Form.
5 THE WITNESS: The temperature -- so the
6 temperature of the inner parts of the display
7 casing and the device casing, those are -- when
8 you put temperature sensors in those vicinities,
9 you get estimations of the local temperatures,
10 but you don't necessarily get the exact
11 temperature of the display casing or the device
12 casing. But there's usually some average. And
13 it also includes air in that local vicinity as
14 well. So the air sensor is measuring an average
15 of what it's exposed to.
16 BY MS. POTKAY:
17 Q. What do you mean, "you get estimations of
18 the local temperatures"?
19 A. Yeah. Instrumentation, like in fluid
20 diagnostic instrumentation, which is one of the
21 subjects that was highlighted on my CV -- and this
22 applies to all instrumentation -- is that the sensor

1 that you use to make the measurement doesn't
2 necessarily give you the actual value, but it gives
3 you an estimation of the actual value.
4 And so commonly, in the scientific field,
5 we will say that it estimates the temperature.
6 Because it's not perfect. So a POSA would understand
7 that they're estimating the temperature of the inner
8 parts of the device casing -- display casing and the
9 device casing -- but they may not be the exact
10 temperatures.
11 And also -- the sensors are also exposed
12 to air, and the air has some influence on the
13 temperature of -- that's indicated by the temperature
14 sensor as well. Or could have some influence.
15 Q. A person of skill in the art designing
16 an LCD system would need to decide where to put the
17 temperature sensor, right?
18 A. If the -- the engineer who's designing the
19 LCD system is interested in measuring a temperature
20 of the LCD, or some estimations of the temperature,
21 they would have to make a determination as to where
22 to put the temperature sensor. And it's based on

1 many factors.
2 Q. What are these many factors?
3 A. Well, it's not an exhaustive list, but for
4 example, one would have to ask where -- what
5 temperature they are most interested in. And that
6 can very much depend upon the specific design, and
7 also the operating conditions.
8 And also -- for example, if one is
9 interested in measuring the maximum temperature of
10 an LCD display, then one would need to instrument
11 many temperature sensors on the LCD display, and then
12 take these measurements and determine which sensor is
13 producing the maximum temperature.
14 If one is merely interested in measuring
15 an average estimation of a panel temperature, and
16 it's being cooled by airflow, then one may very well
17 want to put the temperature sensor near the exit of
18 the airflow, because the air would do an average --
19 would average the effective temperatures of the
20 panel.
21 And if there is a particular concern about
22 one specific region of the panel being too hot, then

1 maybe a POSA would want to put the temperature sensor
2 at the location that they think is most subject --
3 subjective to a high temperature, for example.
4 So it's very much depending on many
5 factors. It's also dependent on the operating
6 conditions as to where one would put the sensor, or
7 multiple sensors.
8 Q. Karppanen describes a concern with the
9 warming-up components within the display and device
10 casing, right?
11 A. Can you show me where that is,
12 specifically?
13 Q. Yeah, we're back at Column 9, where we
14 were earlier.
15 A. What line?
16 Q. Around 13. Karppanen describes
17 transferring heat effectively from the warming-up
18 components to the airflow.
19 A. Yeah, I see that, yeah. "The circulating
20 air flow rinses the surface of the parts that warm
21 up, such that the display element, whereupon heat
22 transfers effectively from the warming of components

1 directly to the air flow."
2 And at the beginning of that paragraph,
3 Karppanen also says, starting on line 4: "When the
4 information board is in operation, the display
5 element 30 and the electronic devices 62 and the
6 device casing warm up."
7 So -- he does talk about components
8 warming up.
9 Q. Based on Karppanen's description, would a
10 person of skill in the art understand that Karppanen
11 is interested in measuring the temperature of the
12 display element 30?
13 A. So I see on line 20 it says "the
14 temperatures of the inner parts of the display casing
15 and device casing."
16 And you asked a question in regards to
17 element 30, display element. So the display
18 element 30 and the electronic 62 in the device case.
19 So they're maintaining the temperature, or
20 standardizing -- that's what I use -- standardizing
21 the temperature of the device casing, and the display
22 element is contained within the device casing.

1 So it is in some thermal communication
2 with the device casing.
3 Q. Karppanen refers there to standardizing
4 the temperatures of the inner parts of the display
5 casing and device casing, right?
6 A. That is correct. Yeah.
7 And the display element 30 is within the
8 display casing. Now, the question that's not
9 completely clear here is that in line 20, does inner
10 parts of the display casing also apply to the device
11 casing? Because it says "inner parts of the display
12 casing and the device casing."
13 So he's clearly referring to the inner
14 parts of the display casing, and he's referring to
15 device casing. And the inner parts of the device
16 casing has thermal communication with the display,
17 with the display element 30.
18 Q. How do the inner parts of the device
19 casing have thermal communication with the display
20 element 30?
21 A. Through thermal conduction and convection.
22 Q. How are they arranged relative to each

1 other?
2 A. I would have to analyze Figures 1 and 2 to
3 show how Karppanen arranges them relative to each
4 other. But I can do that, if you like.
5 Q. Without analyzing those figures, right
6 now, you wouldn't be able to answer the question?
7 MR. ALEMANNI: Objection. Form.
8 THE WITNESS: Well, the thermal
9 communication in this device is a result of
10 thermal convection and thermal conduction. And
11 I can't explain how they're interconnected
12 without looking at detail of Figure 1 and
13 Figure 2.
14 BY MS. POTKAY:
15 Q. Did you analyze Figure 1 and Figure 2 in
16 forming your opinions in this case?
17 A. Can you say that again, please?
18 Q. Did you analyze Figure 1 and Figure 2 in
19 forming your opinions in this case?
20 A. I did. So I'd have to review it to tell
21 you how those two elements are connected.
22 Q. Do you want to take a look at Figure 1 and

1 Figure 2 now?
2 A. Sure. And can you repeat the question,
3 so -- so I answer it effectively?
4 Q. Sure. The original question was how the
5 inner parts of the device casing have thermal
6 communication with display element 30.
7 A. Yes. So when I look at Figure 1 and
8 Figure 2, there are some -- it appears that there's
9 some mechanical connections between display
10 element 30 and device casing 60. So there's probably
11 a minor component, a thermal conduction. And the
12 primary component would be a thermal convection,
13 based upon what I see in Figures 1 and 2.
14 Q. How, if at all, does this influence a
15 person of skill in the art's understanding of
16 Karppanen's transducers?
17 A. Well, as -- what Karppanen says in line --
18 back on Column 9, line 19, Karppanen says that
19 they're interested in the temperatures of the inner
20 parts of the display casing and the device casing can
21 be standardized, so those are the temperatures he's
22 primarily interested in.

1 And he doesn't specifically, you know, say
2 where they're located; but he just says in the device
3 and display casing are placed transducers. So that
4 could be more than one, and they could be in
5 different areas. But there is thermal -- a POSA
6 would understand that there's thermal communication
7 between display element 30 and display casing 50 and
8 device casing 60.
9 Q. Turning back to your declaration -- sorry,
10 I know you have a number of documents in front of you
11 now, so take your time -- and turning to page 141.
12 A. Okay.
13 Q. Looking at paragraph 314, your opinion is
14 that "In the case of Karppanen, one option would be
15 to affix a transducer to the display element itself,"
16 which is labeled 30 in Karppanen?
17 A. Yes.
18 Q. You say that "the display element may be
19 obtained from a supplier as a self-contained unit."
20 A. Yes.
21 Q. What is your basis for that?
22 A. Yeah, so in my experience with the

1 electronics cooling, oftentime when someone is
2 assembling multiple components into a device, they
3 often buy those individual components from OEM
4 suppliers, right? And so the LCD is -- or these
5 display elements are things that can be obtained from
6 OEM suppliers. And that's general knowledge of
7 a POSA.
8 Karppanen may also say that, but I'm not
9 quoting it here.
10 Q. You don't have experience buying LCD
11 displays from OEM suppliers, right?
12 A. Me, personally? I have not purchased LCDs
13 from various suppliers, although my -- my colleague
14 has. I have a colleague that's done that, but I
15 personally have not.
16 Q. Looking back at paragraph 314 of your
17 declaration, a few lines down, seven lines down, you
18 say, "an alternative option would be to locate the
19 temperature sensor in a region of air flow
20 immediately downstream from the display element." Do
21 you see that?
22 A. Yes.

1 Q. What do you mean by "immediately
2 downstream from the display element"?
3 A. What I mean by that is you have a channel,
4 you have a display. And then there's a gap,
5 typically, where air is flowing, or in this context,
6 where air is flowing. And as air flows over the LCD
7 panel, it will pick up heat from the LCD panel if the
8 LCD panel's hotter than the air.
9 And after it passes across the LCD panel,
10 that would be a good place to measure air -- or that
11 would be an advantageous place to measure the air
12 temperature, because the air integrated over or
13 averaged over the LCD panel.
14 So as a POSA, that would be an obvious
15 place to put -- to put a temperature sensor.
16 Q. You don't cite anything in support of that
17 in paragraph 314?
18 A. It would be -- a POSA would understand
19 that that's a good place to put it, or place that one
20 might want to put it. Anyone that would take a fluid
21 mechanics class from me, or a thermal dynamics class,
22 would -- would understand that.

1 Q. But again, you don't cite anything in
2 paragraph 314, right? Strike that.
3 You don't cite anything in support of your
4 statement that it would have been an obvious place to
5 put a temperature sensor?
6 MR. ALEMANNI: Objection. Form.
7 THE WITNESS: I say it's -- "an
8 alternative option would be to locate the
9 temperature sensor in a region of air flow
10 immediately downstream from the display
11 element." So it's another option. And it's --
12 it would be a very good place to put it. That's
13 one option.
14 There's -- and again, we talked about
15 where to place air -- temperature sensors, and
16 it depends very much on specific designs,
17 operating conditions, things of that nature.
18 So -- but we know that these air channels are
19 designed to pick up heat from the LCD screens,
20 the display panels; and after they absorb that
21 thermal energy, it would be a good option to
22 measure the temperature downstream, immediately

1 downstream. It's not the only place, but that's
2 a good place.
3 BY MS. POTKAY:
4 Q. You agree there's a number of options?
5 A. There are -- there are strategic places
6 where one could put temperature sensors, depending
7 upon designs, operating parameters, things like that.
8 A good option in many cases would be to put the
9 temperature sensor downstream of the airflow.
10 Q. What types of operating conditions would
11 influence this decision?
12 A. Well, if one is -- certain operating
13 conditions, it may be more important to measure the
14 maximum temperature of the panel. If there's one
15 part of the panel that heats up versus another
16 part -- for example, if the sun is incident on the
17 panel in one location versus another location, then
18 where the sun is incident on a panel, that may be an
19 important place to measure the temperature.
20 If -- in other situations, there may not
21 be a specific area that's of concern, but the general
22 overall panel is of concern. And in that case, one

1 may want to make a temperature measurement that
2 estimates an average panel temperature. And in that
3 case, putting a temperature sensor immediately
4 downstream would be a suitable choice for a POSA.
5 Q. In Karppanen's information board, where is
6 immediately downstream?
7 A. Okay. So if we go to Figure 2 of
8 Karppanen.
9 So keep in mind, Karppanen does not
10 disclose specific locations of the temperature
11 sensors. But if we look at Figure 2, the way it's
12 written in this claims or specification is that air
13 goes through 64a, and then goes through the display
14 area, and then exits 64b.
15 Another option that a POSA would
16 understand is that the -- the fans labeled 72 could
17 also be reversing and -- could also reverse the flow.
18 And the flow could actually go into Figure -- into
19 hole 64b and out 64a.
20 So 64a, 64b are the entrances and exits.
21 And depending upon a choice by design, you could have
22 the flow going in one of those, say 64a, and out 64b.

1 Or you could have the flow going in 64b and out 64a.
2 Q. So I'll just ask the question again. I'm
3 not sure I understood.
4 In Karppanen's information board, where is
5 immediately downstream?
6 A. Immediately downstream could be hole 64b,
7 or it could also be -- and that's what's described in
8 the text. Or it could also be 64a, if the flow was
9 reversed in the other direction.
10 I can point to it in -- in Figure 1,
11 although I can't describe it audioly.
12 Q. Why can't you describe it?
13 A. Well, I can point to it. So it would be
14 in the region just above the display casing, and --
15 and/or the region just below the display casing,
16 depending upon which direction fan 72 is operating.
17 MR. ALEMANNI: Is it an okay time for a
18 break?
19 MS. POTKAY: Sure.
20 MR. ALEMANNI: It's been almost an hour.
21 MS. POTKAY: Yep. Absolutely.
22 MR. ALEMANNI: Off the record.

1 (A recess transpired from 10:47 a.m.
2 Until 10:59 a.m.)
3 BY MS. POTKAY:
4 Q. Welcome back, Dr. Meinhart.
5 A. Thank you.
6 Q. Looking back at your declaration, at
7 page 140 still, in paragraph 313, you cite two
8 references in paragraph 313?
9 A. One second.
10 Q. Take your time.
11 A. Okay. Go ahead.
12 Q. Yes. So my question was, you cite two
13 references in paragraph 313? Do I have that right?
14 A. Yeah, Exhibit 1008, Column 9, through --
15 line 9 through 11, and Column 9, line 13 through 21.
16 Q. Sorry. Looking at paragraph 313, not 312.
17 A. Oh, 313. Oh, sorry.
18 Q. It's not a trick question.
19 A. I misunderstood.
20 Q. It's okay.
21 A. Yeah. So I cite Exhibit 100 -- 1011
22 and 1013.

1 Q. And first you refer to "the Burke
2 reference"?
3 A. Let me just double-check.
4 Yes.
5 Q. And again, still just looking at
6 paragraph 313.
7 A. Yes. 313, I cite the Burke reference and
8 Hannemann reference.
9 Q. Yes. Okay. You state, with respect to
10 the Burke reference, that it -- and I'm quoting here:
11 "Explained that it was known to position one or more
12 temperature sensors within the housing of the device
13 or within electronics chamber of the device"?
14 A. Yes.
15 Q. You agree that Burke does not disclose the
16 specific use of a temperature sensor in an LCD device
17 to measure the temperature of air discharged from a
18 channel in front of the LCD?
19 MR. ALEMANNI: Objection. Form.
20 THE WITNESS: Well, the Burke -- yeah.
21 So I say the Burke reference explains "that it
22 was known to position one or more temperature

1 sensors within the housing of the device or
2 within an electronics chamber." So Burke
3 mentions multiple sensors.
4 So what -- I'm sorry, what was your
5 question?
6 BY MS. POTKAY:
7 Q. Yeah. The question is, you agree that
8 Burke does not disclose the specific use of a
9 temperature sensor in an LCD device to measure the
10 temperature of air discharged from a channel in front
11 of the LCD?
12 MR. ALEMANNI: Same objection.
13 THE WITNESS: That's -- I don't know that
14 I can say that it doesn't disclose that. I can
15 tell you what it does disclose. I'd be happy to
16 do that.
17 So when I reviewed Burke, I saw that
18 there's multiple temperature sensors.
19 BY MS. POTKAY:
20 Q. But you don't cite to any disclosure in
21 Burke of a temperature sensor, an LCD device used
22 specifically to measure the temperature of air

1 discharged from a channel in front of the LCD?
2 MR. ALEMANNI: Objection. Form.
3 THE WITNESS: What I used Burke for is
4 to -- as a reference to explain what the
5 knowledge of a POSA was, before the priority
6 date that we're talking about here.
7 And the Burke reference specifically talks
8 about using one or more temperature sensors
9 within the housing. So a person of ordinary
10 skill in the art would know that they could
11 place temperature sensors in various locations,
12 depending upon what it is they're -- they want
13 to measure specifically, which would depend upon
14 design choices and operating parameters.
15 So that is why I used the Burke reference.
16 I don't use it specifically to say that it puts
17 a sensor in a specific location, but that it's
18 general knowledge of a POSA that one could put
19 one or more temperature sensors in desired
20 locations. So that's a -- a level of knowledge
21 that a POSA would have.
22 So if a POSA -- to follow up, so if a POSA

1 read Burke, a POSA would also know that one
2 could measure -- put a temperature sensor near
3 the exit of a channel. And people taking my
4 undergraduate fluid mechanics class would also
5 know that.
6 BY MS. POTKAY:
7 Q. But Burke doesn't say that; agreed?
8 MR. ALEMANNI: Objection. Form.
9 THE WITNESS: Burke says that one or more
10 temperature sensors can be placed within the
11 housing of the device. So they talk about how
12 you could place them in multiple locations. So
13 a POSA would know that you could put temperature
14 sensors at the end of the channel.
15 BY MS. POTKAY:
16 Q. Burke doesn't disclose a channel in front
17 of an LCD?
18 A. I would have to review Burke to -- to see
19 that -- whether or not they disclose it in a channel.
20 Like I said, Burke is an example of what a
21 POSA would know at that time, that you could use
22 multiple temperature sensors, and you could put them

1 in strategic locations.
2 If you'd like me to review Burke, I would
3 be happy to analyze it in detail, to tell you whether
4 or not they specifically disclose a channel.
5 Q. You don't have an opinion, sitting here,
6 as to whether Burke discloses a channel?
7 MR. ALEMANNI: Objection. Form.
8 THE WITNESS: I would be happy to review
9 the reference of Burke. But what I can tell you
10 is that Burke discloses one or more temperature
11 sensors within the housing. And that is a
12 demonstration of the knowledge of a POSA, that a
13 POSA could use one or more temperature sensors
14 in the housing.
15 And a POSA would also know that those
16 temperature sensors could be placed down at the
17 downstream end of the channel.
18 BY MS. POTKAY:
19 Q. But again, you don't rely on Burke for
20 your assertion that a POSA would know that the
21 temperature sensors could be placed at the downstream
22 end of the channel, right?

1 MR. ALEMANNI: Objection. Form.
2 THE WITNESS: I rely on the knowledge of a
3 POSA, and Burke is an example of the knowledge
4 of a POSA.
5 BY MS. POTKAY:
6 Q. But we're in agreement that you don't rely
7 on Burke for any specific location of a temperature
8 sensor?
9 MR. ALEMANNI: Objection. Form.
10 THE WITNESS: To be clear, I rely on the
11 knowledge of a POSA. And Burke is an example of
12 the knowledge of a POSA. But I rely on the
13 knowledge of a POSA.
14 BY MS. POTKAY:
15 Q. And you're relying on the Hannemann
16 reference for the same -- strike that.
17 You also cite the Hannemann reference in
18 paragraph 313?
19 A. Yes.
20 Q. And do you agree that Hannemann does not
21 disclose a specific use of a temperature sensor in an
22 LCD device to measure the temperature of air

1 discharged from a front channel?
2 A. Again, I use Hannemann in a similar way
3 that I use Burke. So a POSA would understand that
4 one could put a temperature sensor at the exit of a
5 channel to measure temperature.
6 Both Burke and Hannemann are examples of
7 what a POSA would know. And Hannemann further
8 references or explains that the number and position
9 temperature sensors may be varied as needed to allow
10 for thermal regulation.
11 So it gets down to design choices. It
12 gets down to operating parameters, as to where a
13 thermal engineer might place one or more temperature
14 sensors. And Burke and Hannemann both explain that.
15 And that is also the knowledge of a POSA.
16 And for my obviousness arguments, I rely
17 on the knowledge of a POSA.
18 Q. I'd like to turn to your declaration,
19 paragraph 227.
20 A. Okay.
21 Q. And here you state that "Nagayama
22 discloses affixing a temperature sensor to a back

1 surface of the liquid crystal panel 13." Right?
2 A. Yes.
3 Q. And Nagayama's temperature sensor is
4 attached to the liquid crystal panel 13; is that a
5 correct understanding?
6 A. That is correct.
7 Q. You agree that Nagayama does not disclose
8 a temperature sensor to measure the temperature of
9 air?
10 A. So like we said before, if you take a
11 temperature sensor and attach it to a surface, that
12 temperature sensor is providing an estimate of the
13 local temperature in that region. And that can
14 include the surface that it's attached to, such as
15 the back surface of the liquid panel, and it can also
16 be affected by the surrounding air that -- that is
17 exposed to that temperature sensor.
18 So that temperature sensor is estimating
19 the temperature of the -- of the back surface of the
20 liquid crystal panel, and also influenced by the
21 temperature surrounding it in that region.
22 Q. Again, Nagayama discloses that its

1 temperature sensor is affixed to the back surface of
2 an LCD, right?
3 A. That is correct.
4 Q. Turning to Nagayama, which is Exhibit 1006
5 in IPR 2023-01202 and 1203 -- and we'll likewise mark
6 as 1006 here.
7 (Exhibit 1006 was marked for identification.)
8 BY MS. POTKAY:
9 Q. And take your time, but when you're ready,
10 I'd like -- oh, sorry.
11 Do you recognize this as Nagayama?
12 A. I do, yes.
13 Q. So I'd like to turn to paragraph 74, which
14 is at page 11 of Exhibit 1006.
15 Now, this section of Nagayama, starting
16 with paragraph 74, is titled "Temperature control
17 operation"?
18 A. Yes.
19 Q. And Nagayama discloses, in paragraph 74,
20 "a temperature sensor TS attached to the back surface
21 of the liquid crystal panel 13"?
22 A. Yes.

1 Q. And Nagayama discloses that temperature
2 sensor TS is measuring the temperature of the liquid
3 crystal panel 13?
4 A. Yes. It says "When information about the
5 temperature liquid crystal panel 13 measured using
6 temperature sensor TS attached to the back surface of
7 liquid panel 13 is given to the liquid crystal panel
8 temperature control board TC, the liquid crystal
9 panel temperature control board TC controls fans F71,
10 F72, heaters H1, H2, to achieve a preset
11 temperature."
12 Q. Nagayama refers to its element 11 as a
13 housing, right?
14 A. Can you show me that? I can confirm it?
15 Q. Sure. I'm looking at paragraph 37.
16 A. 37.
17 Yes, so it mentions housing 11.
18 Q. Just to reask the question, to make sure
19 we're on the same page: Nagayama refers to an
20 element, labeled 11, as a housing, right?
21 A. Yes.
22 Q. And Nagayama states, in paragraph 37, that

1 it -- starting on the second to -- sorry. Strike
2 that -- third-to-last line "it is desirable to store
3 electronic devices, such as the backlight 12 and the
4 drive circuit of the liquid crystal panel 13 in the
5 housing 11, and seal the housing 11 with packings,
6 fillers, et cetera, so that there is no gap"?
7 A. Yes.
8 Q. Nagayama teaches here that its housing 11
9 is sealed, right?
10 A. When I read paragraph 37, the way I read
11 it, if you look at the beginning of the paragraph,
12 it's talking about direct air cooling, such as
13 blowing wind on the back surface of the panel, or
14 blowing wind on the backlight is not employed because
15 static electricity induced by the backlight,
16 et cetera, makes it easier for dust in the air to
17 absorb the fluorescent light.
18 So what they're saying here is that they
19 want to make sure that just ambient air doesn't
20 freely enter this device. Because if -- if it's not
21 controlled -- and they use the word "sealed," but if
22 it's not controlled -- then dust will -- could

1 accumulate, due to static electricity on the lighting
2 and perhaps on the LCD as well.
3 So -- so what they're meaning by this is
4 that they -- they control the airflow that goes into
5 it, so it's not uncontrolled. That's what they mean
6 by "sealed." But they do bring in ambient air into
7 the device.
8 Q. Nagayama's housing 11 is a separate
9 component from its device box 2, right?
10 A. Housing 11 and device box? Can you remind
11 me the -- which component is the device box? Which
12 number that you're referring to?
13 Q. It's 2.
14 A. And where does it say "device box 2"?
15 Which -- in the text?
16 Q. For instance, at paragraph 57, the summary
17 notes device box 2.
18 If you look at Figure 9, it might be
19 helpful.
20 A. Okay. Yeah, paragraph 57 refers to
21 Figure 6, and I wasn't seeing it in Figure 6, so let
22 me look at Figure 9.

1 Yes, in Figure 9, it shows a component
2 device box 2, and it shows a component 11 housing.
3 Q. And as we just discussed, with respect to
4 paragraph 37, Nagayama teaches that the housing 11 is
5 sealed to control the flow of air to the LCD device,
6 right?
7 MR. ALEMANNI: Objection. Form.
8 THE WITNESS: Well, in that paragraph,
9 when they talk about sealing, what they're doing
10 is talking about making sure the -- the ambient
11 air that enters the device box is controlled.
12 That's what they mean by "sealed."
13 But it does bring in ambient air, so it's
14 not hermetically sealed. What they mean by that
15 is that they're controlling the flow, so there's
16 not excess dust and things like that
17 accumulating on the electronics that they do not
18 want. That's what -- as a POSA, that's how I
19 read that paragraph.
20 BY MS. POTKAY:
21 Q. The air inside device box 2 is not going
22 to be the same temperature as the air inside

1 housing 11; do you agree?
2 A. I would have to measure the temperatures
3 to know.
4 Q. Nagayama's temperature sensor TS is not
5 measuring the temperature of air inside the device
6 box 2; do you agree with that?
7 A. The temperature sensor in Figure 2 is
8 attached to the -- to the back of the LC. And as we
9 discussed before, it's measuring the local
10 temperature of the LC, as well as the air that's in
11 communication with the temperature sensor, that has
12 some influence on the temperature.
13 And that air is also contained within
14 device box 2. So in some sense, it is influenced by
15 air that's within device box 2.
16 Q. So in your view, there's no difference
17 between putting a temperature sensor on the back of
18 Nagayama's LCD or putting a temperature sensor inside
19 device box 2, outside housing 11?
20 MR. ALEMANNI: Objection. Form.
21 THE WITNESS: Well, again, what I said
22 was -- I did not say that.

1 What I said was that the temperature TC,
2 as placed in Figure 9, is measuring the
3 temperature on the back of the LC device. And
4 it's also influenced by air that's in
5 communication with the temperature sensor.
6 Now, as to whether the temperature TS,
7 that TS estimates is the same as other
8 temperatures throughout the device, I couldn't
9 tell you without actually measuring other
10 temperatures throughout the device.
11 BY MS. POTKAY:
12 Q. Looking back to paragraph 74 of Nagayama.
13 A. Okay.
14 Q. Nagayama's display system is designed with
15 both a cooling and warming operation, right?
16 A. Yes.
17 Q. And again, as we've established, the
18 temperature sensor TS is attached to the back of the
19 liquid crystal display in Nagayama's housing 11?
20 A. Yes.
21 Q. And Nagayama refers to Figure 9 with
22 respect to that?

1 A. Yes.
2 Q. And paragraph 74 also references
3 Nagayama's Figures 11 through 13 for additional
4 information about the temperature control operation?
5 MR. ALEMANNI: Objection. Form.
6 THE WITNESS: What it says is that "Next,
7 with reference to Figure 9, temperature control
8 operation of the liquid crystal display device 1
9 at outdoor device 2- -- display device 200 is
10 described using Figures 11 through 13."
11 BY MS. POTKAY:
12 Q. Do you disagree that paragraph 74
13 references Figures 11 through 13 for additional
14 information about the temperature control operation?
15 A. I can tell you that it references
16 Figures 11 through 13. And if you look at Figures 11
17 through 13, they show characteristic temperatures,
18 the panel temperature, inverter frequency. They also
19 show characteristic temperatures of the -- of the
20 heater being on and the heater being off.
21 There's an on and off state. I'll have to
22 look at Figure 13 in more detail, but it shows --

1 Figure 13 shows an on state and an off state. It's
2 on until T -- T-zero, and then it turns off.
3 Q. Figures 11 and 12 plot the panel
4 temperature, right?
5 A. Yes, Figure 11 is a plot -- an exemplary
6 plot of panel temperature, and Figure 12 is also
7 exemplary plot of panel temperature.
8 Q. And the panel temperature data is
9 collected by Nagayama's temperature sensor TS?
10 A. I would have to read in detail to tell you
11 where they get their temperature measurements, or if
12 they are temperature measurements, or if they're
13 exemplary temperatures. So I would -- I would have
14 to review to tell you where they get that
15 information.
16 Q. Did you consider those questions in
17 forming your opinions?
18 A. Well, I would just need to review it to
19 give you the most accurate answer. If you'd like me
20 to review where they discuss Figure 11 and Figure 12,
21 I'm happy to do so.
22 Q. Sure. It's in the same section of

1 Nagayama.
2 A. Okay.
3 Okay. Yes, in paragraph 76, it --
4 it says "First temperature control by on/off control
5 of fan will be described. Figure 11 is a
6 characteristic diagram illustrating a temperature
7 change when controlling panel temperature by on/off
8 control of fan F71."
9 So what they are saying, it's a -- a
10 characteristic diagram illustrating a temperature
11 change. So when I read those words, as a POSA, it's
12 not data, but it's describing a phenomenological
13 process. It's a characteristic diagram.
14 Q. But it's with reference to the panel
15 temperature, right?
16 A. Well, it says it's "a characteristic
17 diagram illustrating a temperature change when
18 controlling panel temperature."
19 So that sentence does not say explicitly.
20 And as a POSA, what it tells me is it's --
21 characteristically, this is what's going to happen.
22 So when you look at Figure 11, you can see

1 the temperature -- and they call it the panel
2 temperature; so they're referring to characteristics
3 of the panel temperature, not to specific measured
4 values, say, from temperature TS. It's a -- it's
5 characteristic of what the panel is going to do.
6 Q. You agree that the panel temperature is
7 detected by Nagayama's temperature sensor TS, right?
8 A. What I said before, and I'll say it again,
9 is that the temperature sensor gives you an
10 estimation of the local temperature. If the
11 temperature sensor is mounted to something like a
12 panel, then it's giving an estimation of the
13 localized temperature of the panel; but it's also --
14 may be influenced by the surrounding air that
15 surrounds that temperature sensor.
16 So it's giving you an estimation or some
17 indication as to whether the temperature panel is
18 rising or not, temperature -- or dropping.
19 Q. When Nagayama's liquid crystal display is
20 first activated, Nagayama's fan F71 is off, right?
21 A. Where does it say that?
22 Q. I'm looking at paragraph 78.

1 A. 78?
2 Yes, that's what it says. So it says
3 "When the liquid crystal display device 1 is
4 activated, the panel temperature begins to rise to
5 heat input from the backlight 12. At this stage, the
6 fan F71 is off."
7 So they're talking about a particular
8 embodiment where the -- the fan is off, and then
9 they're allowing it -- the temperature to rise.
10 And then they go on to say, in
11 paragraph 79, "The panel temperature is detected by
12 the temperature sensor TS" -- which we know it's
13 estimated by the temperature sensor TS -- "and
14 temperature information is provided to the -- is
15 provided to the liquid crystal panel temperature
16 control board TC."
17 And then they go on to state that "the
18 liquid crystal panel temperature control board TC,
19 when the panel temperature reaches a predetermined
20 temperature T1, then the fan is operated on." Fan 71
21 is operated on.
22 So that describes what we call a bang-bang

1 controller. So, similar to the -- how a thermostat
2 would work in a house.
3 Q. So Nagayama's fan F71 turns on if the
4 panel exceeds a certain temperature, as measured by
5 temperature sensor TS?
6 A. Yes. So what he says is that the panel
7 temperature's detected by temperature sensor TS. And
8 as I said, TS will provide an estimate of that
9 temperature.
10 And then, based upon that estimated
11 temperature, the fan is turned on.
12 (Exhibit 1007 was marked for identification.)
13 MS. POTKAY: I'll mark as Exhibit 1007
14 U.S. Patent Number 6,493,440, to Gromatzky.
15 This is also Exhibit 1007 in both the '311
16 and '253 patents.
17 BY MS. POTKAY:
18 Q. Take your time, Dr. Meinhart. But do you
19 recognize this as the Gromatzky reference?
20 A. I do. Thank you.
21 Q. Look specifically at Column 5 of
22 Gromatzky.

1 A. Okay.
2 Q. Do you see where Gromatzky states,
3 starting at line 3, "A laminar flow fan 32 creates a
4 sheet of air, rather than turbulent air, across the
5 LCD module 26"?
6 A. Yes.
7 Q. And Gromatzky goes on to teach that
8 "laminar airflow is more efficient than turbulent
9 airflow for moving air and transferring heat from the
10 front of the LCD module 26 to the rear portion 16 of
11 the enclosure." Right?
12 A. Yes.
13 Q. You would agree that Gromatzky teaches
14 that laminar airflow is preferred, right?
15 A. Well, what Gromatzky says in these
16 particular lines is that it's more efficient; but
17 that does not mean necessarily that it's preferred.
18 So efficiency in thermal dynamics has a very specific
19 meaning.
20 Q. Gromatzky goes on to say that "A more
21 efficient fan 32 allows selection of a fan 32 that is
22 smaller in size." Right?

1 A. Yes.
2 Q. And that this requires less rotations of
3 the fan 32?
4 A. Generally, when you make a fan smaller in
5 size, you need more rotations. But if it's
6 sufficiently more efficient, it could overcome that.
7 So it is possible that a more efficient fan that is
8 smaller in size could require less rotations.
9 And what I believe they mean by that is
10 like the rotation rate to move air. That statement's
11 not always true, but it could be true.
12 Q. Do you read it as true in Gromatzky here?
13 A. If he -- I don't know which fan he
14 selected, specifically; but if he says that he -- he
15 can find a more efficient fan, that's smaller in size
16 and produced the same forward thrust rotations, as a
17 POSA, I would believe that's possible. And I have no
18 reason to doubt what they're saying. It's not always
19 the case, but it's reasonable. Yeah.
20 Q. Gromatzky discloses that "Each of these
21 factors contributes to a smaller fan 32 size that in
22 turn contributes to a thinner depth enclosure 12"?

1 A. Yes, he says that.
2 Q. And you would agree that is desirable,
3 according to Gromatzky?
4 A. I don't see where he says it's desirable,
5 but he says that if you use a smaller fan, and
6 based -- and again, this also depends upon a lot of
7 design constraints and where things are placed.
8 But it is reasonable, if he's saying this,
9 that in his particular embodiment, that having a
10 smaller fan, in the way he is positioning the fan, it
11 could possibly lead to a smaller -- what does he say?
12 "A thinner depth -- depth enclosure."
13 It's a reasonable statement, yeah.
14 Q. You would agree that Gromatzky doesn't
15 describe any benefits of using turbulent airflow?
16 A. Well, what Gromatzky says specifically
17 about turbulence is the present invention may use --
18 if you read further in that paragraph, on line 17, he
19 says "However, the present invention may use any type
20 of fan 32, including those that generate turbulent
21 air. The fan speed -- the fan 32 speed may also be
22 adjusted to move air in the desired manner and

1 efficiency."
2 So what -- how I read that, as a POSA, is
3 that he's -- he's teaching that you could generate
4 air, turbulent air, and that the invention covers
5 that; and that a POSA may want to adjust fan 32 speed
6 in a desired manner and efficiency.
7 So -- and a POSA, having taken my fluid
8 mechanics class, would know that turbulence can be
9 more effective for removing heat. It may not be more
10 efficient, but it could be more effective. And those
11 are two importantly different terms.
12 And there -- as a POSA, you know that
13 there are certain times that turbulence is desirable
14 or advantageous; and there's certain times where
15 laminar flow may be advantageous. And a POSA could
16 choose between those, as -- as desired.
17 Q. You would agree there are engineering
18 trade-offs between laminar and turbulent airflow?
19 A. There are. There are certain advantages
20 to laminar flow. There's certain advantages to
21 turbulent flow. And it very much depends upon the
22 situation.

1 Q. Gromatzky doesn't discuss any advantages
2 of turbulent flow, right?
3 A. I couldn't say specifically if they don't
4 discuss them. But what I can tell you is I can -- I
5 see it here, where he's saying that you may use
6 turbulent airflow.
7 And I can also tell you, as a POSA -- I
8 did my Ph.D. in turbulence, and I can tell you that
9 there's tremendous advantages for turbulence in
10 different situations.
11 So a POSA would know that you could use
12 turbulence if you desired to. And you would be --
13 and it would be desirable if -- for certain
14 conditions. And laminar flow may be desirable for
15 certain conditions.
16 Q. For Gromatzky's conditions, he's focused
17 here on the advantages of using laminar airflow; you
18 would agree with that?
19 MR. ALEMANNI: Objection. Form.
20 THE WITNESS: Well, what Gromatzky says is
21 that it's -- the laminar flow is more efficient.
22 So if he's looking at efficiency, fan

1 efficiency, that may be very well be true; but
2 if he's looking at heat transfer performances,
3 that may not necessarily be true. As a POSA
4 would know.
5 You know, a POSA would be reading this;
6 and as a POSA reads this, they would know that
7 Gromatzky teaches both laminar and turbulence,
8 and that Gromatzky says it's more efficient if
9 it's laminar. But that doesn't mean it's more
10 effective.
11 BY MS. POTKAY:
12 Q. Isn't efficiency a benefit in Gromatzky's
13 device?
14 A. Efficiency may be a benefit in Gromatzky's
15 device, and turbulence may be a benefit as well. And
16 what he's saying is that laminar flow is more
17 efficient; and so if you're looking at the power that
18 goes into the fan, the power going into the fan may
19 be less with laminar flow.
20 But he's also teaching, in the very same
21 paragraph, that one can use turbulence. And like I
22 said, a POSA would read that and realize that there

1 are certainly advantages to using turbulence.
2 Q. You would agree that a turbulent airflow
3 would require a more powerful fan to generate the
4 turbulence?
5 A. It may be less efficient. The -- the
6 power is very much a function of the flow rate, the
7 gap of the channel, things of that nature. So -- so
8 when you introduce power, that -- that's a whole
9 'nother conversation.
10 But what we can read from this, and what a
11 POSA knows, is that laminar flow may be more
12 efficient in terms of the mechanical -- or the
13 pressure energy required to -- to propel the flow.
14 Turbulent flow can have a higher -- what
15 we call a Nusselt number, which is nondimensional
16 heat transfer coefficient. And so turbulence can
17 have higher Nusselt numbers than laminar flow. So a
18 POSA would know that.
19 So -- so in some ways laminar flow may be
20 more efficient, from a fan point of view; and
21 turbulent flow may be more effective. But it really
22 depends upon the engineering tradeoffs; it depends

1 upon the design parameters; and it depends upon the
2 operating parameters.
3 And furthermore, there's -- there's many
4 ways to generate turbulence, that controls
5 turbulence, so -- beyond just the fan. So there's
6 many design considerations that a POSA would know to
7 take.
8 Q. But Gromatzky doesn't just teach that the
9 laminar flow is more efficient, right? He also
10 teaches that the efficiency allows for a smaller fan
11 and a thinner depth enclosure?
12 A. Yes. Gromatzky teaches a more efficient
13 fan allows for a smaller size, that requires less
14 rotations to move air, and desired and/or the same
15 amount of air in a smaller air path.
16 And that's possible, but that's not
17 necessarily always true. So it may require more
18 rotations.
19 Like I've helped design computer cooling
20 systems. And generally speaking, a larger fan
21 actually is -- usually produces a quieter flow, so
22 there's less disturbance, and a smaller fan tends to

1 make more noise and runs faster.
2 So my experience is that smaller fans,
3 generally, you need -- you need a higher RPM. But
4 that's not to say that -- that -- he may have a
5 particular fan in mind, where he has maybe a large,
6 really inefficient fan, and he has a small, very
7 efficient fan. And maybe in that case, it's true
8 that the fan rotates less -- at a less rotational
9 velocity than a larger fan.
10 My experience, commonly, in designing
11 computer cooling devices, is that the smaller fan
12 typically runs faster for the same flow. But perhaps
13 I was using comparably efficient fans.
14 Q. Would you agree a turbulent airflow
15 generally requires a larger fan?
16 A. Not necessarily. And the reason for that,
17 if we go back to my example with cooling computers,
18 the larger fan is chosen -- it's more expensive,
19 and -- but the larger fan tends to run at a slower
20 velocity, so it generates less noise. And in some
21 situations, less noise is more efficient than more
22 noise, because it takes energy to create that noise.

1 So in many situations, a small fan could
2 actually generate more turbulence, because there's
3 more instabilities. There's a higher frequency of
4 turbulent generation compared to a large,
5 slower-moving fan. So there's many factors that
6 contribute to the turbulence generation.
7 So it isn't always true that a smaller fan
8 generates less turbulence than a larger fan. It
9 could certainly be the opposite.
10 Q. But again, Gromatzky attributes the
11 laminar airflow to allow for a more efficient fan and
12 selection of a fan that is smaller in size? You
13 agree with that?
14 A. Well, Gromatzky is teaching that laminar
15 flow is more efficient. And -- and then if you have
16 a more efficient fan, then you could have a smaller
17 fan. If the fan is more efficient, you could have a
18 smaller fan, and it could require less rotation to
19 move the same amount of air. If that -- if you do
20 have a more efficient fan. But that doesn't
21 necessarily mean that a -- a POSA would want to use
22 laminar flow.

1 It again -- and the POSA may very well
2 want to use turbulence. It really depends upon the
3 situation. When a POSA reads this, the desire
4 between turbulence and laminar really depends upon
5 specifics that are far beyond this paragraph.
6 Q. So it can get pretty complicated?
7 A. There -- well, there's a whole field of
8 engineering behind this. There's -- there's a lot of
9 factors involved, yes.
10 But I agree that Gromatzky does teach that
11 if you did have a more efficient fan, then you -- you
12 might be able to choose a smaller size of fan, and it
13 might have less rotations. But that is directly
14 counter to much of my experience.
15 MS. POTKAY: Let's take a break.
16 Ten minutes?
17 MR. ALEMANNI: Okay.
18 (A recess transpired from 11:55 a.m. until
19 12:07 p.m.)
20 BY MS. POTKAY:
21 Q. Thanks for your time today, Dr. Meinhart.
22 I don't have any further questions for you at this

1 time.
2 MR. ALEMANNI: I don't have any questions.
3 We can end the depo.
4 COURT REPORTER: And you would like the
5 transcript?
6 MS. POTKAY: Yes, and we're going to need
7 it probably faster than normal.
8 COURT REPORTER: Just tell me when.
9 Do you want a copy?
10 MR. ALEMANNI: Yeah, but I don't -- it is
11 not rush, but I would like a copy eventually.
12 COURT REPORTER: Do you want a rough
13 draft?
14 MR. ALEMANNI: No.
15 MS. POTKAY: Can we have it by the end of
16 week?
17 COURT REPORTER: Would you like a rough
18 draft?
19 MS. POTKAY: Yes, please.
20 (Time Noted: 12:09 p.m.)
21
22

1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC
2
3 I, Karen Kidwell, Certified Shorthand Reporter
4 and Notary Public within and for the State of North
5 Carolina do hereby certify:
6 That DR. CARL DANIEL MEINHART, the witness
7 whose deposition is hereinbefore set forth, was duly
8 sworn by me before the commencement of such
9 deposition and that such deposition was taken before
10 me and is a true record of the testimony given by
11 such witness.
12 I further certify that the adverse party,
13 Samsung Electronics Co., Ltd., was represented by
14 counsel at the deposition.
15 I further certify that the deposition of DR.
16 CARL DANIEL MEINHART, occurred at the offices of
17 Kilpatrick Townsend & Stockton LP, on Tuesday, May 7,
18 2024, commencing at 9:03 a.m. to 12:09 p.m.
19 I further certify that I am not related to any
20 of the parties to this action by blood or marriage, I
21 am not employed by or an attorney to any of the
22 parties to this action, and that I am in no way

1 interested financially or otherwise, in the outcome
2 of this matter.
3 IN WITNESS WHEREOF, I have hereunto set my hand
4 this 9th day of May, 2024.
5
6
7 _____
8 Notary Public In and For The
9 State of North Carolina
10
11 My Commission Expires:
12 June 15, 2028.
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