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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____)

APPLE INC.,

Petitioner,

Case IPR2024-00697

v.

Case IPR2024-00698

RESONANT SYSTEMS, INC.,

US Patent 8,093,767

Patent Owner.

_____)

VIDEOTAPED DEPOSITION OF KEITH W. GOOSSEN, PH.D.

May 7, 2025

10:19 a.m. Eastern Time

Reported by: Lori J. Goodin, RPR, CRR, RSA,
California CSR #13959

DIGITAL EVIDENCE GROUP
1730 M Street, NW, Suite 812
Washington, D.C. 20036
(202) 232-0646

1 REMOTE VIDEOTAPED DEPOSITION of
2 KEITH W. GOOSSEN, PH.D.,
3 in the above-titled action, held on Wednesday,
4 May 7, 2025, commencing at approximately 10:19
5 a.m. before Lori J. Goodin, RPR, CRR, RSA,
6 California CSR #13959, Registered Professional
7 Reporter, Certified Realtime Reporter, Realtime
8 Systems Administrator, and Certified Shorthand
9 Reporter, and Notary Public of the State of
10 Florida, State of California, State of Maryland,
11 District of Columbia, and State of Delaware.

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1 REMOTE APPEARANCES:

2

3

4 ON BEHALF OF PETITIONER:

5 FISH & RICHARDSON P.C.

6 BY: CRAIG DEUTSCH, ESQUIRE

7 60 South Sixth Street

8 Minneapolis, Minnesota 55402

9 202-783-5553

10 deutsch@fr.com

11 AND

12 FISH & RICHARDSON P.C.

13 BY: THOMAS ROZYLOWICZ, ESQUIRE

14 1000 Maine Avenue, Southwest

Washington, D.C. 20024

15 202-626-6395

rozylowicz@fr.com

16

17

18 ON BEHALF OF PATENT OWNER:

19 RUSS AUGUST & KABAT

20 BY: KRISTOPHER R. DAVIS, ESQUIRE

12424 Wilshire Boulevard, 12th Floor

21 Los Angeles, California 90025

310-826-7474

22 kdavis@raklaw.com

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2 WITNESS: KEITH W. GOOSSEN, PH.D.

3

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PAGE

5 MR. DEUTSCH

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1 WEDNESDAY, MAY 7, 2025, 10:19 a.m.

2

3 PROCEEDINGS

4

5 * * *

6 Whereupon,

7 KEITH W. GOOSSEN, PH.D.,

8 a witness called for examination, having been

9 first duly sworn, was examined and testified as

10 follows:

11 * * *

12 EXAMINATION

13 BY MR. DEUTSCH:

14 Q. Thank you for being here today,

15 Dr. Goossen. I will start with just a few

16 housekeeping items and kind of the ground rules

17 for today.

18 And before I do that, I just wanted

19 to double-check. Hopefully, I have been

20 pronouncing your name correctly. Is it

21 Dr. Goossen?

22 A. Correct. Thank you.

1 Q. Perfect. Well, so to start, I just
2 want to recognize that our conversation today is
3 being transcribed by the court reporter. So, to
4 make her job easier and ensure we can obtain an
5 accurate record, I will try not to talk over you,
6 of course. I will ask a question, and then
7 provide you with an opportunity to respond.

8 If a question is unclear, please
9 just ask me to clarify and I will restate or try
10 to rephrase the question.

11 And if you don't ask me to clarify,
12 I will assume that you understood the question.

13 Is that fair?

14 A. Okay.

15 Q. And if you need to take a break,
16 please just let me know. I will try to take
17 breaks, you know, every hour or so. But, we can,
18 we can have more frequent breaks.

19 And I understand from counsel that
20 you recently underwent back surgery. And so if
21 you just need a break for that or any other
22 reason, just let me know.

1 A. Okay, thank you. I will.

2 Q. We can do that.

3 Dr. Goossen, where do you currently
4 work?

5 A. University of Delaware.

6 Q. And where are you located right now?

7 A. I am in my office at the University
8 of Delaware.

9 Q. And, is anyone with you in your
10 office today?

11 A. No.

12 Q. Is there any reason that you cannot
13 give truthful and accurate testimony today?

14 A. There is not.

15 Q. Great. Just to clarify, when I use
16 the term '767 patent, I will be referring to U.S.
17 Patent Number 8,093,767.

18 And that is the patent number that
19 is marked as Exhibit 1001 in the two IPRs that we
20 are discussing today.

21 And those IPRs are IPR 2024-00697,
22 and IPR 2024-00698.

1 (Whereupon, previously marked
2 Exhibit 1001,
3 first referral.)

4 BY MR. DEUTSCH:

5 Q. Does that make sense?

6 A. Yes, thank you.

7 Q. Dr. Goossen, have you ever been
8 deposed before?

9 A. Yes.

10 Q. About how many times?

11 A. This is around number 20, I think.

12 Q. Could you describe your preparation
13 for today's deposition?

14 A. Yes. I re-read my declaration and
15 met with counsel for about an hour and a half.

16 Q. As part of your preparation, did you
17 communicate with anyone else aside from counsel?

18 A. No.

19 Q. Do you recall what documents you
20 reviewed in preparation for the deposition?

21 A. Well, my own declaration, of course,
22 and the patents in suit here.

1 Q. Okay. Turning the '767 patent, to
2 the best of your knowledge is this a patent that
3 you were familiar with before being contacted to
4 work on this matter?

5 A. I was not familiar with it
6 beforehand.

7 Q. When were you first contacted by
8 someone on behalf of patent owner for your work
9 on these IPRs?

10 A. Oh, I think it was about a year and
11 a half ago.

12 Q. And before that time, had you ever
13 worked or performed services on behalf of patent
14 owner?

15 A. No. And by time, you mean the
16 assigning of the patents?

17 Q. Yes. To clarify, Resonant's.

18 A. No, I had not.

19 Q. Okay. Thank you.

20 Could you describe the process of
21 preparing your declaration in this proceeding?
22 And I am referring to what is marked as

1 Exhibit 1009 in this proceeding.

2 (Whereupon, previously marked
3 Exhibit 1009,
4 first referral.)

5 THE WITNESS: The declaration, or
6 the report?

7 BY MR. DEUTSCH:

8 Q. Correct, yes.

9 A. Yes. That was in rebuttal to the
10 IPRs listed, developing arguments to rebut those
11 arguments, and writing them up and putting them
12 in the report.

13 Q. Is that your typical process?

14 A. Well, certain sections, you know,
15 were not written by me but were reviewed and
16 edited by me.

17 So, the entire report is mine and
18 reflects my opinions.

19 Q. Understood. Are you currently aware
20 of any errors that exist in your declaration?

21 A. Yes, I have been reviewing it
22 recently. I noted a very slight typo.

1 By the way, I have paper copies of
2 my declaration and the patents and they are not
3 marked up in any way.

4 I noticed in Paragraph 150, the
5 second line, that should be a separate signal P,
6 not D.

7 Q. You are referring to Line 2 of
8 Paragraph 150?

9 A. Yes. A separate signal, that should
10 be P from the control component to the power
11 supply.

12 Q. Understood. Thank you.

13 Any other errors that you are aware
14 of?

15 A. I don't think so.

16 Q. Okay. And you mentioned that you
17 had clean copies of the declaration and patent.

18 Do you have any other materials with
19 you?

20 A. Oh, well, I have the other report
21 for the '882 patent.

22 Q. Okay. Okay. Let's turn to the

1 Cosper reference first.

2 A. I don't have a copy of that.

3 MR. DEUTSCH: Oh, okay. I will drop
4 that in the Chat.

5 Cosper is Exhibit 1009.

6 (Whereupon, previously marked
7 Exhibit 1009,
8 first referral.)

9 THE WITNESS: Let me see, how do I
10 do this? So, I guess I have to download it
11 and then I can open it.

12 Okay. I have it open.

13 BY MR. DEUTSCH:

14 Q. Great. Does this look familiar?

15 A. Yes.

16 Q. So, let's start with Figure 1 of
17 Cosper, which appears to show a mass attached to
18 a spring; is that correct?

19 A. Yes.

20 Q. And is numeral -- or, excuse me,
21 what is numeral 18 pointing to?

22 A. It is pointing to the mass.

1 Q. And what is numeral 16 pointing to?

2 A. It is pointing to the spring.

3 Q. And then it looks like the, you
4 know, if I am looking at Figure 1, the lower end
5 of the spring is attached to the mass?

6 A. Okay, yes.

7 Q. And the top of the spring is
8 attached to something else.

9 What is the top of the spring shown
10 as attached, to you?

11 A. In this figure, it is not labeled.
12 Some surface, apparently.

13 Q. And then Figure 1 of Cosper includes
14 text, "oscillatory motion."

15 A. Yes.

16 Q. Do you see that?

17 A. Yes.

18 Q. And then there is a straight line
19 just to the left of that text with arrows at each
20 end.

21 A. Yes.

22 Q. What is that referring to?

1 A. Well, it is sort of defining, I
2 guess, oscillatory, meaning moving in an
3 oscillatory fashion.

4 Q. You mean the mass -- the movement of
5 the mass?

6 A. Yes.

7 Q. Okay. So, in the Figure 1
8 embodiment, the mass would move up and down on
9 the page in the direction of the straight
10 vertical line?

11 A. Well, this is a very schematic
12 diagram. So, the arrows are up and down.

13 Q. I just want to make sure I
14 understand what you mean by that.

15 The -- looking at Figure 1, the way
16 it is drawn, the mass is depicted as moving up
17 and down on the page in the direction of that
18 line?

19 A. Yes. That is what is depicted.

20 Q. Okay. And then could you --

21 Looking left in Figure 1, there are
22 a few other boxes and numerals that are shown.

1 Could you describe to me what those
2 components are?

3 A. Well, can I refer to the text of the
4 patent? That would be --

5 Q. Yes, absolutely.

6 A. So, I guess, it would have been
7 helpful to get paper copies of this.

8 But, if we go to the text of the
9 patent, and if I go to Paragraph 49 --

10 Q. Okay.

11 A. Figure 1 illustrates schematically
12 control system for use with the mechanical
13 resonant subassembly. The control system
14 includes control logic, a sensor for determining
15 a parameter of the moveable subassembly,
16 including the mass, a sensor input, and a control
17 output to drive the moveable subassembly at or
18 near the resonance.

19 Q. And so in that paragraph, you had
20 mentioned a Sensor 14 for determining a parameter
21 from the moveable subassembly and then a sensor
22 input for inputting the parameter into the

1 control logic of Control Circuit 12.

2 And so, the -- again looking at
3 Figure 1 and the feedback control that is
4 described, is that something that would have been
5 understood to facilitate efficiency in generating
6 vibration of the mass that is shown in Figure 1?

7 A. Well, the -- in a sense, the aim of
8 Cosper is to maintain the mechanical system at
9 its resonant frequency.

10 And I forget whether the word
11 "efficiency" is used for that -- as a result of
12 that.

13 Q. And is that, if the, through that
14 feedback system it maintains operation at
15 resonance, that would result in a higher gain
16 during operation; is that right?

17 A. A higher gain? I'm not sure the
18 term "gain" is here or where that term is used.

19 But, it will at resonance, generally
20 mechanical system will operate at its greatest
21 amplitude.

22 Q. And so in that sense it would be

1 facilitating efficient operation?

2 I don't want -- I'm trying to
3 clarify what you said a moment ago about
4 efficiency.

5 A. I didn't say anything about
6 efficiency.

7 Q. Oh.

8 A. You asked me and I said I wasn't
9 sure that term was used in the patent.

10 Q. Let me rephrase that.

11 So, I -- Cosper talks about, in one
12 example, operating at resonance. And so a system
13 like that shown in Figure 1 would operate at its
14 greatest amplitude.

15 A. Well, generally mechanical system at
16 resonance is operating with its greatest
17 amplitude.

18 I'm not sure -- you know, you would
19 have to direct me to some portion of the patent
20 to -- I'm not sure what you are asking.

21 Q. That is it. That -- okay. That
22 answers the question. Okay.

1 In still talking about Cosper, I
2 would like to turn to Paragraph 85 of your
3 declaration, which I think you have in front of
4 you.

5 A. Yes.

6 Q. And in Paragraph 85, you talk about
7 embodiments of Cosper that describe rotational
8 motion of the moving mass.

9 And, in particular, Paragraph 85
10 mentions the two embodiments shown.

11 And what are the -- I'm sorry?

12 A. You mean in my Paragraph 85, yes,
13 okay.

14 Q. Correct. What are the two
15 embodiments that you are referring to?

16 A. Well, the one is shown there where
17 he is basically trying to cause a mirror to
18 oscillate sort of in a rotary fashion in order to
19 scan an optical beam.

20 Q. Is there a second embodiment that
21 you are referring to when you said the two
22 embodiments?

1 A. Well, the one is in Figure 2, which
2 I don't have in my report. And the other one is
3 in Figure 15.

4 Q. Got it. Are those the only two
5 embodiments that Cospers describes?

6 A. They are the only two embodiments he
7 described in any detail.

8 Q. Let me ask a different question.

9 So, the, when you said the two
10 embodiments, you are not including Figure 1 that
11 we have been discussing?

12 A. Well, I would say Figure 1 is more
13 of a schematic nature.

14 Q. Turning back to Figure 1 and
15 Cospers's description of Figure 1 at Paragraph 50,
16 Cospers describes one or more Sensors 14. Do you
17 see that?

18 A. Yes.

19 Q. What are the parameters that Cospers
20 describes Sensors 14 can detect?

21 A. Well, he describes any appropriate
22 sensor may be used -- for example, optical,

1 magnetic, capacitive -- that may detect an
2 appropriate parameter that may correlate the
3 position of the subassembly from which the motion
4 can be derived.

5 Q. Are there other parameters that
6 would be detected?

7 A. Well, the only time the word
8 "parameter" is used is correlating to position to
9 derive the motion of the subassembly.

10 Q. And so that is the only -- or let me
11 rephrase that.

12 The -- so, it is your opinion that
13 the only parameter being detected in the system
14 of Figure 1 is used to correlate the position of
15 the subassembly?

16 A. Well, just reading that paragraph,
17 that is the only time the word "parameter" is
18 used.

19 Q. Maybe I am misusing the word
20 "parameter."

21 The system would also detect
22 position, velocity, acceleration, things like

1 that, correct?

2 A. Well, it says the Sensors 14 may
3 detect position, velocity and acceleration.

4 Q. And then the signals from those
5 sensors, could you explain what happens next?

6 A. What happens next? Well, I mean in
7 terms of the patent, what he writes is that he is
8 using the output of the sensors to derive the
9 motion of the subassembly, by which I would
10 assume it is primarily he is deriving the
11 velocity.

12 Q. When Cosper -- in that sentence when
13 Cosper says one or more sensors may detect
14 position, do you have an example of what type of
15 sensor that might be?

16 A. Well, he gives examples. Optical,
17 for example.

18 Q. And same question for velocity
19 sensors.

20 A. Well, I would guess, you know,
21 electromagnetic, if he is looking at the EMF,
22 would detect velocity.

1 Q. And how about sensors for
2 acceleration, is there a type of sensor that
3 would be used for that?

4 A. Well, in the list here, I guess I
5 don't see it directly, no.

6 Q. A moment ago you mentioned the
7 velocity sensor could be implemented as an
8 electromagnetic sensor.

9 Do I have that right?

10 A. Well, I am making an inference there
11 that when he says electromagnetic sensor, he is
12 referring to, you know, something measuring the
13 back EMF of -- if the mass is a magnet.

14 But, I am sort of reading ahead
15 there, maybe. I can't remember if he describes a
16 back EMF sensor here.

17 Q. All right. Let's turn to the
18 Shahoian reference.

19 THE WITNESS: Again, you will have
20 to provide it.

21 MR. DEUTSCH: Yes, I just dropped
22 Exhibit 1004 into the Chat. Okay?

1 (Whereupon, previously marked
2 Exhibit 1004,
3 first referral.)

4 BY MR. DEUTSCH:

5 Q. I would like to talk about what is
6 shown in Figure 2 of Shahoian. Can you tell me
7 what Figure 2 is depicting?

8 A. Well, can I, just to make sure I get
9 it right, refer to the text describing Figure 2?

10 Q. Yes, absolutely.

11 A. Okay, so, if you go to Column 6 at
12 the top.

13 Q. Okay.

14 A. So Figure 2 is a side view of an
15 Actuator that can provide force feedback to the
16 user of a controller, meaning some sort of
17 handheld, describing gaming devices, generally.

18 And, Actuator 100, in the next
19 paragraph, is a moving magnet actuator, includes
20 a Wire Coil 104, and Magnets 106 and 108.

21 And it -- in the third paragraph
22 what I gather is that the coil produces a force

1 on the magnet and causes it to move.

2 Is that sufficient?

3 Q. Yes, it is. And you answered my
4 next question, too. I was going to ask how the
5 Magnet Head 105 is driven. And I think you
6 answered that.

7 And so, thinking about the drive
8 waveform, how does the drive waveform affect the
9 vibration output?

10 A. I'm sorry. Where do you see drive
11 waveform?

12 Q. I guess one usage of that is in
13 Column 7, beginning at Line 34.

14 A. Well, okay. So, it says, "A drive
15 waveform that," you know, "changes between
16 positive and negative signs can be provided to
17 the actuator to cause the oscillations."

18 Q. And then the next line says, "If a
19 lower amplitude drive waveform is used, then the
20 magnitude of vibration output is correspondingly
21 lower."

22 Did I read that correctly?

1 A. Yes.

2 Q. And then, likewise, if a higher
3 amplitude drive waveform is used, then the
4 magnitude of vibration output would be
5 correspondingly higher, correct?

6 A. That is what it reads, yes.

7 Q. How does the frequency of the drive
8 waveform impact the vibration output?

9 A. Well, it can change the frequency of
10 the movement, I suppose.

11 Q. If I am understanding you correctly,
12 you are saying if the frequency of the drive
13 waveform is changed, that would impact the
14 frequency of the vibration output?

15 A. Well, I mean, this paragraph is
16 somewhat schematically descriptive. But, that
17 appears to be what he is describing.

18 Q. And so is it the case, is it similar
19 to magnitude, that if the frequency of the drive
20 waveform increases, then the frequency of the
21 vibration output increases and vice versa?

22 A. Well, depending on how the circuit

1 is designed, it may work that way.

2 Q. How about for a system like what is
3 depicted in Figure 2 of Shahoian?

4 A. Well, he doesn't show the driving
5 circuit in Figure 2.

6 I mean, if I can, you know, back up
7 a little bit here. With reference to Figure 2,
8 if there is -- you know, if there is more current
9 in the coil, there is going to be more force on
10 the magnet.

11 But, other than that, I'm not sure
12 what else to infer from this paragraph.

13 Q. And on that point, then, when you
14 say there is -- if there is more current in the
15 coil, there is going to be more force on the
16 magnet. Can you describe that a little more in
17 terms of the impact on the vibration output?

18 A. From what is written here, I
19 couldn't make any additional inference.

20 Just based on Figure 2, which is
21 somewhat schematic -- you know, in, in describing
22 that the coil is what is causing the magnet to

1 move, I would infer that if there is more current
2 in the coil, the force in the magnet is going to
3 be larger.

4 Q. Understood. So, continuing down in
5 that same discussion of Shahoian. At Column 7
6 beginning at Line 54, Shahoian indicates, "The
7 linear actuator 100 provides a greater magnitude
8 of vibrations at higher frequencies (assuming the
9 waveform magnitude is held constant)."

10 Did I read that correctly?

11 A. That is what it says.

12 Q. So, in that scenario, the magnitude
13 of vibrations is greater as the frequency has
14 increased?

15 A. I guess I have a difficulty parsing
16 that sentence, why that would be.

17 Q. Why what would be?

18 A. Why -- I mean just reading that
19 sentence alone -- why if the linear actuator is
20 operated at higher frequencies, it would have a
21 greater magnitude of vibrations.

22 I'm not sure what he is referring to

1 there.

2 Q. Is it -- is there anything in that
3 sentence that suggests --

4 A. Well, the next sentence --

5 Q. Sorry. I don't mean to -- no, go
6 ahead --

7 A. I mean, the next sentence, I mean,
8 indicates that at higher frequencies, you are
9 approaching the resonant frequency.

10 Q. And so that seems to answer the
11 question of why the magnitude is greater at
12 higher frequencies?

13 A. Well, just reading those two
14 sentences, what he seems to be saying is that as
15 you approach the resonant frequency -- as you
16 raise frequency and approach the resonant
17 frequency, the vibrations will have a greater
18 magnitude.

19 Q. And it seems like there is --
20 depending on what output is called for in a given
21 scenario, that could be a good thing or that
22 could be something that could be --

1 A. Well, in the context of this
2 paragraph, it is a bad thing. He says, "needs to
3 be compensated for, so as to provide an overall
4 flat response."

5 Q. Where do you see that?

6 A. Well, I am finishing reading the
7 sentence. "This gain at higher frequencies is
8 due to primarily to the vibration occurring at
9 the resonant frequency," would -- which can be
10 compensated for, to obtain a more flat response.

11 Q. So, you are saying that is, that
12 higher gain -- or, excuse me, the. I'm sorry.

13 The greater magnitude of vibrations
14 at higher frequencies, due to the vibration
15 occurring near the resonant frequency, is
16 something that needs to be compensated for, or,
17 in other words, avoided?

18 A. Well, interpreting that sentence,
19 that is what he is saying. He is endeavoring to
20 compensate for the resonance, so as to obtain a
21 more flat response.

22 Q. And I think when you recited that

1 sentence, it was a little bit different than the
2 text that I see on the page.

3 And if we go back to that sentence,
4 starting with "this gain."

5 A. Uh-huh.

6 Q. It says, "This gain at higher
7 frequencies is due primarily to the vibration
8 occurring at the resonant frequency of the
9 mechanical system including actuator from
10 housing, et cetera, and, if desired, can be
11 compensated for in other embodiments to obtain a
12 more flat response."

13 And so, when Shahoian says "if
14 desired, can be compensated for," are you
15 interpreting that as it must be counteracted?

16 A. Well, it -- in the patent generally,
17 he is endeavoring to get a more flat frequency
18 response.

19 Q. And so if he says if desired --

20 A. I mean I --

21 Q. -- some might say it may not be
22 desired. If the, if the goal was a greater

1 magnitude of vibrations at these high
2 frequencies, then it wouldn't be compensated for.

3 Is that correct?

4 A. Just reading the, that single
5 sentence literally, yes.

6 Q. Okay. If we could turn to the '767
7 patent. I think you said you have that in front
8 of you.

9 A. Yes.

10 Q. And I would like to look at Claim 3
11 of the '767 patent. Do you have it?

12 A. Yes, I am looking at the claims.

13 Q. Okay. So, Claim 3 recites, "The
14 linear resonant vibration module of Claim 2
15 wherein the linear resonant vibration module
16 further includes a vibration sensor and wherein
17 the control program continuously monitors output
18 from the vibration sensor in order to adjust the
19 frequency at which the control program changes
20 the voltage state of the directional signal D."

21 A. Yes.

22 Q. And you had commented on that second

1 wherein clause and particularly, "wherein the
2 control program continuously monitors output."

3 And I think, and I can -- we can
4 turn to your declaration if it is helpful.

5 A. Oh, you mean in my declaration,
6 okay.

7 Q. Yeah, I'm sorry.

8 A. You will have to tell me where I am
9 looking here.

10 Q. I believe it is Paragraph 108 -- or,
11 I'm sorry, 111. Paragraph 111.

12 But, let me know if there is other
13 paragraphs that are relevant. But Paragraph 111
14 specifically talks about this claim limitation,
15 "continuously monitors output from a vibration
16 sensor."

17 A. Yes.

18 Q. And I see in Paragraph 110 -- or,
19 excuse me, Paragraph 111, there is citations to
20 Pages 45 to 46 of the petition, which cites
21 the '767 patent at Column 7, Lines 9 to 14.

22 A. Okay.

1 Q. And what I am wondering is -- are
2 there passages in the '767 patent besides
3 Column 7, Lines 9 to 14 that you are relying on
4 for your opinion here regarding the term,
5 "continuously monitors output from the vibration
6 sensor"?

7 A. Well, what I am citing to there is
8 Dr. Hannaford's -- I always get mixed up
9 declaration and report, whichever it was, where,
10 when he discusses continuous monitoring, the only
11 thing he appears to point to is the '767 patent
12 itself.

13 So, if you have -- I don't have a
14 paper copy of his document.

15 But, if you go to the cited pages,
16 it will say where he and the '767 patent describe
17 continuous monitoring.

18 Q. Maybe my question is a little bit
19 different. I think -- let me phrase it this way.

20 What does it mean to you to
21 continuously monitor, as it is used in Claim 3?

22 A. Well, I mean, it means that whatever

1 control system is using the output of the sensor
2 as an input, it is continuously being input to
3 that control system.

4 Q. Is there a certain timing
5 requirement that would need to be satisfied in
6 order for it to be continuous?

7 A. Well, I mean, you are sort of asking
8 me to perform, you know, interpretation perhaps.

9 But, you know, the control program
10 is a program and so, you know, during every cycle
11 of the program it inputs from the sensor.

12 Q. So, if I am understanding correctly,
13 it is -- well, let me rephrase that.

14 Can you explain what you mean by
15 that when you say during every cycle of the
16 program it inputs from the sensor?

17 A. So, just reading Claim 3 by itself,
18 what I would interpret that is that the control
19 program has a loop. And that loop, it monitors
20 the sensor and it uses that information to adjust
21 the frequency.

22 And so, every -- you know, it is

1 happening throughout the operation of the
2 program. I mean, the program is software, right.

3 And I can't remember if Claim 3 had
4 any construction. Should I check that?

5 Q. Sure. Yes, feel free.

6 A. Apparently it does not.

7 Q. Let's turn to Column 7, Line 9,
8 which I think is what you were just describing.

9 A. Of what? I'm sorry.

10 Q. Of the '767 patent. I'm sorry.

11 A. Yes.

12 Q. So, there the '767 patent says, "In
13 the default mode the LRVM uses continuous
14 feedback control to optimize the vibrational
15 force produced by the LRVM by continuously
16 seeking to operate LRVM at a frequency as close
17 as possible to the resonant frequency needed for
18 the LRVM."

19 A. Yes.

20 Q. And so I see in that sentence, there
21 is two places where it uses the term
22 "continuous."

1 Are there other portions of '767
2 that inform kind of what it means to use
3 continuous feedback control?

4 A. Well, I mean, it would have to be in
5 the context of the control program.

6 And so, the control program is a set
7 of software. You are running code, and it is
8 operating a loop. And every time it goes through
9 the loop, it would have to read in the output of
10 the sensor.

11 Q. Okay.

12 MR. DEUTSCH: Could we take a quick
13 break? I think it has been about an hour.

14 THE WITNESS: Okay.

15 (Recess taken -- 11:17 a.m.)

16 (After recess -- 11:24 a.m.)

17 BY MR. DEUTSCH:

18 Q. All right, Dr. Goossen, I would like
19 to talk about the Rossi reference.

20 A. Okay.

21 MR. DEUTSCH: And that I will drop
22 in the Chat, unless you have a copy in front

1 of you.

2 THE WITNESS: No, I don't.

3 MR. DEUTSCH: This is Exhibit 1020.

4 (Whereupon, previously marked

5 Exhibit 1020,

6 first referral.)

7 THE WITNESS: Okay.

8 BY MR. DEUTSCH:

9 Q. Figure 6 of Rossi shows a circuit
10 diagram -- or at least Rossi refers to it as a
11 circuit diagram.

12 A. Yes.

13 Q. And I understand this diagram
14 illustrates the circuit logic that Rossi
15 describes as utilizing analog switches
16 implemented by means of MOSFET transistors; is
17 that right?

18 A. It appears -- they appear to be
19 MOSFETs, yes.

20 Q. And I think this -- you have
21 referred to illustrations earlier as kind of
22 schematic or maybe there is another term.

1 I think Figure 6 similarly is
2 showing the logic of the circuit.

3 A. Yes, I mean, when I said schematic
4 earlier, perhaps a more appropriate word would be
5 abstract.

6 Q. Okay. And so what does that mean --
7 or what did you mean by that with reference to
8 Figure 6 in Rossi?

9 A. Well, I mean a circuit schematic is
10 showing generally all of the circuit components
11 and their connections.

12 So, it was more literal.

13 Q. And so in this case, for Figure 6,
14 if you were manufacturing a circuit that was
15 consistent with the layout in Figure 6, there
16 would be kind of an additional manufacturing
17 drawing or specification with additional detail;
18 is that right?

19 MR. DAVIS: Objection, form.

20 THE WITNESS: I'm sorry, I'm not
21 sure what you are asking. This is a circuit
22 schematic.

1 BY MR. DEUTSCH:

2 Q. Yes, let me, let me rephrase that.

3 If you were to manufacture a circuit
4 shown in Figure 6, what other documentation would
5 typically be prepared?

6 MR. DAVIS: Same objection.

7 THE WITNESS: Well, I'm not sure.

8 And I'm not sure what the patent itself
9 describes in terms of additional
10 documentation.

11 I mean, as a circuit designer, I
12 mean you may want to know the particular
13 components like what particular MOSFET, you
14 know, a model number or something like that
15 or some other design parameters.

16 BY MR. DEUTSCH:

17 Q. Yeah, understood. And so that is
18 not something that is shown in Figure 6 of Rossi?

19 A. It is showing all of the components
20 of the circuit. I don't believe it is leaving
21 out any components.

22 Q. I think you had mentioned what the

1 particular components are as something additional
2 that is not shown in Figure 6; is that right?

3 A. No. I am just saying -- I mean you
4 asked if there might need to be more information.
5 For example, the diodes you might need to know,
6 like a model number diode or -- you know, the
7 circuit designer might have, you know, certain
8 diodes in mind to fulfill those diodes of the
9 circuit.

10 That is all I'm saying is, you know,
11 the circuit designer may have included, you know,
12 descriptions of what particular model diodes they
13 were.

14 Q. Right. So, an engineer implementing
15 a circuit shown in Figure 6 would get that
16 information somewhere in order to manufacture the
17 circuit?

18 A. I mean, it may or may not be
19 necessary. All of the components are shown.

20 Q. And if not necessary, just to
21 clarify that, you mean the engineer would just
22 make a determination of what part to use to

1 implement what is shown in Figure 6?

2 A. Yes. I mean all of the components
3 look pretty straightforward. And so, a standard
4 circuit designer would probably have a good
5 understanding of what he could use.

6 Q. Okay. Looking at the circuit
7 itself, Figure 6 shows four switches that are
8 labeled SW1, SW2, SW3, SW4; is that correct?

9 A. Yes.

10 Q. Could you explain to me how those
11 switches work in Figure 6?

12 A. Well, depending on the input to the
13 gain -- the gate, I'm sorry, determines whether
14 current flows from the drain to the source.

15 Q. And are the inputs labeled by those
16 switches?

17 A. Yes.

18 Q. Okay. Let me clarify. When you say
19 inputs, what inputs are you referring to?

20 A. To the gates of the MOSFETs.

21 Q. And what are the labels on those
22 inputs?

1 A. They appear to be labeled, like the
2 top left one, IN1.

3 Q. How about for the others?

4 A. Well, they are labeled as shown
5 there, yes.

6 Q. I don't mean to belabor, just to
7 make sure we are pointing to the same things?

8 A. Yes. IN1, IN1 bar, IN1 bar, and
9 IN1.

10 Q. Okay. I see that. And so can you
11 walk through an example of what happens, say for
12 a given N1, at the left side of the diagram, how
13 does that input on the state of the switches?

14 A. Well again, you know -- I prefer to
15 read the patent's own description so I'm not
16 interjecting anything different than what the
17 inventor intended.

18 Can I go to that?

19 Q. That would be great. Yes, thank
20 you.

21 A. So -- I'm sorry, I'm looking. Okay,
22 I'm sorry. So, yes. Okay, Column 3, I guess

1 starting at Line 48, "Such an integrated circuit
2 as shown in Figure 6 wherein the power switches
3 of the bridge stage SW 1, 4, 3 and 2, are made
4 with as many," meaning four, "power MOS
5 transistors."

6 So, I guess he is -- that is where
7 he is describing Figure 6. And in terms of the
8 operation, one would assume he is referring to an
9 earlier figure to describe its operation, perhaps
10 Figure 4. Where the -- in Figure 4, the switches
11 are just drawn as switches.

12 And so, in Figure 4 -- you know, it
13 has been a while since I read this document --

14 Q. That is okay.

15 A. -- and, okay. So he doesn't
16 describe it well, I mean, or -- but, let me look
17 at Figure 4.

18 Yes, in Figure 4, he is using SW, a
19 number. You know, I'm not seeing where he,
20 directly refers to the figures. He goes back to
21 Figure 1.

22 Okay, so maybe we can just use

1 Figure 1. Where, again, the MOSFETs of Figure 6
2 are depicted as switches.

3 So, if we go to Column 1, Line 65.
4 "An H-bridge stage for driving the Inductive Load
5 L is shown in Figure 1 using conventional
6 symbols. Switches SW1, 4, 2 and 3 are driven
7 respectively by a Driving Signal IN1 and by
8 Inverted Signal IN1 bar, and the latter being
9 attained by means of Inverter I."

10 And the two pairs of switches are,
11 okay, coincide with the Nodes V1 and V2 such
12 that -- it is funny because I'm not seeing where
13 he says it directly, when the switch is closed
14 and when they open.

15 You know, he doesn't say
16 apparently -- I mean, directly. So, he seems
17 to -- I mean, going back to Figure 1, you know, I
18 mean, sort of somewhat indirectly refer to the
19 operation of an H-bridge in that either Switch 1
20 and 4 are closed while Switch 2 and 3 are open,
21 or vice versa.

22 But, I was looking for where he

1 actually writes that down and he doesn't really
2 seem to.

3 Q. That makes sense.

4 A. Yes.

5 Q. And when -- just to finish that
6 functionality, when you mentioned that either
7 Switch 1 and 4 are closed while Switch 2 and 3
8 are open or vice versa, that is the result of the
9 state of N1 and N1 bar?

10 A. Well, he, I mean it -- yeah, the
11 paragraph at the top of Column 2, he is kind of
12 saying that but not sort of very literally.

13 Q. What do you mean by that?

14 A. Well, I mean just reading it --
15 okay, so, he talks about two pairs of switches,
16 namely S1, S4, and S2, S3.

17 So, he is pairing the switches. He,
18 by that parentheses, grouping 1 and 4 and 2
19 and 3.

20 And, other than that he, you know,
21 it is not very clear. So, I am just inferring
22 from his grouping of 1 and 4 and 2 and 3, that

1 that is what he is meaning to say. That 1 and 4
2 are closed while 2 and 3 are open, or vice versa.

3 THE WITNESS: Are we being
4 videotaped, recorded, the video?

5 MR. DEUTSCH: No.

6 THE WITNESS: Okay. I am trying to
7 find a comfortable position to sit in.

8 MR. DEUTSCH: Yes and again, you
9 know, let me know if you need to adjust or
10 need a break. It is no problem at all.

11 THE WITNESS: Okay.

12 BY MR. DEUTSCH:

13 Q. All right. So, going back to the
14 inputs to the switches. It looks like in some of
15 the figures it just shows the input, you know,
16 not connected to anything else in terms of how it
17 is generated.

18 So, Figure 4, I think is an example
19 of that.

20 A. Right. And Figure 1 is prior art,
21 actually, so not part of the invention.

22 So, it is sort of odd, actually. I

1 didn't recall that, you know, the exact wording
2 of this patent. But it is sort of odd that in
3 his description of the invention, which is, you
4 know, I would assume starts with a brief
5 description of the drawings, he refers to how it
6 operates from Figure 1 which is prior art.

7 Q. Which portion are you referring to?

8 A. I am just looking at the figure.

9 Q. Oh, I see. The label.

10 In looking at Figure 1, would the
11 four switches no longer function in the manner
12 that Rossi describes if it was drawn with two
13 Inverter Component Is that were used to generate
14 the N1 bar signal for SW2 and SW3?

15 A. Well, it is not precisely clear in
16 the sense that Figure 1 is, I guess I would say,
17 not a complete schematic in that the switches are
18 not -- I mean they are drawn, in sort of the
19 parlance that I was using earlier, in an abstract
20 fashion. I don't know what they are.

21 Q. Yes, and so an engineer looking at
22 Figure 1 would have an understanding of the logic

1 that is being conveyed that then would have to
2 make implementation decisions when actually
3 building a physical circuit?

4 A. Yes, and those are not taught until
5 Figure 6.

6 Q. Where in Figure 6 it is showing --

7 A. The actual component.

8 Q. -- specific types of switches. Is
9 that what you mean?

10 A. Yes.

11 Q. Got it. Okay. So, in the Figure 6
12 diagram, would the switches, SW1, SW2, SW3, SW4
13 no longer function in the manner that Rossi is
14 describing if a single Converter Component I were
15 used to generate the N1 bar signal?

16 A. Well, I guess I would interpret that
17 he drew it with two inverters for some reason to
18 meet the requirements of his invention.

19 Q. Do you have a sense of what those
20 requirements might be?

21 A. Perhaps the types of MOSFETs that he
22 was envisioning using.

1 Q. What do you mean by that?

2 A. Well, I mean, you know, the MOSFETs
3 especially, you know, given that he has some
4 other circuit components here, the MOSFETs SW1
5 and SW2, the ones on the top that are connected
6 to VS might be different than SW3 and SW4.

7 They might have different
8 requirements in terms of what gate voltage is
9 actually required to switch them.

10 You see, the circuit as drawn is not
11 sort of symmetric from top to bottom. So, even
12 though, you know, he has a label IN1, that could
13 be, you know, perhaps a, how do you say -- I
14 mean, it is not necessarily meant to convey that
15 they are exactly the same signal, because of the
16 different requirements of SW1 and SW4.

17 Q. Can you walk me through that,
18 starting with N1 on the left and then following,
19 you know, to the N1 at SW1 and the N1 at SW4?

20 A. Well, what I am saying is that --
21 and I think I misspoke earlier. I got the
22 numbers mixed up.

1 The IN1 bar signal could have a
2 different -- on SW2 could have a different
3 requirement than the IN1 bar signal on SW3
4 because of the way he has designed the circuit.

5 You asked me to surmise why he put
6 in two inverters. And that is one possibility I
7 can imagine just looking at the circuit.

8 Q. Oh, I see, okay. So it would be,
9 that would apply to N1 -- the two N1 bars.

10 A. Yes, I'm sorry. I misspoke earlier.

11 Q. I understand, okay. And the -- and
12 that wouldn't be the case if SW3 and SW4 didn't
13 have different requirements -- or, I'm sorry. I
14 referred to the wrong switches.

15 So, the -- if SW2 and SW3 didn't
16 have different requirements that you had referred
17 to, then it wouldn't be the case that --

18 A. Well, you asked me to just surmise
19 why he included two inverters, and that is a
20 reason I can come up with.

21 Q. That makes sense. And so, if that
22 is not the case, are there any constraints that

1 would make it unwise to use a single
2 Inverter I -- I'm sorry. Let me -- I think I can
3 clarify that question.

4 Are there any constraints that would
5 make it unwise to use two Inverter Is when the
6 same logic could be achieved with one, in the
7 scenario where SW2 and SW3 do not have different
8 inverter requirements?

9 A. I mean, he designed it this way so
10 he must have had a reason. And, I mean, as a
11 circuit designer, I would take his invented
12 circuit schematic literally, that he believed
13 there was some requirement.

14 Q. Is there anything in the description
15 of Figure 6 that leads you to that conclusion?

16 A. Well, as I mentioned earlier, the
17 patent is fairly brief. And, an innovated
18 circuit, a multiplex MPX -- oh, wait a minute.

19 What is the multiplex MPX? Okay, I
20 am not sure.

21 It is, description in Figure 6 is
22 very brief, and there is nothing in that

1 paragraph about the inverters.

2 Q. Okay. And just to clarify, there is
3 nothing in that paragraph that specifies SW3 and
4 SW2 are different in the way you described in
5 your example, correct?

6 A. "Two integrated analog switches."

7 It may go to how he is, how he is
8 contemplating the construction of the, of
9 Figure 6, because he talks about two integrated
10 analog switches.

11 So, it may have to do with how he is
12 envisioning implementing it as integrated circuit
13 chips that he requires, two.

14 Q. Where does he say that he requires
15 two?

16 A. Well, he says that the H-bridge,
17 he -- well, I'm not sure he is referring to --
18 what he is referring to there. He says the
19 multiplex by means of two integrated analog
20 switches.

21 So, it may mean that he meant -- I
22 am just, you know, reading into that perhaps, but

1 because of the circuit chips that he is
2 designing, he required two. Because they are on
3 two different chips, possibly. But it doesn't
4 say that literally in that paragraph.

5 Q. Okay. Let's look at Figure 1
6 again --

7 A. Okay.

8 Q. -- the prior art.

9 A. Yes.

10 Q. Figure 1 of Rossi is labeled, in
11 parentheses, Prior Art.

12 So, in Figure 1, if I am starting at
13 the left, the note labeled N1, and I move to the
14 right then down, I see the Inverter I.

15 And then there is -- from there,
16 there is a branch labeled N1 bar going into SW3.

17 And then if I continue down, to the
18 right there is a line that continues around and
19 up and is also labeled N1 bar and N2 SW2.

20 A. So, in the prior art there is one
21 inverter. In his invention, there are two. As a
22 circuit designer, I would assume that he had a

1 reason for needing two in his invention.

2 Q. And that is what I am trying to
3 understand is the significance, if any, of that.

4 And so in the Figure 1 drawing,
5 would the logic change if it was drawn using two
6 Inverter Is that generate inputs for SW3 and SW2?

7 A. And again not knowing what the
8 switches are, I can't answer that question.

9 Q. What would you need to know about
10 the switches to answer that question?

11 A. About how they work. I mean, what
12 are they.

13 Q. In a scenario where they are the
14 same, they have the same characteristics or the
15 same switches?

16 A. I mean, I don't know. I mean, even
17 if they were, the top ones could require
18 different inputs than the bottom ones, you know,
19 or something like that.

20 So, I would have to, I would have to
21 know exactly what those switches are.

22 Q. In that scenario, the inputs, you

1 are saying the inputs would be different in that
2 scenario?

3 A. Well, I'm saying, you know, why in
4 his invention he included two inverters when the
5 prior art shows one. I would assume that there
6 is some reason in his invention for two.

7 Q. But you don't have a reason sitting
8 here today what that might be in a case where the
9 inputs to SW2 and SW3 are the same?

10 A. Well, I gave you reasons that I
11 could envision.

12 Q. If the inputs were different, are
13 the -- or if the switches had different
14 requirements, I believe those were the examples
15 that you were talking about?

16 A. Well, I am saying if the -- so, I
17 mean, I can envision in the circuit, especially
18 because, you know, he has these additional
19 elements, that the top and the bottom could have
20 different input requirements.

21 And so that might be a reason he
22 drew it that way. Or it could be because of the

1 way he was envisioning them being implemented in
2 integrated circuits that there had to be two.

3 He could have believed it was a, you
4 know, a time-dependent reason. We are looking at
5 this circuit, sort of in a DC fashion.

6 In operation, I mean it could be
7 that there had to be two inverters in order for
8 everything to keep up to speed in his mind.

9 He had to have a reason for drawing
10 that. I think I have given three reasons now.

11 Q. Well, and those are all dependent on
12 scenarios where the switches are different,
13 correct?

14 A. No, no. The third reason, you know,
15 because of, he felt that in order for the circuit
16 to keep up to speed, he had to have a second
17 inverter for SW2 compared to SW3.

18 I mean --

19 Q. And in that scenario, the, the --
20 I'm sorry, I interrupted.

21 A. No, I'm just saying, you know, you
22 can't just look at a circuit in a DC fashion.

1 You know, you have to think about it being
2 operated, going through cycles.

3 And so, he could have felt that in
4 order for Switch 2 to keep up with Switch 3, it
5 had to have its own inverter.

6 Q. And this -- could you remind me what
7 in the text tells you that?

8 A. Nothing. I don't think anything in
9 the text tells me that.

10 Q. Okay. Going back -- sorry to jump
11 around between the figures.

12 Going back to Figure 4. Figure 4
13 shows N1s for SW1 and SW4 and N1 bars for SW2 and
14 SW3, and doesn't show the source for those
15 signals; is that correct?

16 A. It doesn't. Just -- you know, very
17 abstract.

18 Q. And so that, it would -- the
19 significance is what is generated as input -- or
20 excuse me. Let me strike that.

21 The -- what Figure 4 depicts is the
22 signal that is being input to the respective

1 switches without specifying whether there is one
2 inverter, two inverters, some other
3 configuration?

4 A. No. And I would like to point out
5 that, you know, in Figure 6, even though it
6 writes in figure -- or the inventor writes that
7 the input to SW2 is IN1 bar and the input to SW3
8 is IN1 bar, you --

9 Q. You are referring to Figure 4, or --

10 A. No, 6. But, it leads back to
11 Figure 4.

12 The thing is, you know, the input to
13 SW2 and the input to SW3 are not the same signal
14 because there is, you know, different circuit
15 components between them, I mean to be the same
16 signal, you know, they have to be connected.

17 So, I'm just pointing that out that
18 when you go back to Figure 4 and you see IN1 bar
19 and IN1 bar, in the mind of the inventor, they
20 are not necessarily the same signal because they
21 aren't in Figure 6.

22 I mean, they are not the same in the

1 sense that they are not connected directly.

2 Q. Yes. They are not connected
3 directly. And in the text, it is not saying that
4 they are different?

5 A. Well, I'm just going by the circuit
6 diagram.

7 Q. I'm sorry --

8 A. You know, just in a very literal
9 sense of the circuit diagram itself.

10 I mean, he drew two for a reason.
11 Is this search -- it is not that long so I can
12 read it. I'm wondering if it is the loads he is
13 considering.

14 He doesn't say -- he doesn't specify
15 the load. It is just inductive.

16 And so it may mean that the
17 application he had in mind was for high speed
18 operation. And so he felt the second inverter
19 was required for his invention to work.

20 Q. And that is something that is not
21 mentioned -- that is a possibility for one
22 scenario and not something that is in the text.

1 Or is there text that you are
2 thinking of?

3 A. Just inasmuch as he only describes
4 the Load L as being inductive. And so it could,
5 it could be a high speed load that he is
6 contemplating.

7 MR. DEUTSCH: All right. Let's turn
8 to the Izumi reference which is Exhibit 1005.

9 (Whereupon, previously marked
10 Exhibit 1005,
11 first referral.)

12 THE WITNESS: Okay.

13 BY MR. DEUTSCH:

14 Q. And I just had a couple of quick
15 questions about Izumi. And this is -- I'm
16 looking at Paragraph 63 of Izumi.

17 A. Okay.

18 Q. And that paragraph begins, "Although
19 each of the ON-time and the OFF-time of the
20 voltage is controlled in order to form the
21 intended current waveform in this embodiment, in
22 the actual real-time control, it can be difficult

1 to perform complicated control at every
2 half-cycle or one cycle of the moving Element 1
3 due to a constraint of the control device such as
4 CPU speed, ROM capacity, et cetera.

5 "So, the controller may control a
6 ratio of the ON-time (T1) to the OFF-time (T2),
7 namely a duty ratio (T1/T2), while keeping the
8 sum of the ON-time and the OFF-time (T3=T1+T2)
9 constant.

10 "That is, the controller may use a
11 so-called PWM control method. In this case the
12 Controller 6 can form and intended current
13 waveform without using a complex control system."

14 A. Correct.

15 Q. And so when it talks about a PWM
16 control method, is it your understanding that
17 that can be performed by both an entirely analog
18 circuit or performed in conjunction with a
19 processor?

20 A. Yes. My interpretation of what he
21 is saying here is that he is teaching away from
22 using a processor.

1 Q. I think my question was a little bit
2 different.

3 The -- I guess I was asking just
4 specifically about the, when it talks about PWM
5 control method, are you saying that can only be
6 carried out using an entirely analog circuit?

7 A. That is what he is indicating. That
8 within his intended invention, he intends it to
9 be analog.

10 Q. And, when you say "it," I guess I'm
11 not sure what you are referring to.

12 A. The controller. Or, how, how the
13 signal was produced, the PWM signal.

14 He is saying -- he has these
15 requirements on speed that he doesn't think a CPU
16 can satisfy.

17 And so, he is saying what he needs
18 to be done without using a complex control
19 system, meaning without a CPU.

20 Q. So, the complex control system is
21 referring to something different than CPU, I
22 think, right? Or is there text that is equating

1 complex control system with CPU?

2 A. Well, I mean, he refers to, he
3 equates CPU with complicated control. And so I
4 equated that with complex control.

5 So, I guess, the two words,
6 "complicated" and "complex" are not exactly the
7 same. But, that was how I read the paragraph.

8 Q. So, then the sentence that begins
9 "So."

10 "So the controller may control a
11 ratio of the ON-time," et cetera.

12 And the next sentence, "That is, the
13 controller may use a so-called PWM control
14 method."

15 A. Yes.

16 Q. That PWM control method is something
17 that can be carried out on a processor, right?
18 PWM control, you are not saying PWM control is
19 only able to be carried out by analog circuitry,
20 correct?

21 A. No, I'm saying that within the
22 context of his invention, he is pointing the

1 reader to using an analog system.

2 Q. But the PWM control method can be
3 carried out by a processor, correct?

4 A. The -- just generally and not taking
5 into account this invention, I would say perhaps.
6 I mean -- I haven't performed that analysis.

7 Q. So, you are not sure if PWM control
8 can be carried out with a processor?

9 A. Well, it would depend on the
10 application.

11 He is indicating that for his
12 application -- he is indicating in this
13 paragraph, at least the way I read it, that he
14 needs an analog technique.

15 Q. Is there an analog -- I'm not seeing
16 analog in Paragraph 63.

17 Is there --

18 A. Well, not CPU.

19 Q. I'm not seeing "not CPU," either.
20 Is that somewhere -- am I missing
21 that?

22 A. Well, again, I'm saying, he is

1 saying what he needs to do is difficult to
2 perform using a CPU, using complicated control.

3 And so he says at the bottom without
4 using complex control, which I interpret it
5 without using a CPU. Sort of equating the words,
6 complex and complicated.

7 Q. The -- right. Well, and it seems
8 like it is giving an option of it can be
9 difficult to perform complicated control at every
10 half-cycle or one cycle of a moving element.

11 And then the next sentence begins
12 "so," and gives another option, specifically that
13 the controller may control a ratio of the ON-time
14 to the OFF-time.

15 And then in the last sentence -- or
16 in the second to the last sentence, that is the
17 controller may use the so-called PWM control
18 method.

19 And so, is it, is the -- is it your
20 understanding that the so-called PWM control
21 method is what is being described up above that,
22 control at every half-cycle or one cycle of the

1 element.

2 Or is the PWM control method
3 something different than the first sentence that
4 says complicated control at every half-cycle or
5 one cycle?

6 A. Well, I, I mean, the analysis is
7 simpler than that.

8 He is saying in this case, meaning
9 the case of his invention, he doesn't need a
10 processor. And in fact, sort of indicates that
11 they should be avoided.

12 Q. I don't see -- you said in this
13 case. Is that a different paragraph?

14 A. No, it is the last sentence. In
15 this case. That is what he says.

16 Q. Right, where the controller may use
17 a so-called PWM control method.

18 A. Yes. Well, which is his invention.
19 He is teaching his invention. He is teaching PWM
20 control.

21 And he is saying in this case,
22 meaning the case of using that within the context

1 of its invention, he does not use a complex
2 control system which I equated with not using a
3 CPU.

4 Q. And so by not using a complex
5 control system, that could be carried out
6 digitally with a processor or using an entirely
7 analog circuit; is that correct?

8 A. Well, that is how I read this, that
9 he is pointing -- he is saying to use an analog
10 system, not a CPU.

11 Q. Why would this not be carried out
12 using a CPU?

13 A. Well, I am not saying why or why
14 not. I'm saying this is what he is teaching to
15 do, not use a CPU.

16 Q. But you don't know why?

17 A. Well, he says why. Because of, you
18 know, the constraints of the CPU speed and memory
19 capacity, et cetera.

20 Q. So, you are saying the PWM control
21 method wouldn't work on a CPU because of
22 constraints of CPU speed?

1 A. Well, he is saying it. And,
2 evidently within the context of his invention.

3 Q. Do you -- but I think the sentence
4 is saying the Controller 6 can form an intended
5 waveform without using a complex control system?

6 A. Yes, without using a CPU.

7 Q. So, you are equating complex control
8 system with CPU. Not, not the --

9 A. Well, that is the --

10 Q. Not the control method or logic?

11 A. That is what he is saying. He is
12 saying it is difficult to perform complicated
13 control which he equates with a CPU in that
14 statement.

15 And so, I am equating that with
16 complex control, yes. I am equating that with
17 CPU.

18 And he is teaching that he is
19 concerned about CPU speeds to perform what he
20 needs for his invention.

21 Q. The -- right. And so, maybe the
22 disconnect is, I'm not understanding how you are

1 interpreting the complicated control at every
2 half-cycle or one cycle of the moving Element 1.

3 And so I understand that -- let me
4 rephrase that.

5 Do you understand the next sentence
6 beginning, "So" as an alternative to that
7 difficult -- or, excuse me, that complicated
8 control at every half-cycle or one cycle?

9 Or is the complicated control at
10 every half-cycle or one cycle what you are saying
11 is being performed by the analog circuit?

12 A. Well, I mean, what I am saying is he
13 is teaching that what he needs in his PWM control
14 method cannot be done or is difficult to be done
15 with a CPU.

16 And so he then teaches, you know,
17 doing it without using a complex control system,
18 which I interpret it, based upon what else was in
19 the paragraph, as not using a CPU.

20 Q. There is nothing specific --

21 A. I mean, it is a fair -- I'm sorry.

22 Q. Go ahead.

1 A. It is a fair concern, right. I
2 mean, you know, if you can do what he needs in an
3 analog circuit, I mean, that will be the fastest,
4 you know, way.

5 So, he is teaching to use an analog
6 circuit.

7 Q. And that is the key criteria, the
8 fastest way?

9 A. Well, that is what his concern is,
10 is the speed of the CPU in order to perform what
11 he needs.

12 Q. I just wanted to make sure I
13 understood something you said earlier. And this
14 goes again back to what Izumi refers to as a
15 so-called PWM control method.

16 There is nothing about pulse-width
17 modulation that is limiting to analog circuitry,
18 correct?

19 A. Generally, not taking into
20 consideration what the inventor is saying or what
21 the inventor's requirements are, no.

22 Q. So, PWM control method does not

1 prohibit the use of CPU, generally speaking?

2 A. Well, I mean you can, you can write
3 a program to do anything.

4 So, you know, I don't know. I
5 actually haven't performed that analysis. The
6 analysis I performed was that it could be done
7 with analog methods.

8 And, in fact, the first
9 implementation of PWM had to have been done with
10 analog circuits back in the '40s.

11 Q. Got it.

12 If we go to your declaration
13 briefly.

14 A. I'm sorry?

15 Q. I'm sorry. One moment. Just
16 turning to Paragraph 92 of your declaration. The
17 first sentence begins, "For example, Ground 1a
18 relies on a combination of Izumi with Cosper.
19 Both in the petition and in the declaration of
20 Dr. Hannaford, it relies upon the only citations
21 to prior art for this limitation are citations to
22 Izumi."

1 And then there is a Footnote 56 with
2 a citation to the petition and the Dr. Hannaford
3 declaration.

4 Were there any other portions of the
5 petition and declaration that you considered in
6 making that statement?

7 A. Dr. Hannaford's declaration?

8 Q. Just that, the -- your assertion
9 that the petition and in the declaration of
10 Dr. Hannaford it relies upon only the citations
11 to prior art for this limitation and citations to
12 Izumi. And there are a few paragraphs and a few
13 pages of the petition that are cited.

14 A. Yes.

15 Q. If those were the only portions that
16 you have looked at or if there is others that
17 aren't cited here?

18 A. Well, I evaluated all of
19 Dr. Hannaford's document. And my conclusion was
20 that those are the citations he relied upon.

21 MR. DEUTSCH: Okay. I have no
22 further questions at this time, Dr. Goossen.

1 THE WITNESS: Okay.

2 MR. DAVIS: All right. No redirect
3 from Resonant, either.

4 (Whereupon, signature not having been waived,
5 the deposition suspended at 12:38 p.m.)

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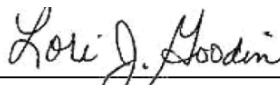
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7 Date of deposition: May 7, 2025

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