

UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT TRIAL & APPEAL BOARD

QSC AUDIO PRODUCTS, LLC,

Petitioner,

Case IPR2014-00129

vs.

U.S. Patent 5,652,542

CREST AUDIO, INC.,

Patent Owner.

VOLUME I
VIDEOTAPED DEPOSITION OF
ROBERT CORDELL

September 17, 2014

9:24 a.m.

400 Interstate North Parkway
Suite 1500

Atlanta, Georgia

Lee Ann Barnes, CCR-1852, RPR, CRR

Job No. NJ1923727

APPEARANCES OF COUNSEL

On behalf of the Petitioner:

PERKINS COIE
KAUSTUV M. DAS, ESQ.
RODNEY C. TULLETT, ESQ.
1201 Third Avenue
Suite 4900
Seattle, Washington 98101-3099
206.359.6889
206.359.4304 (facsimile)
kmdas@perkinscoie.com

On behalf of the Patent Owner:

THOMAS HORSTEMEYER
N. ANDREW CRAIN, ESQ.
ROBERT D. GRAVOIS, ESQ.
KENNETH A. KNOX, ESQ.
400 Interstate North Parkway, SE
Suite 1500
Atlanta, Georgia 30339
770.993.9500
770.951.0933 (facsimile)
andrew.crain@thomashorstemeyer.com
robert.gravois@thomashorstemeyer.com
kenny.knox@thomashorstemeyer.com

Also Present:

Terruss Reed, Videographer

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(Original exhibits are attached to the
Original transcript.)

Deposition of ROBERT CORDELL

September 17, 2014

(Reporter disclosure made pursuant to
Article 8.B of the Rules and Regulations of the
Board of Court Reporting of the Judicial Council
of Georgia.)

VIDEOGRAPHER: We are now on the record.
Please know the microphones are sensitive and
may pick up whispering and private
conversations. Please turn off all cell phones
or place them away from the microphones, because
they can interfere with the deposition audio.
Recording will continue until all parties agree
to go off the record.

My name is Terruss Reed, representing
Veritext Legal Solutions. The date today is
September 17, 2014, and the time approximately
is 9:25 a.m.

This deposition is being held at Thomas
Horstemeyer, located at 400 Interstate North
Parkway, Suite 1500, Atlanta, Georgia 30339, and
it's being taken by counsel for the petitioner.

The caption of the case is QSC Audio versus
Crest Audio. This case is being held in the

1 United States Patent Office, Case
2 No. IPR2014-00129. The name of the witness is
3 Robert Cordell.

4 At this time, the attorneys present in the
5 room and everyone attending remotely will
6 identify themselves and the parties they
7 represent and our court reporter, Lee Ann
8 Barnes, representing Veritext Legal Solutions,
9 will swear in the witness and begin proceeding.

10 MR. DAS: Kaustuv M. Das on behalf of the
11 petitioner, QSC Audio Products, LLC, and also
12 with me is Rodney Tullett.

13 MR. CRAIN: Andrew Crain of Thomas
14 Horstemeyer for Crest Audio and the witness.
15 With me also is Robert Gravois and Kenny Knox.

16 ROBERT CORDELL, having been first duly sworn,
17 was examined and testified as follows:

18 EXAMINATION

19 BY-MR. DAS:

20 Q. Mr. Cordell, again, I'm K.M. Das or Kaustuv
21 M. Das, but I go by K.M.

22 A. Thank you.

23 Q. And we appreciate your being here.

24 Do you understand you're under oath?

25 A. Yes, I do.

1 Q. Okay. And just go through some preliminary
2 comments, which I'm sure Mr. Crain has already
3 discussed with you.

4 One of the things is everything we say
5 today, everything you say, Mr. Crain says, I say, is
6 being recorded by Ms. Barnes, so it's important that
7 you verbalize your responses instead of nodding.

8 A. Right, which I'm doing right now.

9 Q. Yes, you were nodding and we tend to do
10 that.

11 And oftentimes, we'll -- you know, in
12 conversation we'll say things like "uh-uh" and things
13 like that, but it's important for this -- that will
14 get picked up on the video, but it won't get picked
15 up on the record --

16 A. Sure.

17 Q. -- so saying things like "yes" or "no."

18 And I'm sure I'll mess this up, and if that
19 happens with you, I might remind you of this again.

20 A. Thank you.

21 Q. Also, because this is being recorded, it's
22 important that we not interrupt each other as much as
23 possible. So I will try to let you finish your
24 answer completely before I ask my next question, and
25 I'd appreciate it if you let me finish my question

1 before starting your answer.

2 Does that make sense?

3 A. It does.

4 Q. The whole process will be -- I'll be asking
5 a number of questions. I will try to ask clear
6 questions, but I'm sure not all my questions will be
7 clear. So if there's any time where you're not sure
8 about what I'm asking, please seek clarification.

9 Does that make sense?

10 A. Yes, it does.

11 Q. On the flip side, however, if you -- if I
12 ask a question and you answer it, then my assumption
13 will be you understood the question that I posed.

14 A. Right.

15 Q. If at any point during the deposition
16 you -- you want to take a break, just speak up. I
17 will try to go no longer than an hour, hour and 10
18 minutes at any given stretch, but you don't have to
19 wait for that. You can go ahead and ask for a break.

20 The one request I have is if there's a
21 question pending, I prefer you answer the question
22 before we go on the break.

23 Is that fair?

24 A. Sure.

25 Q. One clarification on that, however, is if I

1 ask you a question where you want to consult with
2 Mr. Crain or your attorneys about whether there's a
3 privilege issue, you -- you can take the break before
4 answering the question.

5 But to the extent there's some part of that
6 question you can answer without consulting, I'd,
7 again, ask that -- let's get that answer and then go
8 on the break.

9 Make sense?

10 A. Actually, one question I have there is you
11 mentioned a -- a privilege issue.

12 Q. Right.

13 A. In other words, if Mr. Crain objects on the
14 basis of a privilege issue --

15 Q. Right.

16 A. -- it -- it's customary to have a break
17 after that?

18 Q. Not nec- -- not necessarily. And I'll try
19 to explain --

20 A. Okay.

21 Q. -- and then Mr. Crain will clarify this,
22 too.

23 So it can come up in a few ways. I can ask
24 you a question where Mr. -- and very early in the
25 proceeding, it will probably come up this way, where

1 I'll ask you a question about what did you do to
2 prepare for this deposition, and Mr. Crain might
3 actually just caution you, don't get into any
4 privileged communications.

5 A. Right.

6 Q. Right.

7 And privilege covers a bunch of things, but
8 it's mostly the substance of your conversations --

9 A. Right.

10 Q. -- with -- with Crest counsel.

11 There -- in that situation, he's just
12 cautioning you; probably don't need to take a break.

13 There might be a different situation where
14 Mr. Crain actually says, "That's privileged and I'm
15 going to instruct the witness not to respond." Then
16 Mr. Crain and I might discuss what the basis for the
17 privilege is; again, may not land up in a break.

18 But there may be a question I ask where
19 you're thinking to yourself, "Well, I don't really
20 know how to answer this and if I start answering it
21 in a certain way, I mind end up getting into
22 something that's privileged, so I want to talk to
23 Mr. Crain." And that's the sort of situation where
24 I'm thinking --

25 A. I see.

1 Q. -- you might say, "Actually, before I
2 answer that, can I talk to my attorneys?" And that's
3 fine.

4 A. Sure.

5 Q. Because I told you let's answer the
6 questions before going on the break, but in that
7 circumstance --

8 A. That's right.

9 MR. CRAIN: Are you clear about that?

10 THE WITNESS: I think so. And in general,
11 if -- if I'm unclear about whether a question
12 involves privilege, I will err on the side of
13 waiting for some kind of direction from you or
14 Mr. Crain.

15 Q. (By Mr. Das) I -- I probably won't be
16 giving you very many directions after this --

17 A. Sure, sure.

18 Q. -- but, again, to just -- and we don't want
19 to spend too much time on this privilege issue
20 because I'm not interested in --

21 A. Sure.

22 Q. -- finding out privileged --

23 A. Right.

24 Q. -- information.

25 But at the end of the day, Mr. Crain is an

1 incredibly competent attorney and I'm sure he will
2 jump in and warn you --

3 A. Sure.

4 Q. -- if you're getting into places where --
5 where he's concerned. And so we'll -- we'll play it
6 by ear --

7 A. Sure.

8 Q. -- but I just wanted to --

9 A. Okay.

10 Q. -- clarify that.

11 A. Okay.

12 Q. So I will say something here. And, again,
13 I don't want to be rude, but you're saying "sure" as
14 I'm speaking --

15 A. Oh, sorry.

16 Q. -- and Ms. Barnes is having to take those
17 down; right? So that's the sort of thing we do it in
18 conversation all the time, but we want to try to
19 avoid doing that here.

20 Makes sense?

21 A. So I should say "yes" instead of "sure"?

22 Q. It's more that if I'm in the middle of
23 saying something --

24 A. Oh, okay.

25 Q. -- then if you don't speak, it hel- -- it

1 helps. And we'll -- we'll all mess this up.

2 A. Right. I apologize. That's --

3 Q. No apologies --

4 A. That's part of my style.

5 Q. Another thing is as we're going through the
6 day, we might have talked about something, say, in
7 the next 15 minutes, and later in the day you're
8 like, "You know, I just remembered something else
9 about what we were talking about this morning."

10 If that -- whether you're on a break and
11 you think of it or you're answering some other
12 question which triggers this recollection, go ahead
13 and interrupt me and say, you know, "Mr. Das,
14 actually, I just remembered something about this
15 thing we were talking this morning."

16 And my preference would be to do it that
17 way instead of you trying to hold onto it until we
18 get to a break in the questioning where you can
19 introduce it.

20 So at any point if you -- if you suddenly
21 remember something you wanted to say before and you
22 didn't say it, go ahead and stop me, say, "Can we go
23 back and revisit that topic?"

24 Does that make sense?

25 A. Yes, it does.

1 Q. Okay. And, again, it may be not adding
2 something, it may be correcting something, but go
3 ahead and do that; okay?

4 Are you taking any medications that may
5 interfere with your ability to understand or
6 respond -- respond to the questions posed to you
7 today?

8 A. I don't believe any of the medications I'm
9 taking would do that.

10 Q. Okay. Is there any reason you feel that
11 you may not be able to respond to the questions posed
12 today truthfully and completely?

13 A. No reason.

14 Q. Okay. Have you been deposed before?

15 A. No, I have not.

16 Q. Okay. Have you provided sworn testimony in
17 any trial proceeding before?

18 A. I think I did a long time ago in a divorce
19 proceeding.

20 Q. Okay. Do you remember when that was?

21 A. That was in the range of 1994 to 1996.

22 Q. Other than in these two I -- IPRs, and
23 we'll talk -- we call these interparties reviews IPRs
24 for the patent office.

25 Other than these two IPRs, have you served

1 as a consultant in any patent litigation matter?

2 A. No.

3 Q. Okay. Now, these two proceedings are
4 before the patent office, but there -- there are two
5 underlying District Court cases between QSC and
6 Crest.

7 Do you know about those cases?

8 A. I think the -- if I understand correctly,
9 that underlying litigation has -- is the litigation
10 we're talking about today on '542 and the litigation
11 that we'll be talking about tomorrow on the '544.

12 Is -- is that what you had in mind?

13 Q. Let me clarify.

14 A. Thank you.

15 Q. So today and tomorrow, what we're talking
16 about are these proceedings before the patent office
17 where the petitioner has challenged the validity of
18 the patent, the '542 and the '544.

19 But the -- part of the reason they've
20 challenged the validity is because the patent owner
21 has asserted the '542 patent and the '544 patent
22 against the petitioner in these -- in District Court
23 cases. So those are the cases I'm talking about.

24 Are you aware of those cases?

25 A. That -- that sounds like the same thing. I

1 mean, the -- the extent to which I'm aware of those
2 is limited to the fact that I've been asked to be an
3 expert witness in those -- these two matters.

4 Q. Okay. And just to be clear, when you say
5 "these two matters," are you talking about the
6 matters before the patent office or in the District
7 Court case?

8 A. The matters involving the two IPRs, IPR on
9 '542 and IPR on '544.

10 Q. And we've been calling them the '542 and
11 the '544 and we're going to call them that both days,
12 but just to be sure -- and maybe you won't remember
13 this off the top of your head -- but the '542 is the
14 5,652,542 patent?

15 A. (Witness nodded head affirmatively.)

16 Q. You'll have to speak up. See, you -- you
17 nodded. That --

18 A. I --

19 Q. Or maybe you weren't sure.

20 A. Oh, I'm sorry. I have -- I have not really
21 paid attention to all those numbers in front. To
22 me --

23 Q. It's the '542?

24 A. -- it's the '542 and the '544.

25 Q. Fair enough. No problem. And I -- I will

1 give you copies of the patent. No problem.

2 And you have not been asked to consult in
3 the underlying District Court cases?

4 A. That is correct.

5 Q. Okay. When were you retained by Crest to
6 consult on the '542 IPR?

7 A. I was asked to act as an expert witness --
8 I believe it was in early June of this year.

9 Q. Okay. Is that the first time you had any
10 contact with Crest's -- actually, strike that.

11 Who contacted you when you were asked to
12 serve as an expert witness in early June?

13 A. Vivek Gunta [sic].

14 Q. Ganti?

15 A. Ganti. I'm sorry.

16 Q. Yeah. And that -- that is one of --
17 Mr. Ganti is no longer with Thomas Horstemeyer, but
18 at that time he was one of Crest's counsel; correct?

19 A. That is my understanding.

20 Q. Okay. And did you have any contact with
21 anyone from Thomas Horstemeyer prior to this June?

22 A. Yes, I did. In approximately August or
23 September of 2013, I received a phone call from
24 Andrew Crain and we just talked about the
25 possibility --

1 MR. CRAIN: I'll --

2 THE WITNESS: I'm sorry.

3 MR. CRAIN: I'm going to caution you --

4 THE WITNESS: I'm sorry. I apologize.

5 MR. CRAIN: -- not to get into any
6 communications.

7 THE WITNESS: I apologize.

8 So the answer to your question is yes.

9 Q. (By Mr. Das) Okay. And, again, without
10 getting into the substance of that conversation, do
11 you recall how long that conversation lasted,
12 approximately?

13 A. It was just over lunch.

14 Q. Okay. So did you meet in person then?

15 A. Yes, we did.

16 Q. And where was that?

17 A. That was in Eatontown. I'm sorry. That
18 was in Eatontown, which is the town where I work.

19 Q. Okay. In New Jersey?

20 A. That's correct.

21 Q. Okay. I apologize. I didn't know where
22 that -- Eatontown was.

23 And between August or September 2013, when
24 you met with Mr. Crain, and then Mr. Ganti contacting
25 you in early June, did you have any other contacts

1 with anyone from Thomas Horstemeyer?

2 A. There was virtually no contact. One or two
3 e-mails, that was about it. These were short e-mails
4 that I initiated just, you know, asking if there
5 was -- I'm sorry.

6 Q. Again, I just wanted to --

7 A. Yes.

8 Q. -- make sure that --

9 A. I apologize.

10 Q. You don't want to get into the content --

11 A. Yeah --

12 Q. -- so --

13 A. -- that's right.

14 Q. And who were you having these e-mails --
15 communications with?

16 A. Andrew Crain.

17 Q. Okay. And -- but you were not formally
18 retained by Crest or Crest's counsel until early June
19 of this year to serve as an expert; is that correct?

20 A. I was retained to -- well, I was retained.

21 Q. Okay. And what were you retained to do?

22 A. I was retained to just be a consultant to
23 the extent necessary.

24 Q. Okay. And when were you retained?

25 A. I believe that was probably late

1 September 2013.

2 Let me clarify that. I'm not familiar with
3 some of these terms. Sometimes "retainer" means
4 somebody pays somebody up front, and that was not
5 the -- not the issue.

6 Q. Right.

7 Again, I wasn't using "retainer" --

8 A. I'm sorry.

9 Q. -- in that -- that sense. No, thank you
10 for that clarification.

11 The way I'm using the term "retained" is
12 that you were -- you had an agreement to provide
13 consulting or expert services to Crest or Crest's
14 counsel.

15 A. That is correct.

16 Q. And that was in late September 2013?

17 A. That is correct.

18 Q. Okay. And do you have a written retainer
19 agreement with either Crest or Crest's counsel?

20 A. Yes, I do.

21 Q. And do you know who you've been retained
22 by?

23 A. I -- I don't recall whether the -- the
24 document was a Crest document or a Thomas Horstemeyer
25 document. I suspect it was the latter.

1 Q. Okay. And between late September 2013 and
2 early June of this year, how many hours do you think
3 you put in towards the '542 IPR?

4 A. Virtually none.

5 Q. Okay. And how many hours -- and we can
6 talk about this tomorrow, but since it makes sense to
7 do it today, how many hours do you think, in that
8 time period between September 2013 and June 2014, did
9 you put in towards the '544 IPR?

10 A. Virtually none.

11 MR. CRAIN: Object to the form.

12 THE WITNESS: I'm sorry.

13 MR. CRAIN: Go ahead.

14 Q. (By Mr. Das) And so in early June of 2014,
15 when Mr. Ganti contacted you, did your role as to
16 what you were doing for Thomas Horstemeyer or for
17 Crest change somehow?

18 A. I don't think so.

19 Q. Okay. So I'm wondering, when you first
20 started by saying you were contacted in early June of
21 this year to serve as an expert, why that date came
22 to mind, as opposed to the late September of 2013?

23 A. Because virtually nothing of substance
24 happened in the time frame of September 2013. In
25 fact, I was not even aware of the '542 and the

1 '544 -- '4 patents at that point in time.

2 Q. Okay. And when did you first become aware
3 of the '542 patent?

4 A. It was when I first spoke with Vivek, as
5 far as I can recall.

6 Q. And that's June of 2014?

7 A. That is correct.

8 Q. In fact, let me go back and clarify.

9 Between September 2013 and June 2014, were
10 there anyone else at Thomas Horstemeyer that you were
11 communicating with regarding these IPRs?

12 A. No.

13 Q. All right. And that was a terrible
14 question.

15 Anyone else other than Mr. Crain at Thomas
16 Horstemeyer?

17 A. No.

18 Q. Okay.

19 A. And -- and I might add that during that
20 period that you're talking about, I didn't even know
21 what the term "IPR" meant.

22 Q. Okay. Well, I'm sorry you had to find out.

23 MR. CRAIN: I'm sure you're not alone. A
24 lot of people didn't.

25 Q. (By Mr. Das) Since June 2014 to the time

1 you submitted your declaration in the '542 IPR, how
2 many hours do you believe you worked on this matter?

3 A. On the order of slightly over 200 hours.

4 Q. Okay. And is that just on the '542 IPR or
5 is that the '542 IPR and the '544 IPR?

6 A. The latter --

7 Q. Okay.

8 A. -- the '542 IPR and the '544 IPR.

9 Q. And do you have a sense of how much of the
10 approximately 2- -- 200 hours was spent on the '542
11 IPR?

12 A. I would say of the approximately 200 hours,
13 somewhat more than half was spent on the '542,
14 because there was -- there was a number of things
15 that were in common between the '542 and the '544.

16 Q. Why does the fact that there was -- there
17 were things in common between '542 and '544 lead you
18 to say somewhat more than half was spent on the '542?

19 A. I don't know that factually. I just was
20 speculating, which I probably shouldn't have done.

21 Q. Okay. But I'm just trying to get my arms
22 around sort of the amount of time you've spent on the
23 '542 versus the '544.

24 And perhaps a better question would be --
25 break it up into three pieces -- time that you spent

1 on issues that were common to the '542 and the '544,
2 how much time would you say that was?

3 A. I don't know.

4 Q. Okay. If you were to put an approximate
5 number of hours on that?

6 A. I would rather not speculate.

7 Q. Okay. So combined, approximately 200
8 hours, and if I understood you correctly, perhaps a
9 little bit more than half of that was on the '542?

10 A. Yes.

11 Q. Okay. Between September 2013 and
12 June 2014, were you provided any documents relating
13 to either the District Court litigation that we
14 talked about before or the IPRs by either Crest or
15 Thomas Horstemeyer?

16 A. No.

17 MR. CRAIN: Object to the form.

18 THE WITNESS: No, I was not.

19 (Petitioner's Exhibit 1 was marked for
20 identification.)

21 Q. (By Mr. Das) Mr. Cordell, I've handed you
22 what's been marked as Exhibit 1.

23 Do you recognize this document?

24 A. Yes, I do.

25 Q. And what is this document?

1 A. This document is Petitioner's Notice of
2 Deposition of Mr. Robert R. Cordell.

3 Q. Okay. And have you seen this document
4 before?

5 A. Yes.

6 Q. And when did you see this document?

7 A. I believe it was Mon- -- this Monday.

8 Q. Okay. And what were the circumstances
9 under which you saw the document?

10 MR. CRAIN: To the extent that you can
11 answer the pending question without getting into
12 the substance of any communications you've had
13 with counsel, you can do that.

14 To the extent you can't, then I'm going to
15 instruct you not to answer.

16 THE WITNESS: I was just provided this
17 document as a -- as a matter of course,
18 completeness.

19 Q. (By Mr. Das) Okay. And you understand
20 you're here today in response to this notice of
21 deposition; correct?

22 A. That is correct.

23 Q. And what did you do to prepare for today's
24 deposition? And, again, to save Mr. Crain the --
25 from having to instruct you, I don't want to get into

1 communications you may have had with Crest's counsel;
2 I just want to know broadly what you did to prepare
3 for this deposition.

4 MR. CRAIN: Again, to the extent that you
5 can answer that question without getting into
6 the substance or communications with counsel,
7 you may do so.

8 THE WITNESS: I reviewed my declarations.
9 I reviewed the patents that were referenced by
10 petitioner. Those were the main things that I
11 reviewed.

12 Q. (By Mr. Das) And when you say reviewed
13 patents referenced by petitioner, would that include
14 non-patent prior art that was also relied on by
15 petitioner?

16 A. Not in the time frame between when I
17 submitted my declaration and now.

18 Q. Did you look at any other documents to
19 prepare for your deposition?

20 A. I did look at a couple of documents on the
21 Internet to refresh my memory.

22 Q. Okay.

23 A. I looked at my CV.

24 Q. Okay. Anything else?

25 A. I searched and found a Bell System

1 Technical Journal article that was helpful in
2 reminding me of what I was doing when I was in the
3 latter years at Bell Laboratories. Many of these
4 things are -- it's been 30 years.

5 Q. Anything else?

6 A. Not that I recall.

7 Q. Okay. When you say "searched and found,"
8 was that an Internet-based search?

9 A. Yes, it was.

10 Q. Okay. And if I understand correctly, this
11 was to remind you of what you were working on in the
12 latter years when you were working for Bell?

13 A. That is correct.

14 Q. Okay. You --

15 A. I'm sorry. The latter years when I was
16 working at Bell Laboratories.

17 Q. Bell -- okay. So not -- this was not
18 Bellcore, so this was the original Bell Labs?

19 A. That is correct.

20 Q. Okay. That makes more sense about it's
21 been 30 years, and we'll come back to --

22 A. Uh-huh (affirmative).

23 Q. -- visit that in a bit.

24 You -- just to make sure I have the
25 documents you've looked at, the universe closed, you

1 reviewed your declarations; correct?

2 A. Yes.

3 Q. You reviewed the patents on -- which the
4 petitioner is relying on in the IPRs?

5 A. Yes.

6 Q. You looked at your CV?

7 A. Yes.

8 Q. You did an Internet search for a couple of
9 documents?

10 A. Yes.

11 Q. And then you searched and found this Bell
12 Systems Technical Journal article?

13 A. Yes.

14 Q. Was there anything else you reviewed to
15 prepare for your deposition?

16 A. Not that I recall.

17 Q. Okay. Do you recall what Internet searches
18 you ran?

19 A. I ran an Internet search on the term
20 "DSPMATE," which was a device that my group was
21 responsible for in those later years at Bell
22 Laboratories.

23 Q. And could you spell that or how -- DSPMATE,
24 one word or --

25 A. Yes. I think it was all caps.

1 Q. Okay. And D-S-P-M-A-T-E?

2 A. That is correct.

3 Q. Okay. And what was DSPMATE?

4 A. DSPMATE was a development system for the
5 DSP that was developed at Bell Laboratories.

6 Q. And what were you trying to find out or
7 remind yourself about DSPMATE?

8 A. I just wanted to review the -- the details
9 of who, working for me, worked on that project and
10 the -- the large -- large picture functionality of
11 the DSPMATE.

12 Once again, this was just to refresh my
13 memory because it's so long ago. And as you can see
14 from my CV, I've been involved in many, many
15 different technologies over the years.

16 Q. Did you run any other Internet searches?

17 A. I believe I ran an Internet search on
18 "DSP," which was the one that led to my search for
19 "DSPMATE."

20 Q. Just the term "DSP"?

21 A. Yes.

22 Q. And what were you -- what was the intent
23 behind searching for the term "DSP"?

24 A. Actually wanted to refresh my memory on
25 some of the details of the Bell Labs DSP that we were

1 using in the development system.

2 Q. And did the search help you identify
3 documents that allowed you to refresh your memory
4 about the details?

5 A. Yes, the DSPMATE document in particular.

6 Q. So --

7 A. I might add that the document that is of
8 significance here where I was reminded of the DSPMATE
9 was actually an overview that was written in the Bell
10 System Technical Journal that basically covered
11 the -- the whole DSP technology that was developed by
12 Bell Laboratories.

13 Q. And were there other DSPs developed by the
14 Bell Labs, other than DSPMATE?

15 A. DSPMATE is not a DSP.

16 Q. Okay. So DSPMATE is the development system
17 for DSPs?

18 A. That is correct.

19 Q. And was DSPMATE used to develop any DSPs at
20 Bell Labs?

21 A. No.

22 Q. Okay. This technical journal that gave an
23 overview of development of DSPs at Bell Labs, did it
24 reference any other DSPs other than those developed
25 using DSPMATE?

1 A. Not that I recall.

2 Q. Okay. Did Bell Labs ever have a
3 commercially-available DSP that it developed?

4 A. Yes.

5 Q. And was that referenced in the Bell Lab --
6 or Bell System Technical Journal overview?

7 A. No.

8 Q. Did your search for DSP remind you of any
9 features of this commercially-available DSP developed
10 by Bell Labs?

11 A. The commercially-available DSP from Bell
12 Labs was a DSP that was developed at Bell Labs after
13 the time that I was there.

14 Q. When was that DSP developed, if you know?

15 A. The one that was commercialized?

16 Q. Yes.

17 A. I only recall that it was after I left
18 there, and I left there in 1984 as part of the
19 divestiture at that time.

20 Q. Was this DSP that was developed at Bell
21 Labs -- strike that.

22 Were there more than one DSP developed at
23 Bell Labs that were made commercially available?

24 A. I don't know.

25 Q. So you're aware of at least one?

1 A. That's correct.

2 Q. And this commercially-available DSP at Bell
3 Labs -- well, let me strike that.

4 This DSP developed at Bell Labs that was
5 made commercially available, was this for use in
6 audio amplifiers?

7 A. That was one of the uses.

8 Q. Okay. Do you --

9 A. I'm sorry. I -- it was used -- it was for
10 use in audio applications --

11 Q. Okay.

12 A. -- not limited to audio amplifiers.

13 Q. Do you recall what the name or model number
14 of this DSP was?

15 A. I believe it was WE32000, but I could
16 easily be wrong about that.

17 Q. When you say "audio applications," what
18 kind of audio applications are you talking about?

19 A. The one that I remember -- and, again,
20 there were numerous ones, but, again, I was not part
21 of Bell Labs at the time -- one example that I can
22 recall is that it was used in digital mixing disks,
23 mixing consoles, in the audio industry.

24 Q. Any other uses that you can think of?

25 A. Not that I can recall. I'm sure there

1 were.

2 Q. Were you involved in any way with the
3 development of this WE3200 [sic]?

4 A. 32000.

5 Q. 32000. Sorry.

6 A. And, again, I could be wrong, but that's my
7 recollection of roughly what the -- the -- the number
8 was.

9 Q. Right.

10 A. But, again, this was well after I was no
11 longer at Bell Laboratories.

12 Q. So I think we've lost the question, but
13 let -- let me -- just as an aside, let -- we'll use
14 WE32000 to refer to this commercially-available DSP
15 developed at Bell Labs, understanding that may not be
16 the right model number; is that fair?

17 A. That's fair.

18 Q. Okay. So did you have any involvement in
19 the development of the WE32000?

20 A. No, I did not.

21 Q. Did any members of the teams that you
22 worked with at Bell Labs have any involvement while
23 you were at Bell Labs in the development of the
24 WE32000?

25 A. The development -- to the best of my

1 knowledge and recollection, the development of the
2 32000 began after I left Bell Labs.

3 Q. So we've talked about two Internet searches
4 you ran. One was for the term "DSP," one was for the
5 term "DSPMATE."

6 Did you run any other Internet searches?

7 A. Yes, but I think it was -- I'm sorry. You
8 have to specify the time frame that you're talking
9 about.

10 Q. Okay. So did you run any other Internet
11 searches to prepare for this deposition?

12 A. Yes. I ran an Inter- -- Internet search on
13 "EPROM."

14 Q. Okay. Just the term "EPROM"?

15 A. That is correct.

16 Q. And what was the reason for running that
17 search?

18 A. The reason for running that search was the
19 fact that Dr. Ellis, in his declaration, had asserted
20 that EPROM could be used in a certain way.

21 Q. And did this search lead you to find
22 information relevant to Dr. Ellis' assertion?

23 A. No, it did not, actually, because I had --
24 I believe I had also searched on "EPROM" during the
25 time that I was creating my declaration.

1 Q. Okay. So why did you go back and run the
2 search again? Was there something -- some additional
3 information that you were looking for?

4 A. Yes. I was interested in refreshing my
5 memory on the specific device technology that -- that
6 is used in EPROM.

7 Q. And what specific device technology is
8 that?

9 A. The fact that EPROM uses a floating gate.
10 Many of these things I knew at the time and I was
11 just trying to refresh my memory.

12 Q. Knew at what time?

13 A. When I was working with that sort of
14 technology back in Bell Laboratories.

15 Q. Okay. Now, earlier when I asked you about
16 Internet searches, you said something about, "You'll
17 have to specify the time," so -- and then we narrowed
18 it to Internet searches to prepare for your
19 declaration.

20 So sticking to that time period, preparing
21 for your declaration, were there any other Internet
22 searches you ran?

23 A. Not that I recall.

24 Q. Okay. Now, were there any specific
25 documents that this EPROM search led you to when you

1 were preparing for your declaration that -- for your
2 deposition that you were not aware of earlier?

3 A. You know, when you do a search, you come up
4 with many different things, and I honestly do not
5 recall which search -- these were Google searches. I
6 don't recall which search I clicked on to have a
7 recollection reminder about the EPROM technology at
8 the time.

9 Q. Do you recall who the web page was
10 maintained by, for example?

11 A. It very well could have been Wikipedia.

12 Q. Okay. I have to say that I wouldn't be
13 surprised if it were Wikipedia, because that's where
14 I land up with most of my initial Google searches.

15 Any other Internet searches that you ran to
16 prepare for your deposition?

17 A. Not that I recall.

18 Q. Okay. Now, based on, again, this -- you
19 asking me to specify the time period for the Internet
20 search, is it fair to assume that while preparing
21 your declaration, you ran some internet searches?

22 A. Yes, I did.

23 Q. Do you recall what Internet searches you
24 ran during the time you were preparing your
25 declaration?

1 A. I recall one where I wanted to find the --
2 I don't recall the exact name of it, but the -- the
3 user manual or the application notes for the TMS320.

4 Q. And did you successfully find the user
5 manual or application notes for the TMS320?

6 A. Yes, I did.

7 Q. And did you review that in preparing your
8 declaration?

9 A. Yes, I did.

10 Q. And do you recall -- and this is not a
11 memory test, so if you don't recall, that's fine.

12 Do you recall if you listed that as one of
13 the documents you reviewed in preparing your
14 declaration?

15 A. I believe that I listed it as a re- -- not
16 a reference, but in -- you know, I made notes at the
17 bottom of the page, you know, where stuff -- where
18 different things came from. I mean, most of those
19 footer -- what are they called?

20 Q. Footnotes?

21 A. I'm sorry. Footnotes. That's right.

22 Most of those footnotes were for things
23 that were, you know, part of the core documentation,
24 you know, that was provided to me in regard to this
25 litigation.

1 But I do believe that there was perhaps one
2 instance where I may have put that manual in a
3 footnote.

4 Q. And do you recall if that was in your
5 declaration for the '542 or the '544 patent?

6 A. I'm guessing that it was the '542, but I --
7 I really shouldn't speculate on that.

8 Q. Okay. And we'll -- we'll be looking at
9 your declaration, so we can always get to that.

10 Did you run any other Internet searches
11 when preparing your declaration?

12 A. I probably did, but I honestly can't
13 recall.

14 Q. Honestly can't recall the exact search
15 terms or sort of the topic? What -- what can you
16 not?

17 A. Pretty much both.

18 Q. Okay. So you believe that you may have run
19 some Internet searches -- some -- strike that. Let
20 me start from the top.

21 So do you recall if you ran any other
22 Internet searches while preparing your declaration?

23 A. I'm sure that I did.

24 Q. Okay. And -- but you don't recall the
25 topics of those searches?

1 A. I don't.

2 Q. When were you running these Internet
3 searches in terms of time period?

4 A. The time period between June and August,
5 early August. I mean, it was probably not the full
6 expanse of that time frame.

7 Q. So can you put a --

8 A. Somewhere in there.

9 Q. Right. Earlier part of that time period?

10 A. I would say most likely July.

11 Q. Okay. Other than Internet searches, did
12 you do any other searching for documents in preparing
13 your declaration that were not provided to you by
14 Thomas Horstemeyer?

15 A. I did search for most, if not all, of the
16 patents that were listed as references in the '542
17 and the '544. I think there were probably, between
18 those two -- two Crest patents, there may have been
19 as many as 30 or 35 patents that had been cited by
20 either Crest or the examiner, I don't know who.

21 Q. And when you say searched for these, where
22 were you running these searches?

23 A. I believe I was running them on Google.

24 Q. Okay. So -- but you didn't consider --
25 you're not considering -- considering those as

1 Internet searches or --

2 A. No, actually, I just remembered. You --
3 you --

4 Q. Right.

5 A. -- you triggered my memory --

6 Q. Right.

7 A. -- in the fact that, you know, it was other
8 patents that I was looking for.

9 Q. Okay. So my confusion is because you're
10 saying you didn't remember the topics of your
11 Internet searches and then this is a very specific
12 topic, and so I'm trying to sort of make that
13 connection.

14 A. I understand completely.

15 Q. Right.

16 So this was one of the topics for the
17 Internet search while you were preparing your
18 declaration, was these references cited in the -- on
19 the face of the '542 or the '544 patent?

20 A. Both.

21 Q. Thank you.

22 And -- and when I say "face of," it's --
23 the way you came up with these patent numbers is just
24 looking at what was cited --

25 A. That's correct.

1 Q. -- on the patent?

2 A. That's correct.

3 Q. Just to -- just to complete this, does that
4 trigger your memory of any other searches that you
5 ran?

6 A. No.

7 Q. And you searched for, you said, most, if
8 not all, of the patents listed.

9 Did you actually end up reviewing these
10 prior art references?

11 A. Yes, I did.

12 Q. Okay. Do -- do you recall if you reviewed
13 all of the prior art listed on the face of the '542
14 patent?

15 A. Yes, I did.

16 Q. Do you recall if you reviewed all of the
17 prior art search -- cited on the face of the '544
18 patent?

19 A. Yes, I did.

20 Q. And we'll get to the other documents that
21 you reviewed that are listed in your declaration in a
22 minute, but other than documents provided to you by
23 Thomas Horstemeyer and these prior art patents and
24 the user manual for the TMS320, were there any other
25 documents you considered in preparing your

1 declaration?

2 A. Yes, I did.

3 Q. And what were -- what were those?

4 A. The book that I wrote.

5 Q. And just so we're clear on the record, what
6 is the name of that book?

7 A. The name of that book is "Designing Audio
8 Power Amplifiers," and it is published by McGraw
9 Hill. It was published in September of 2010.

10 Q. And, again, leaving aside the documents
11 provided by Thomas Horstemeyer and the documents
12 we've talked about so far, were there any other
13 documents you reviewed in preparing your declaration?

14 A. I don't think there were.

15 Q. Do you recall whether, in the documents
16 that were provided to you by Thomas Horstemeyer,
17 there were any documents from the underlying District
18 Court cases?

19 A. I am not familiar with this District Court
20 terminology that you're referring to. Are -- are
21 there any such documents that you had in mind that
22 you could ask me whether I reviewed or not?

23 Q. Sure.

24 So, for example, in the District --
25 there -- there are two District Court cases. In one

1 of the cases, the '542 patent is being asserted by
2 Crest.

3 In that District Court case, QSC, the
4 petitioner in the IPR, provided some invalidity
5 contentions where they identified prior art, made
6 arguments as to why the prior art invalidated the
7 claims of the '542 patent.

8 So do you recall seeing any of those
9 invalidity contentions?

10 A. I think I did, but -- I can say for sure,
11 of course, the contentions that I was most
12 knowledgeable about, that knowledge came from my
13 review of Dr. Ellis' declaration.

14 Q. But you believe you reviewed the invalidity
15 contentions from the District Court case?

16 A. It is quite likely.

17 Q. Do you recall if you list those invalidity
18 contentions in your declaration as documents you
19 considered in --

20 A. No.

21 Q. You don't recall or you didn't list them?

22 A. I did not list them. Perhaps that was an
23 oversight on my part.

24 Q. Okay. So, again, I identified a very
25 specific set of documents from the underlying

1 District Court case, but I'm thinking of other
2 similar types of documents from the District Court
3 case that you may have reviewed.

4 A. I reviewed the IPR decision of the board --

5 Q. Right.

6 A. -- for both of those patents.

7 Q. Right.

8 So, again, Mr. Cordell -- and I'm trying to
9 keep the IPR documents -- and we'll talk about those
10 and those are listed in your declaration -- separate
11 from what was maybe exchanged between the parties in
12 the District Court case, like those invalidity
13 contentions we talked about, or what was filed by the
14 parties in the District Court case.

15 And I'm trying to find out if there were
16 other such documents that you may have reviewed in
17 preparing your declaration?

18 MR. CRAIN: Object to form.

19 THE WITNESS: I may have reviewed -- I
20 could be wrong here, but it may have been called
21 some kind of a preliminary response that might
22 have been filed --

23 Q. (By Mr. Das) Again, that was in the IPR.

24 A. -- by the Crest side.

25 Q. Right. That was in the IPR.

1 A. Okay.

2 Q. And we'll, again --

3 A. Okay.

4 Q. -- come back and --

5 A. Well, then -- then I'm sure the answer will
6 be no.

7 Q. Okay. And just to make the record clear,
8 the preliminary response, do you remember if that was
9 in the '542 IPR or the '544 IPR?

10 A. I believe it was both. If they -- I
11 reviewed both -- the materials that I had access to
12 for the IPRs, I believe I reviewed all of it. I
13 tried to be as thorough and diligent as I could
14 possibly be in this whole matter.

15 Q. And, again, I appreciate that it is
16 becoming a little bit of a memory test, but I -- I
17 don't know what you looked at and I'm just trying to
18 get my arms --

19 A. Understood.

20 Q. -- around it.

21 And -- and just to be clear -- this is just
22 something that I know that you may not realize --
23 there was actually a preliminary response in only one
24 of the two -- two IPRs. So -- and if I remember
25 correctly, it's in the '544.

1 So -- but neither here nor there on that.

2 A. Thank you for clarifying that --

3 Q. Yeah.

4 A. -- for me.

5 Q. Did you review any other documents in
6 preparing your declaration that we haven't already
7 touched on?

8 A. I don't think so.

9 Q. Okay. Were you -- and, again, this is a
10 "yes" or "no" question, because this is getting close
11 to a privilege question. So I just want a "yes" or
12 "no" answer and then we'll get -- depending on your
13 answer, I might have some follow-up.

14 Were you asked to make any assumptions in
15 preparing your declaration for the '542 IPR?

16 MR. CRAIN: Before you answer, to the
17 extent that you can answer that question without
18 getting into the substance of any communications
19 with counsel, then please go ahead and answer
20 the question. And I think you can.

21 THE WITNESS: No.

22 Q. (By Mr. Das) Okay. Were you -- same
23 caveats, same warning.

24 Were you asked to make any assumptions by
25 Crest's counsel in preparing your declaration for the

1 '544 IPR?

2 A. No.

3 Q. Other than documents that were provided to
4 you by Crest's counsel, were you provided any
5 facts -- again, "yes" or "no" question -- were you
6 provided any facts by Crest's counsel that you
7 considered in preparing your declaration in the '542
8 IPR?

9 A. No.

10 Q. Other than the documents that you were
11 provided by Crest's counsel, were you provided any
12 facts that you considered -- were you provided any
13 facts by Crest's counsel that you considered in
14 preparing your declaration in the '544 IPR?

15 MR. CRAIN: Object to form.

16 Q. (By Mr. Das) Let me -- it was -- it was a
17 badly-phrased question. Let me start over.

18 Other than the documents you were provided
19 by Crest's counsel, were you provided any facts by
20 Crest's counsel that you considered in preparing your
21 declaration in the '544 IPR?

22 MR. CRAIN: Object to form.

23 THE WITNESS: I believe the answer is no.

24 I did try and base all of my declarations on
25 facts. Many, many of those facts just came from

1 the -- the paperwork we've talked about that's
2 part of the IPR and general knowledge in
3 electrical engineering.

4 Q. (By Mr. Das) Did you rely on any
5 information or facts from the invalidity contentions
6 from the underlying District Court in forming your
7 opinions in the '542 declaration?

8 MR. CRAIN: Object to form.

9 THE WITNESS: I believe the answer is no.

10 Q. (By Mr. Das) Okay. When you say you
11 believe the answer is no, is -- is -- do you have
12 some -- instead of just no, is there a difference
13 between "no" and "I believe the answer is no"?

14 A. My recollection is that when I sought to
15 prepare myself for the declarations, my primary
16 source of facts were the Crest patents and the patent
17 references and Dr. Ellis' declarations and the
18 decision -- decisions of the board.

19 Q. Okay. And we talked about this a little
20 while back when we were discussing the -- what you
21 did to prepare for your deposition, but, again, right
22 now you talked about the patent references.

23 Did you not consider the non-patent
24 references in preparing your declaration?

25 MR. CRAIN: Object to form.

1 THE WITNESS: I'm sorry. I don't
2 understand the distinction you're making between
3 patent references and non-patent references.

4 Q. (By Mr. Das) Fair enough. Let me give you
5 an example.

6 So one of the references that petitioner
7 submitted when they filed the petition for IPR in the
8 '542 patent was a spec sheet for the TMS320.

9 Did you consider that in preparing your --

10 A. Yes --

11 Q. -- declaration?

12 A. -- I did.

13 Q. And there was also -- again for the '542
14 IPR, there was actually an AES preprint by Martin
15 Gittleman.

16 Did you consider that?

17 A. Yes, I did.

18 Q. So those were -- those were the two, and
19 other similar documents, that may have been submitted
20 by the petitioner in seeking the -- either the '542
21 or the '544 IPR that are not patents, as -- when --
22 if they were submitted, then you considered them --
23 those?

24 MR. CRAIN: Object to form.

25 THE WITNESS: I considered everything that

1 I was provided that came from QSC.

2 Q. (By Mr. Das) Were there any other
3 documents that you considered in forming your
4 opinions that are in your declaration for the '542
5 IPR that we haven't discussed?

6 A. I would only remind you that I did search
7 and find a user manual or application note on the
8 TMS320.

9 Q. Right. And I -- that's one we've already
10 talked about, so I wanted to just see if there was
11 anything else that you considered that we haven't
12 talked about yet.

13 A. I don't think so.

14 Q. Okay. Were there any other documents that
15 you considered in preparing your declaration in the
16 '544 IPR?

17 A. No.

18 Q. Were there any facts that you considered in
19 preparing your declaration in the '542 IPR that we
20 haven't discussed already?

21 A. Could you give me an example of -- of what
22 kind of a fact that you would be talking about?

23 Q. For example, you may have run an Internet
24 search which led you to a website where you found
25 some facts that you said, "Ah, this is interesting,

1 this clarifies something -- my understanding about
2 something," and you included that clarification as
3 part of your opinion forming for your declaration.

4 A. In general, no. I'm the type of person
5 that does a lot of sanity checks on whatever I say,
6 so I -- you know, if I'm not certain of something I
7 say, I -- I try to verify it.

8 As I mentioned to you earlier, I -- one of
9 the searches that we discussed brought up the -- I
10 believe it was the search on DSP -- it brought up the
11 Bell Labs DSP1, and that -- it reminded me of some of
12 the technology that we had used in developing that
13 integrated circuit.

14 But that knowledge didn't -- it was not
15 knowledge that was relevant to me including those
16 facts in the declaration.

17 Q. What do you mean by that, not relevant to
18 you including in the declaration?

19 A. A lot of these things are, once again, out
20 of curiosity. I can give you an example of one of
21 those facts.

22 Q. Sure. That would be helpful.

23 A. The DSP1 chip was approximately 67
24 millimeters on a side.

25 Q. Okay. And you didn't think that was

1 relevant to your -- any- -- anything you said in your
2 declaration?

3 A. I don't think so.

4 Q. Okay. Were -- and I apologize if I asked
5 this already, but were there any facts that you
6 considered in preparing your declaration in the '542
7 IPR that we haven't talked about already?

8 A. I don't think so, but there are a lot of
9 facts that are just in my mind from my many years of
10 experience and --

11 Q. You know, that's a really good --

12 A. -- I take those things for granted.

13 Q. That's a really good clarification.

14 So you obviously have a lot of experience
15 in -- in this field. You have experience with audio
16 amplifiers and DSP design and everything else.
17 That's clear from your resume.

18 So leaving those facts aside, I'm talking
19 about facts that you may have found by doing searches
20 or from a book or an article that we haven't talked
21 about yet.

22 A. I don't think so.

23 Q. And is -- were there any facts, again with
24 the clarification of not ex- -- experiential facts,
25 that you considered in the '544 declaration that we

1 haven't talked about already?

2 A. I don't believe so.

3 Q. Now, we got into this line of questioning
4 by -- when I asked you what you did to prepare for
5 your deposition.

6 Do you recall that?

7 A. Yes.

8 Q. Seems like a long time ago; right?

9 A. Yes.

10 Q. In addition to reviewing the documents we
11 talked about, did you do anything else to prepare for
12 your deposition?

13 A. Well, I made plane reservations --

14 Q. Okay.

15 A. -- which was actually a pain in the neck.

16 Q. Can be. But let me ask you a more specific
17 question.

18 A. Sure.

19 Q. Did you meet with Crest's counsel, for
20 example? Again, not getting into what you talked
21 about, did you just meet with Crest's counsel to
22 prepare for your deposition?

23 A. Yes.

24 Q. And when did you meet with Crest's counsel?

25 A. Monday and Tuesday.

1 Q. Okay. Do you recall approximately how many
2 hours you met with Crest's counsel on Monday?

3 A. Perhaps six hours.

4 Q. Okay. How about on Tuesday?

5 A. I would say about the same amount of time.

6 Q. About six hours?

7 A. Something like that.

8 Q. Okay. On Monday, who all did you meet
9 with?

10 A. I met with the three Crest counsel that are
11 here.

12 Q. Okay. And just because we want to make
13 sure it's in the record, so that would be Mr. Crain,
14 Mr. Gravois, and Mr. Knox; correct?

15 A. That is correct.

16 Q. Was there anyone else in the meeting when
17 you were meeting with them to prepare for your
18 deposition?

19 A. No.

20 Q. On Tuesday, who did you meet with to
21 prepare for this deposition?

22 A. The same people as I met with on Monday.

23 Q. Was there anyone else at the meeting on
24 Tuesday --

25 A. No.

1 Q. -- other than...

2 A. Actually, there was one -- one other
3 person.

4 Q. Okay.

5 A. The janitor came in to replace two of those
6 fluorescent lights.

7 Q. Okay. Thanks for the clarification.

8 While the janitor was present, were you
9 talking about any substantive aspects of your
10 preparation?

11 A. No. We stepped out of the room.

12 Q. Okay. Other than Crest's counsel that
13 we've already talked about -- strike that.

14 Other than Mr. Crain, Mr. Knox, and
15 Mr. Gravois, have you discussed this deposition with
16 anyone else?

17 A. I discussed it with my wife.

18 Q. And what did you discuss with her?

19 A. I made a very big apology to her and took
20 her out to dinner, because I had spent more time
21 doing the deposition than I had expected and she --
22 she was a declaration widow during that period of
23 time.

24 MR. CRAIN: K.M. owes you something for
25 that.

1 THE WITNESS: And would -- I should further
2 say that this is not the first time I've done
3 that to my wife Angela. When I wrote my book, I
4 spent four years writing the book, of which the
5 last year and a half to two years was remarkably
6 intense.

7 Q. (By Mr. Das) Other than --

8 A. So I owe her big time.

9 Q. Okay. And I am sure she appreciates that
10 and I'm sure you'll make it up to her.

11 Anyone else that you discussed the
12 deposition with?

13 A. Other than mentioning to one or two people
14 at my church that I basically blew my whole July
15 doing this thing, the answer is no.

16 Q. Did you discuss the substance of your
17 declarations with any of the people at your church?

18 A. No, and I also did not discuss what
19 companies I was -- that were involved in this
20 litigation.

21 Q. Or did you discuss the patents, for
22 example?

23 A. No, I did not.

24 Q. How about with your wife? Did you discuss
25 the substance of your declaration with your wife?

1 A. No. The only thing that I discussed with
2 her was that these declarations involved power
3 amplifiers and, you know, she was impressed that I
4 had been asked to be an expert witness on power
5 amplifiers.

6 MR. DAS: All right. We've been going a
7 little over an hour, so why don't we take a
8 break now.

9 THE WITNESS: Sure. Thank you.

10 VIDEOGRAPHER: This is the end of Video 1.
11 We are off the record at 10:37 a.m.

12 (Thereupon, there was an interruption in
13 the proceedings.)

14 VIDEOGRAPHER: This is the beginning of
15 Video 2. We are on the record at 10:47 a.m.

16 THE WITNESS: Thank you.

17 COURT REPORTER: You're welcome.

18 (Petitioner's Exhibit 2 was marked for
19 identification.)

20 Q. (By Mr. Das) Mr. Cordell, you've been
21 handed what's been marked as Exhibit 2.

22 Do you recognize this document?

23 A. Yes, I do.

24 Q. And what is this document?

25 A. This declaration -- this is my declaration

1 in the '542 patent.

2 Q. Mr. Cordell, did you prepare this
3 declaration?

4 A. Yes, I did.

5 Q. And what did you do to prepare this
6 declaration?

7 A. Largely, we covered a lot of that earlier
8 in our conversation.

9 I spent a great deal of time reviewing all
10 of the documents, many of them several times,
11 drilling down; of course, reading Dr. Ellis'
12 declarations; and basically writing. And, you know,
13 that's about it.

14 Q. Okay. So did you actually type the
15 document?

16 A. Yes. I typed them on my own computer.

17 Q. Okay. The entirety of it?

18 A. Yes.

19 Q. Did you exchange any drafts with Crest's
20 counsel of your declaration?

21 A. Yes.

22 Q. Do you recall how many drafts you
23 exchanged?

24 A. I believe it was just one -- one draft for
25 each one.

1 Q. Okay.

2 A. I might have had a question about one or
3 two, you know, pieces in there, but as far as drafts
4 go, I provided one draft.

5 Q. Okay. So just to clarify -- and, again,
6 for the '542 declaration -- is that draft you
7 provided the same as this final declaration that was
8 submitted to the board?

9 A. No.

10 Q. Were there any opinions in that draft that
11 are not included in this final?

12 A. I don't think so as far as opinions go.
13 Obviously, I reread my own draft many times, found a
14 number of errors.

15 One of the time-consuming things that I did
16 after putting in the initial draft was to put in all
17 of these footnotes.

18 Q. And do you recall when you provided the
19 draft declaration to Crest's counsel?

20 A. I believe it was early in July, but I
21 didn't provide both of them at the same time.

22 Q. Okay. Do you recall which one you provided
23 first?

24 A. '542.

25 Q. Okay. And do you recall when you provided

1 the '542 draft?

2 A. It would have been in the first or second
3 week of July.

4 Q. Okay. And how about the '544 draft?

5 A. It would -- would have been one or two
6 weeks after that.

7 Q. And were you asked by Crest's counsel to
8 include any materials in the first draft that is now
9 in the final declaration?

10 MR. CRAIN: Before you answer that, to the
11 extent that this question would call for you to
12 reveal the substance of any communications, I
13 would caution you not to get into that
14 substance.

15 To the extent you can answer that question
16 otherwise, go ahead.

17 THE WITNESS: Would you repeat the
18 question, please?

19 MR. DAS: Would you mind reading it,
20 please.

21 (Whereupon, the record was read by the
22 reporter as follows:

23 Question, "And were you asked by
24 Crest's counsel to include any materials in the
25 first draft that is now in the final

1 declaration?")

2 THE WITNESS: I believe that's privileged
3 information.

4 Q. (By Mr. Das) Okay. The question is: Were
5 you asked to -- so "yes" or "no," were you asked to
6 include any information?

7 A. I do recall one thing that I -- I believe
8 it's not unreasonable to mention, and that is I was
9 asked to include footnotes.

10 Q. Okay. Are there any statements in your --
11 in the final version of the '542 declaration that
12 was -- that was not in your first draft, other than
13 the footnotes?

14 A. Yes, I believe there were, because
15 throughout the time that I was creating the final
16 declaration, I was continuing to drill down further
17 in the materials supplied.

18 Once again, after I complete a draft, I
19 review it many times. Sometimes it's very helpful
20 for me to review a draft perhaps a week after the
21 last time I wrote it to sanity check what I've
22 written.

23 I -- I -- my style is to question myself as
24 much as I can. As you know, I wrote this 600-page
25 book and, you know, I had a certain way of going

1 about doing that book which was, you know, very
2 diligent, questioning every -- everything I said
3 along the way many times, trying to think if what I
4 said was clear, trying to think if what I said was
5 complete. That's just my nature.

6 And I applied the same degree of diligence
7 to this as I did to my book. I -- I believe this is
8 a fairly important thing.

9 Q. And other than materials you added based on
10 your own sort of due diligence process --

11 A. Uh-huh (affirmative).

12 Q. -- is there any material in the final
13 declaration -- strike that. Let me start over.

14 Other than the footnotes and this material
15 you added based on your due diligence, is there any
16 other material in this expert declaration that was
17 submitted to the board that was not in the previous
18 draft?

19 A. I think one thing -- unless -- I'm not sure
20 whether what you're asking would be something that
21 Andrew would object to.

22 MR. CRAIN: Should we take a break to
23 discuss?

24 THE WITNESS: Sure.

25 MR. CRAIN: Okay.

1 VIDEOGRAPHER: We're off the record at
2 10:55 a.m.

3 (Thereupon, there was an interruption in
4 the proceedings.)

5 VIDEOGRAPHER: We're on the record at
6 11:01 a.m.

7 Q. (By Mr. Das) Mr. Cordell, before we get
8 back into what we were talking about before this
9 break, let me go back and ask a question about the
10 first break we took.

11 During that break, did you have a chance to
12 speak with Crest's counsel?

13 A. I did.

14 Q. In those conversations, did they speak with
15 you about the substance of the testimony you had
16 given?

17 A. No, they did not.

18 Q. Did they suggest to you how you should
19 answer questions?

20 A. No, they did not.

21 Q. Did they discuss with you the substance of
22 the testimony you were about to give?

23 A. No, they did not.

24 Q. Now, before we went on this break, I had
25 asked a question about other than in the footnotes

1 and the material you added through your due
2 diligence, is there any other material in the final
3 declaration that was not in the draft you had
4 provided --

5 A. Yes.

6 Q. -- Crest's counsel?

7 And there is?

8 A. Yes.

9 Q. And what is that material?

10 A. That material is Section VII of my
11 declaration, which is entitled "Claim Construction."
12 That is a section that I did not have in my initial
13 draft.

14 Q. Okay. Section VII is on page 38 of your
15 declaration.

16 Is there any portion of Section VII that
17 you did not author yourself?

18 A. No.

19 Q. In addition to Section VII of your
20 declaration, is there anything else in your
21 declaration -- final version of the declaration that
22 was not in your first draft?

23 A. I don't believe so.

24 Q. Okay.

25 A. Once again, other than what I added myself

1 as a result of the passage of time and due diligence.

2 Q. Correct.

3 If you could turn to the last page of your
4 declaration, page 52, before the CV.

5 Did you draft this or was this language
6 provided to you by Crest's counsel?

7 A. I believe that I plagiarized it from
8 Dr. Ellis --

9 Q. Oh, okay.

10 A. -- so you can send me to jail.

11 Q. That's fine. It's -- the reason I was
12 asking is because this is very specific to the patent
13 office, the way it's all written --

14 A. Sure, sure.

15 Q. -- so I was wondering how you came up with
16 it. And that's a very good explanation.

17 A. Right.

18 Q. I apologize if I asked this already.

19 Was there anything in your first draft that
20 is not included in your final declaration?

21 MR. CRAIN: Object to form.

22 THE WITNESS: Was there anything in my
23 first draft --

24 Q. (By Mr. Das) Of the declaration.

25 A. -- that I took out when I created the

1 second draft?

2 Q. Correct.

3 A. Probably numerous errors. I assume that if
4 I took out a paragraph that I didn't like and
5 substituted a new paragraph that worded it better,
6 that's not really something that you're -- you're
7 trying to find out or get at.

8 Q. Correct. I'm trying to get at if there
9 was -- if there were opinions that you -- that were
10 in your first draft that are not present in the final
11 declaration that was submitted, substantively.

12 A. I don't think so.

13 Q. Now, at the end of the declaration, the --
14 the last few pages are what appears to be your
15 resume, correct, separately-numbered six pages?

16 A. Yes.

17 Q. And is this your standard resume or is this
18 something you prepared to accompany this declaration?

19 A. I prepared it in June or so because I
20 needed to update it. It had -- I had been working
21 for Tyco Telecommunications for about 14 years and so
22 I -- I didn't really have a reason in the meantime
23 to -- to update my resume.

24 Q. Did you prepare it -- let me stop and ask:
25 June of which year?

1 A. It -- it was probably June of 20- -- 2014,
2 sorry.

3 Q. Okay. And was that because you'd been
4 contacted by Crest's counsel or just because it was
5 time to update your resume?

6 A. I was asked to prepare my CV by Crest's
7 counsel.

8 Q. Okay. And did you type this document?

9 A. Yes, I did.

10 Q. This resume gives chronological listing of
11 the jobs you've had since 1970 through now; correct?

12 A. That is correct.

13 Q. And, again, I can break this down by job,
14 but let me ask this broader question and then maybe
15 we'll need to break it down.

16 Prior to your retirement from Tyco
17 Telecommunications, which became TE SubCom --

18 A. Right. It's gone through quite a number of
19 name changes.

20 Q. Prior to your retirement from TE SubCom in
21 2013, did any of the jobs you list in your CV
22 include, as part of your official job description,
23 the design of audio amplifiers?

24 A. In other words, was I paid by any of these
25 employers to design an audio power amplifier? Is

1 that your question?

2 Q. Other than one clarification. I said audio
3 amplifier, and are you using the term "audio
4 amplifier" and "audio power amplifier"
5 interchangeably?

6 A. Sometimes. But, obviously, "audio
7 amplifier" is a much broader term than "audio power
8 amplifier."

9 Q. Okay.

10 A. I think it's -- it's likely that there were
11 a couple of occasions when I was asked to design an
12 audio amplifier in the course of my work. I don't
13 recall being asked or paid by these companies to
14 design an audio power amplifier.

15 Q. And when you say an audio amplifier is
16 broader than audio power amplifier, in what ways is
17 the term "audio amplifier" broader?

18 A. Well, for example, a -- a preamplifier,
19 like, for example, a microphone preamplifier that
20 might be used in a recording studio; a phono
21 cartridge preamplifier that might be used to play
22 back ancient vinyl records; a preamplifier which
23 often includes where -- where the volume control is.

24 So, you know, those are some examples of
25 what the term -- the broader term "amplifier" would

1 certainly include.

2 There are other amplifiers that I was asked
3 to design in the course of my work at Bell Labs which
4 would be in the same broader category; namely,
5 amplifiers that were not power amplifiers.

6 Q. And when you use the term "power
7 amplifier," what distinguishes it from the other
8 types of audio amplifiers you just spoke about?

9 A. In -- in -- certainly, in the audio
10 context, a power amplifier -- in fact, I would like
11 to go to my declaration, because I think in my
12 terminology section I probably -- or somewhere in
13 there I -- I described what a power amplifier was.

14 If you look at my paragraph 12, that gives
15 a fairly good explanation of what I consider to be a
16 power amplifier.

17 Q. Audio power amplifier; correct?

18 A. Yes.

19 Q. Okay. And the other audio amplifiers that
20 you're talking about, for example the microphone
21 preamplifier, that would not meet this definition --
22 why -- why would it not meet this definition?

23 A. Mainly because they handle small signals,
24 as opposed to large signals.

25 Q. What do you mean by "handle small signals"?

1 A. Oh, they -- they process or provide signal
2 processing or amplification for small signals.

3 An example would be that a microphone
4 preamplifier might amplify a 1-millivolt signal to a
5 100-millivolt signal. A line -- a so-called line
6 preamplifier where you might have a volume control,
7 might typically have 12dB of gain maximum when the
8 volume control is set to maximum.

9 Does -- does that answer your question?

10 Q. I'll probably have some follow-up, but
11 that's helpful.

12 So at least part of what -- based on what's
13 in paragraph 12 and what you just said, audio power
14 amplifiers, the output signal typically is at a much
15 higher power than these other types of audio
16 amplifiers?

17 A. It is typically at a higher voltage and it
18 is capable of delivering a higher current and is most
19 ordinarily connected to a loudspeaker.

20 Q. And to go back to your resume now, if I
21 understand correctly, you were not paid by any of
22 those companies between 1970 and 2013 to design audio
23 power amplifiers; correct?

24 A. That is correct. None of my employers paid
25 me to design audio power amplifiers. That was not my

1 work assignment.

2 Q. And were there members of the teams that
3 you were supervising in some of these jobs whose work
4 assignment was to design audio power amplifiers?

5 A. Not to my knowledge.

6 Q. Okay. And same question again for your
7 employers who were paying you: Were any of them
8 paying you to test audio power amplifiers, again
9 between 1970 and 2013?

10 A. No.

11 Q. And were any of the members of the teams
12 you were supervising, again in that time period, paid
13 as part of their official job responsibilities to
14 test audio power amplifiers?

15 A. I don't believe so.

16 Q. Between the -- 1970 and 2013, were you paid
17 by others who are not the employers listed in this
18 resume to design audio power amplifiers?

19 A. Yes, I was.

20 Q. And who were you paid to do that by?

21 A. Well, first of all, I don't know if this
22 counts, but I did write several magazine articles or
23 journal articles for which I was paid that were in
24 the field of audio power amplifiers.

25 I was also paid to consult for -- in -- in

1 the design process of two commercial audio power
2 amplifiers.

3 Q. And these magazine or journal articles, are
4 those the -- you have a reference to having published
5 papers in this field.

6 Are those the paper -- magazine and journal
7 articles you're talking about?

8 A. Yes. And -- and I should clarify it. I
9 don't recall being paid for the journal articles,
10 because that is not customary.

11 Q. Okay. Yeah. I would have been surprised
12 for that.

13 So you -- you recall being paid for certain
14 magazine articles you wrote about power audio
15 amplifiers?

16 A. Trade publications.

17 Q. Trade publications.

18 Leaving that aside, you said you were paid
19 to consult in the design process of two commercial
20 power amp- -- audio power amplifiers?

21 A. I was paid, yes, by two companies.

22 Q. Okay.

23 A. And one of those companies -- the reason I
24 made that distinction is that in one of those
25 companies, I designed two power amplifiers.

1 Q. So what was the name of the first company
2 that you were paid to consult in the design of power
3 amplifier?

4 A. The first company, the one for which I
5 worked on only one amplifier -- I honestly don't
6 recall the exact chronological order --

7 Q. Okay.

8 A. -- and both of these were in the late
9 1980s. The first company was Crest.

10 Q. Okay. And what was the audio power
11 amplifier that you were paid to consult on designing?

12 A. It was the Crest 8001.

13 Q. Okay. And what was the second company?

14 A. Meyer Sound Labs.

15 Q. How do you spell Meyer?

16 A. M-E-Y-E-R.

17 Q. And is that one word, Meyersound, or --

18 A. Three words. Meyer Sound Labs.

19 Q. Okay. And what were the amplifiers that
20 you designed or helped design?

21 A. The first amplifier was their -- referred
22 to as the MS 1000.

23 Q. And what was the second?

24 A. The second wasn't given an official name,
25 to my knowledge, because it was internal to a

1 loudspeaker. These -- in the business, these
2 loudspeakers are referred to as self-powered
3 loudspeakers because they include the power amplifier
4 built into the --

5 Q. Are those also --

6 A. -- speaker.

7 Q. Are those also called active loudspeakers
8 or is that different?

9 A. I think it -- it -- some people would call
10 them active loudspeakers --

11 Q. I had heard the term.

12 A. -- that's right. That's right, yes.

13 Q. What time period were you consulting for
14 Crest in the design of the Crest 8001?

15 A. It was in the late '80s.

16 Q. Do you recall how many months or years you
17 consulted for them?

18 A. I would guess it was perhaps four to six
19 months.

20 Q. And what was your role in the design of the
21 Crest 8001?

22 A. The main emphasis of my role was ensuring
23 stability of the feedback loops.

24 Q. And what do you mean by "ensuring stability
25 of the feedback loops"?

1 MR. CRAIN: Before you get into this
2 testimony, to the extent that any of your prior
3 work he's asking is -- if you're under any
4 confidentiality obligations to any of these
5 entities, I would caution you to keep that in
6 mind.

7 THE WITNESS: Thank you. I'll just keep it
8 general, if you don't mind.

9 Most audio power amplifiers employ negative
10 feedback. Negative feedback is where a sample
11 of the output of the amplifier is sent back to
12 the input, into the input stage, where it is
13 compared with the input signal, and the result
14 of that comparison is what drives the amplifier.

15 And negative feedback, which, of course,
16 was invented by Mr. Black at Bell
17 Laboratories -- I'm so proud of that; I knew all
18 those guys or knew of them -- negative feedback
19 is used to reduce the distortion of an amplifier
20 and make its performance more consistent.

21 However, when you do that, when you feed
22 back some of the output back to the input, you
23 are creating a loop, a circular loop. And as
24 frequency increases, the phase shift and time
25 delay of the signal as it passes through the

1 forward path of the amplifier increases.

2 And when that phase delay or phase lag
3 increases beyond a certain point, the -- you
4 will no longer really have negative feedback,
5 you will have basically a reinforcement, which
6 is called positive feedback.

7 And feedback compensation, which is
8 intended to avoid that circumstance -- and that
9 circumstance, of course, is a stability
10 consideration -- feedback compensation can be an
11 art and that is, you know, one of the areas in
12 which I have some skill.

13 Q. (By Mr. Das) And you said as frequency
14 increases.

15 Frequency of what?

16 A. The frequency of the signal passing through
17 the amplifier.

18 Q. And the -- passing through the power
19 amplifier part of the amplifier?

20 A. Right.

21 Q. Okay. And other than working on ensuring
22 the stability of the feedback loops on the Crest
23 8001, was there any other aspect of the design that
24 you worked on?

25 A. I probably made some recommendations. I

1 honestly don't recall.

2 The one -- the main thing that stands out
3 in my mind is to help design and make work the
4 feedback compensation.

5 Q. Do you know or recall if the Crest 8001
6 included a DSP?

7 A. It did not.

8 Q. Okay. Do you know if Crest ever
9 commercially sold the Crest 8001 amplifier?

10 MR. CRAIN: Object to form.

11 THE WITNESS: They did.

12 Q. (By Mr. Das) And do you know when it was
13 first commercialized?

14 A. Probably the late '80s. If I had to guess,
15 probably a year after I consulted with them.

16 Q. And when you say the late '80s, can we put
17 a little bit more of a limit around it?

18 A. Probably like '88, '89, that kind of time
19 frame.

20 Q. Would be when they commercialized it, and
21 then a year before that would have been when you
22 consulted?

23 A. In very rough ballpark terms, that is
24 correct.

25 Q. Okay. And do you recall who all at Crest

1 you were working with or consulting with?

2 A. J.D. Bennett.

3 Q. Okay. Anyone else?

4 A. No.

5 Q. Okay. And do you know that Mr. Bennett is
6 the named inventor on a third patent that's being
7 asserted by Crest against QSC?

8 A. No.

9 Q. Okay. And do you know that J.D. Bennett
10 also goes by Dietz Gengelbach?

11 A. I did not know that.

12 Q. Okay. Have you stayed in contact with
13 Mr. Bennett since the late '80s?

14 MR. CRAIN: Object to form.

15 THE WITNESS: No.

16 Q. (By Mr. Das) Is there anyone else at Crest
17 that you've had communications with since the late
18 '80s?

19 A. No.

20 MR. CRAIN: Object to form.

21 Q. (By Mr. Das) Okay. Why did you not list
22 your work with -- consulting work with Crest or your
23 consulting work with Meyer Sound Labs in your CV?

24 A. I -- I think I didn't list any consulting
25 work.

1 Q. Well, for example, on paragraph 17 on your
2 CV, the very last page of the full document, you talk
3 about consulting you've done for Linear Integrated
4 Systems.

5 A. That's right.

6 Q. And so my -- I guess the question I'm
7 asking is: You list this consulting work, but you
8 didn't list this other consulting work on power
9 amplifiers.

10 A. Right. And, in fact, first of all, it was
11 probably an oversight. There was no particular
12 reason.

13 But the reason that I specifically listed
14 the Linear Integrated Systems consulting is because
15 at that time I had Cordell Audio, and one of the
16 things that I advertise on my web page is that I
17 offer consulting services.

18 Q. So you started consulting with Linear
19 Integrated Systems prior to when you retired from TE
20 SubCom.

21 A. That is correct.

22 Q. Did you start Cordell Audio also prior to
23 retiring from TE SubCom?

24 A. Yes, I did.

25 Q. When -- when did you start Cordell Audio?

1 A. I would guess -- I'm going to say 2006.
2 And the -- the reason I'm using that date is that is
3 the time that I put up my web page. I believe that I
4 was also, at the time, preparing for the eventuality
5 of the launch of my book.

6 Q. Although your book was not published until
7 2010.

8 A. That is correct.

9 Q. Labor of love?

10 A. Labor of love.

11 And it's also true that power amplifi- --
12 or audio amplifiers in general is not the only area
13 of my labor of love, as it were, in the audio
14 business. I am also -- or I had been, not lately,
15 very deeply involved in loudspeaker design.

16 Q. Were any of these self-powered
17 loudspeakers?

18 A. Yes.

19 Q. And were you involved in design- --
20 designing the amplifier portion or the sound
21 reproduction portion of these loudspeakers?

22 A. Both.

23 Q. And were you consulting with companies that
24 have commercial products for self-powered
25 loudspeakers?

1 A. No.

2 Q. Other than J.D. Bennett, was there anyone
3 else at Crest you interacted with when you were
4 consulting on the Crest 8001?

5 A. I was asked to do that consulting by
6 whoever it was that was -- I don't know, the -- the
7 proprietor or the president or somebody. I -- I
8 don't have his name at the tip of my tongue.

9 Q. But the gentleman who owned the -- Crest
10 Audio at that point?

11 A. I think that's true, yeah.

12 Q. And have you -- how did you come to know
13 this person?

14 A. He reached out to me.

15 Q. Okay. Specific to helping on the design of
16 the Crest 8001?

17 A. I believe so.

18 Q. Okay. Have you stayed in touch with him
19 since?

20 A. No.

21 Q. Did you ever meet Mr. Fink while you were
22 doing the consulting with Crest on the Crest 8001?

23 A. No.

24 Q. Other than the four- to six-month
25 consulting that you did for Crest in the late 1980s,

1 prior to being retained on these IPRs, have you done
2 any other work or consulting for Crest?

3 A. No.

4 Q. Have you had any contacts with anyone who
5 worked for or has some role at Crest between the
6 consulting and then being retained for these IPRs?

7 A. No.

8 Q. Turn to page 3 of your declaration.

9 And I'm going to interrupt now and sort of
10 address this at this point because we're going to
11 get -- get into this issue later on.

12 Some of these documents have multiple page
13 numbers on them in a weird way --

14 A. I noticed.

15 Q. -- and so for this document, when I say
16 page 3, I'm just referring to the doc- -- page number
17 on the bottom of the document. Some of the exhibits
18 will have the internal pagination and then the
19 exhibit pagination.

20 And I'll typically -- consistent to the way
21 you did it in your declaration, I'll use the exhibit
22 pagination.

23 A. Okay.

24 Q. Right. But we'll -- when we come to it --

25 A. And if I have any questions --

1 Q. Yeah.

2 A. -- I'll -- I'll try to get a clarification,
3 because --

4 Q. I know --

5 A. -- quite frankly, that was a pain in the
6 neck to me while I was writing the declaration.

7 Q. No. And I actually -- when I was preparing
8 for this depo, I actually looked through the
9 declaration and figured out you were using the
10 exhibit one, so I'm trying -- going to try to use the
11 exhibit one. But I'm sure we'll get tripped up on
12 this --

13 A. Thank you.

14 Q. -- as we go along.

15 But in any event, paragraph V of your
16 declaration talks about being granted 16 patents.

17 Now, are all 16 patents in the United
18 States?

19 A. Yes.

20 Q. Because I was only able to find 11 patents,
21 so are these 16 patents that you've applied for or
22 are these 16 granted?

23 A. They were all granted.

24 Q. Okay. I -- the records may not be clear,
25 so --

1 A. To the best of my knowledge, every patent
2 that I've ever applied for was granted.

3 Q. And are any of these patents in the field
4 of audio power amplifiers?

5 A. I don't believe you have attached the list
6 of my publications and patents.

7 Q. I --

8 A. Can you provide me with a copy of that?

9 Q. I don't believe we received a list of your
10 publications and patents. This is the complete
11 declaration that was submitted.

12 A. Okay. I think the answer is no.

13 MR. DAS: Mr. Crain, can we get a list of
14 those publications and patents?

15 MR. CRAIN: I'll have to see if I
16 understand what he's talking about, if we
17 have -- excuse me, if we have such a list.

18 MR. DAS: Okay.

19 MR. CRAIN: Yeah.

20 MR. DAS: All right.

21 Q. (By Mr. Das) All right. In this
22 paragraph, you talk about your involvement in writing
23 the specifications and claims and also the fact that
24 you prosecuted one of those patents on your own.

25 Why did you include that information in

1 your declaration?

2 A. Just for completeness.

3 Q. Now, you're not submitting this declaration
4 as a -- as an expert on patent law in this matter;
5 right?

6 A. Absolutely not.

7 Q. And do you feel the fact that you have been
8 granted 16 patents and have been involved in
9 prosecution gives you more insight into patents and
10 claim construction than a person of ordinary skill
11 would have?

12 MR. CRAIN: Object to form.

13 THE WITNESS: The answer is no. I can
14 clarify that.

15 The -- the patent that I prosecuted on my
16 own, I did that because I was too cheap to pay
17 an expensive patent attorney.

18 However, my ability to do that did result
19 from my experience with those other patents,
20 working with patent attorneys at Bell Labs,
21 Bellcore, Tyco Telecommunications.

22 So, you know, I would be wrong to say that
23 I didn't learn something about how to write a
24 patent.

25 Q. (By Mr. Das) I'm interested in a different

1 aspect of it.

2 In -- a large aspect of your declaration is
3 how a person of ordinary skill in the art would
4 understand the '542 patent and then the references
5 that petitioner submitted to the board.

6 In -- as to how a person of ordinary skill
7 would understand those, do you feel your experience
8 having done prosecution gives you insight that a
9 person of ordinary skill would not have about those
10 references or the '542 patent?

11 A. I always find it difficult to read patents
12 and claims, even my own.

13 Q. Okay. And --

14 A. Does that answer your question?

15 Q. Not really. I'm trying to understand
16 whether your experience having prosecuted one patent
17 on your own and being involved with the prosecution
18 of 15 other patents gives you, in your opinion,
19 additional insight into what the -- what -- the
20 claims or the disclosure of the patents at issue in
21 this IPR.

22 A. The only thing I can think of there is
23 that, you know, I've been made aware of the
24 difference between independent claims and dependent
25 claims, and they did drill some thing- -- some things

1 into my mind about Bell Laboratories because Bell
2 Laboratories was a very, very patent-conscious
3 company.

4 I do recall being told that generally
5 it's --

6 MR. CRAIN: I'm sorry. If there's any
7 privileged communications with any of your prior
8 employers, you might want to maintain those
9 conversations as privileged, that you had
10 attorneys at those companies, as well.

11 THE WITNESS: Even if I'm no -- under no
12 obligation of privilege?

13 MR. CRAIN: Well, again, this is not, you
14 know, a privilege that would exist for us. But,
15 I mean, we can go out and talk about this again,
16 but --

17 THE WITNESS: Okay.

18 MR. CRAIN: -- to the extent you had a
19 conversation with an attorney, that privilege
20 might still be in effect.

21 THE WITNESS: Just to be on the safe side,
22 I didn't learn very much. I -- you know, I
23 learned how patent attorneys kind of think and
24 work.

25 Q. (By Mr. Das) My sympathies.

1 MR. CRAIN: Touché.

2 THE WITNESS: Yeah. And -- and -- and I
3 also learned that different types of attorneys
4 think very differently.

5 Q. (By Mr. Das) On paragraph 4 of your
6 declaration, you say you've presented 13 papers at
7 industry techni- -- technical conferences.

8 You see that?

9 A. Yes, I do.

10 Q. Were any of these presented at conferences
11 for the Audio Engineering Society?

12 A. Yes, they were.

13 Q. Do you recall how many?

14 A. It would be very, very helpful, once again,
15 if I had that list of my publications in front of me.
16 The short answer is more than one.

17 Q. Less than 10?

18 A. I believe it is probably less than 10.

19 Q. And, again, because you don't have that
20 list, point out in your resume on the second page you
21 say that four -- four were to AES.

22 So would --

23 A. Oh, okay.

24 Q. -- those be the Audio Engineering Society?

25 A. Yes, that is correct.

1 MR. DAS: Mr. Crain, would it make sense to
2 take a short break to see if you guys can find
3 this --

4 MR. CRAIN: Yeah. I'm not sure what we may
5 have or not have.

6 MR. DAS: Right.

7 MR. CRAIN: I mean, if you'd like it, we're
8 happy to take a break. We can take a break.

9 MR. DAS: Right. Okay. Well, we can do
10 this at the next break, because we'll probably
11 end up getting to lunch and over lunch maybe you
12 can see if you can find this --

13 MR. CRAIN: Sure.

14 MR. DAS: -- listing.

15 MR. CRAIN: Happy to do so.

16 MR. DAS: Okay.

17 MR. CRAIN: Okay.

18 Q. (By Mr. Das) And we can come back and
19 revisit in terms of the titles of these AES
20 presentations, but --

21 A. Sure.

22 Q. -- I was wondering if you remembered any of
23 the titles.

24 A. Certainly one of them, the approximate
25 title was "A MOSFET Power Amplifier With Error

1 Correction." Most of these would be available on my
2 website.

3 Q. The copies of the papers?

4 A. Yes.

5 (Petitioner's Exhibit 3 was marked for
6 identification.)

7 THE WITNESS: You did your homework.

8 Q. (By Mr. Das) Mr. Cordell, so I've handed
9 you a copy of a document that's been marked
10 Exhibit 3.

11 Do you recognize this document?

12 A. Yes, I do.

13 Q. And what is this document?

14 A. This document is the preprint that was
15 presented at the convention when I presented the
16 paper.

17 Q. What do you mean, "the preprint that was
18 presented at the convention"?

19 A. I can only tell you that when I was there,
20 they -- for some papers they would provide a preprint
21 of the paper so that, for example, if somebody came
22 into my talk, if they had chosen to get a preprint,
23 they had had the opportunity to see what I was going
24 to talk about before they went into the talk.

25 Q. So when you say -- you used a couple of

1 "theys" in there.

2 You said "they" provided, and that would be
3 the --

4 A. The AES.

5 Q. -- conference -- conference organizer?

6 A. That is correct.

7 Q. And the other "they" would could look at it
8 would be people who were actually attending the
9 conference?

10 A. That's right.

11 Q. Okay. And so this would -- this preprint,
12 would -- would this be made available to the people
13 who had chosen to get copies of the preprint as -- as
14 a hard-copy document?

15 MR. CRAIN: Object to form.

16 THE WITNESS: It was only made available if
17 they were willing to pay for it.

18 Q. (By Mr. Das) Right.

19 So let's talk about this 72nd convention of
20 the AES, which was 1982.

21 Did you attend that conference?

22 A. Yes, I did.

23 Q. And did you present your paper on "A MOSFET
24 Power Amplifier With Er- -- Error Correction"?

25 A. Yes.

1 Q. And do you recall if AES made copies of
2 your preprint available to conference attendees?

3 A. I believe the answer is yes. You know, I
4 don't know what all of their policies are, but I'm
5 just speculating that because I had a preprint of it
6 and you were obviously able to get a preprint of it,
7 that it -- it was generally made available to those
8 who were willing to pay for it.

9 Q. The back of the paper has a number of
10 schematics and diagrams and so on. If you -- and
11 tables and so forth.

12 If you sort of start flipping back from
13 them until you get to your list of references and let
14 me know when you're there.

15 A. Yes.

16 Q. And do you see the first reference -- and,
17 again, I'm going to try to read it out, but correct
18 me if I get it wrong -- but it says "M.J. Hawksford,
19 Distortion Correction in Audio Power Amplifiers, 65th
20 Convention of the Audio Engineering Society, preprint
21 #1547, February 1980"; correct?

22 A. That is correct.

23 Q. And do you recall if you had a copy of this
24 preprint prior to authoring this preprint that you
25 provided at the 72nd convention?

1 A. I probably did.

2 Q. And how did you obtain a copy of that
3 preprint?

4 A. I purchased it.

5 Q. And how did you purchase that preprint?

6 A. With money.

7 Q. Okay. That would be part of it, but who
8 did you -- who did you contact to get a copy of this
9 preprint?

10 A. At the convention, at least at that
11 convention and the one -- many of the ones I've gone
12 to, the AES maintains what they would call an
13 informal on-site bookstore, if you will. And within
14 that context, that is where they will sell a
15 preprint.

16 Q. Now, just to clarify the conferences we're
17 talking about, the Hawksford paper was presented at a
18 February 1980 conference, correct, the 6- -- 65th
19 convention?

20 A. Yes.

21 Q. Is that the convention where you believe
22 you purchased a copy of this paper?

23 A. Yes.

24 Q. And do you recall if, at the 72nd
25 convention, which is where you presented your "MOSFET

1 Power Amplifier With Error Correction" presentation,
2 if they had a similar informal bookstore -- "they"
3 being AES, have a similar informal bookstore where
4 people can purchase preprints?

5 A. I can only tell you that they, at minimum,
6 had a counter where you could go up and request a
7 preprint.

8 I don't recall whether at all those
9 conventions they had a -- a bookstore where they were
10 trying to sell that stuff. I just don't remember.

11 Q. And in the Hawksford reference, you
12 actually include the preprint number.

13 Why did you include that?

14 A. When I include a reference, I usually try
15 to include, you know, all of the information and, you
16 know, the -- and it's customary. I mean, other
17 people that have written papers that -- that
18 reference that material will sometimes include a
19 preprint number.

20 Q. And so when you say "that material," you're
21 talking about preprints from AES conventions?

22 A. Yes.

23 Q. Okay. And, similarly, References 9 and 10
24 in the list of references, now, those are -- those
25 appear to be -- and correct me if I'm wrong -- two

1 other papers you've presented at other AES
2 conventions; correct?

3 A. Yes.

4 Q. And the first of these references was a
5 paper -- by the way, I should interrupt and say we've
6 got three of the four titles now from this
7 discussion.

8 A. Okay.

9 Q. But the first of these two papers was
10 presented at the 64th convention of the Audio
11 Engineering Society.

12 A. That would be Reference No. 9?

13 Q. Yes. I believe it says 64th; correct?

14 A. Yes.

15 Q. And Preprint No. 1537.

16 Do you see that?

17 A. Yes, I do.

18 Q. Did you attend this 64th convention?

19 A. Yes.

20 Q. Did you present this paper on "Open-Loop
21 Output Impedance and Interface Intermodulation
22 Distortion in Audio Power Amplifiers" at that
23 convention?

24 A. Yes.

25 Q. And do you recall if copies of the preprint

1 were available at the 64th convention?

2 A. I certainly can tell you that as an author,
3 I was given copies.

4 Q. Do you --

5 A. I can speculate that they were made
6 available, but, you know, factually all I know is
7 that I came away with copies that, you know, if I
8 wanted to as an author, I could give to friends at
9 the convention.

10 Q. Do -- do you remember how many copies you
11 got?

12 A. More than 10.

13 Q. Okay. More than 100?

14 A. No.

15 Q. More than 50?

16 A. I honestly don't recall.

17 Q. Okay. Just --

18 A. More than 10 is -- the AES is pretty cheap.

19 Q. Okay. I'm not going to comment on that,
20 but the next --

21 A. And at the time they charged 5 bucks a
22 copy, and 5 bucks is a lot for some of these
23 preprints that are only four pages long.

24 Q. Right.

25 The next reference is a paper that

1 references a paper that seems to have been presented
2 at the 70th convention of the Audio Engineering
3 Society; correct?

4 A. That would be Reference No. 10?

5 Q. Correct.

6 A. Yes.

7 Q. And it's, again, a paper that you presented
8 at that conference; correct?

9 A. That's correct.

10 Q. And do you recall whether you attended the
11 70th convention?

12 A. Yes.

13 Q. And did you present this paper on "Phase
14 Intermodulation Distortion-Instrumentation and
15 Measurement Results"?

16 A. Yes, I did.

17 Q. And do you recall if AES made copies of the
18 preprint of this paper available at that convention?

19 A. I believe they did, but factually all I
20 know is that I was handed some complimentary copies,
21 as we discussed with the earlier paper.

22 Q. Okay. Again, more than 10 copies?

23 A. Yes.

24 Q. But some cheaper number than a hundred?

25 No --

1 A. Yeah.

2 Q. -- I'm just kidding.

3 A. No, they really are cheap.

4 Q. Okay. So if someone wanted to get a copy
5 of one of these preprints, either the -- this paper
6 on "MOSFET Power Amplifier With Error Correction" or
7 the three preprints listed in the reference who was
8 not at one of these conventions, could they get it by
9 contacting AES directly?

10 MR. CRAIN: Object to form.

11 THE WITNESS: I -- I don't know.

12 Q. (By Mr. Das) Could you turn to the cover
13 page of this document that we're talking about, the
14 very first page.

15 And if you'd -- there's three paragraphs of
16 sort of -- it looks like boilerplate to the lower
17 right-hand side, and the middle paragraph is the one
18 that I'm interested in.

19 It says, "Additional preprints may be
20 obtained by sending request and remittance to the
21 Audio Engineering Society," and then it gives an
22 address.

23 A. Yes.

24 Q. Do you see that?

25 Does that help you answer the question as

1 to whether people could obtain preprints from the
2 AES?

3 MR. CRAIN: Object to form.

4 THE WITNESS: It suggests to me that,
5 indeed, they can.

6 Q. (By Mr. Das) Okay. And --

7 A. Now, I -- I will qualify that by saying
8 that all this tells me is that they could get those
9 preprints by doing this in the general time frame
10 following the convention. I can't tell you how long
11 they -- they kept them available.

12 Q. All right. Fair enough.

13 Have you ever obtained a preprint of an AES
14 paper by contacting AES and not at the convention
15 itself?

16 A. No.

17 (Petitioner's Exhibit 4 was marked for
18 identification.)

19 Q. (By Mr. Das) Mr. Cordell, I've handed you
20 what's been marked as Exhibit 4.

21 Do you recognize this document?

22 A. This is the -- I believe it's -- let me
23 just check here. It is the Gittleman reference
24 provided by QSC.

25 Q. When you say "provided by QSC," what do you

1 mean?

2 A. I obtained this as -- I obtained it from
3 Crest's attorneys right here.

4 Q. And does this document appear to be a
5 preprint of a presentation at an AES conference?

6 MR. CRAIN: Object to form.

7 THE WITNESS: To the extent that it says
8 "Preprint" up in the upper right-hand corner,
9 I -- I suppose it is.

10 Q. (By Mr. Das) And it also lists the
11 Audio -- it says "An Audio Engineering Society
12 Preprint" --

13 A. Right.

14 Q. -- correct?

15 And this appears to be a preprint from a
16 convention, the 41st convention, from October 5th
17 through 8th, 1971; correct?

18 MR. CRAIN: Object to form.

19 THE WITNESS: That's correct.

20 Q. (By Mr. Das) Did you attend the 41st
21 convention of the AES?

22 A. No, I did not.

23 Q. Okay.

24 A. By the way, I just saw something on here of
25 interest. I notice down here the convention price

1 for this preprint was 35 cents, and earlier I said
2 they were about 5 bucks. So you can see that the AES
3 changed a lot over that period of time.

4 Q. It went from 35 cents to \$5 in 11 years?

5 A. I think so.

6 Q. That's pretty steep.

7 And when we were looking at Exhibit 3, your
8 preprint paper, we talked about this language on the
9 cover page of, "Additional preprints may be obtained
10 by sending request and remittance to the Audio
11 Engineering Society," with an address.

12 Do you see that the Gittleman paper has the
13 same paragraph? Bottom right-hand corner.

14 A. It's not the same.

15 Q. In what way is it not the same?

16 A. The place where you send your request to is
17 not the same.

18 Q. So the address that -- that's listed or --

19 A. That is correct.

20 Q. Because in the Gittleman paper, it says
21 "Room 929," which is not in the cover of your paper;
22 correct?

23 A. Well, it's not the same zip code either.

24 Q. Good point.

25 But it's still on 60 East 42nd Street, New

1 York, New York. So they didn't move, but the zip
2 code changed?

3 A. Post office.

4 MR. CRAIN: Object to form.

5 Q. (By Mr. Das) But outside of the change in
6 address of the AES, you agree that the same language
7 appears on both?

8 A. Well, not really. I hate to be picky, but,
9 you know, the first paragraph is different. It
10 refers --

11 Q. Again, I was talking about those -- the one
12 about the additional preprints may be obtained.

13 A. Oh, I'm sorry. I believe the substance is
14 the same.

15 Q. Right.

16 And so anything on the face of the
17 Gittleman paper that makes you believe that it could
18 not have been obtained in the same way that you
19 testified earlier about other preprints, specifically
20 your preprint?

21 MR. CRAIN: Object to form.

22 THE WITNESS: I was not a member of the AES
23 at that time, so I cannot answer that question
24 with confidence.

25 Q. (By Mr. Das) Anything that makes you

1 believe that it wasn't available and not whether it
2 was available?

3 MR. CRAIN: Object to form.

4 THE WITNESS: I can only say that it -- if
5 it was available, it was available at -- under
6 different terms.

7 Q. (By Mr. Das) And what were the different
8 terms?

9 A. The price.

10 Q. Other than the price, any other different
11 terms?

12 MR. CRAIN: Object to form.

13 THE WITNESS: Not that I'm aware of.

14 I would just point out that things in the
15 AES changed a great deal over time. When I
16 first joined the AES, they had three conventions
17 every year, which was amazing for an
18 organization that was considered too much of a
19 party organization.

20 And when Ray Dolby became president, he
21 forced us to reduce it to only two conventions a
22 year.

23 Q. (By Mr. Das) But were there any
24 substantive changes as to how they made preprints of
25 presentations available at these conventions?

1 MR. CRAIN: Object to form.

2 THE WITNESS: I don't know. I -- I -- in
3 other words, I simply wasn't a member of the AES
4 in 1971 and I didn't attend any of their
5 conventions in 1981.

6 Q. (By Mr. Das) 1981 or '71?

7 A. I'm sorry. 1971. Excuse me.

8 Q. When did you join the AES?

9 A. I believe it was 1973 or 1974.

10 Q. And since the time you've joined the AES,
11 how many of the conventions have you attended?

12 A. 30 to 40 percent.

13 Q. Okay. I'm not even going to try to do the
14 math. I was trying to figure out 30 to 40 percent of
15 three to two conventions over --

16 A. I know. And that's -- I can only tell you
17 that my attendance at those conventions, depending
18 upon who my employer was, varied, because in many
19 cases, my employer paid for me to go to the Audio
20 Engineering Society convention; in other cases, I
21 had -- had to do it on my own dime.

22 And there were -- at the time, when they
23 had three conventions, each year there was one
24 usually in New York City and the other one in either
25 Los Angeles or San Francisco. And I -- I missed a

1 large number of the ones on the West Coast because I
2 was too cheap to pay for the airfare.

3 Q. Would you say you -- you've attended more
4 than 20 AES conventions?

5 A. Let's see. We're talking a period of 40
6 years. As I said earlier, maybe I attended
7 40 percent, so that comes out to less than 20.

8 Q. But there were two -- there were two
9 conventions every year, at least.

10 A. Oh, I'm sorry. I'm sorry. It could have
11 been 20.

12 Q. More than 10, would you say?

13 A. I would believe it was certainly more than
14 10.

15 Q. Okay. Do you recall ever attending an AES
16 convention where copies of preprints were not
17 available for purchase?

18 MR. CRAIN: Object to form.

19 THE WITNESS: I can only say that my
20 recollection is that for the conventions that I
21 actually did attend, my recollection is that
22 preprints were usually made available.

23 Q. (By Mr. Das) Turn to paragraph 7 of your
24 declaration. That's on page 4 of your declaration.
25 I'm going to ask you about both paragraphs 7 and 8,

1 so if you could review those and let me know when
2 you're ready.

3 A. Yes, I'm ready.

4 Q. Okay. And, now, we talked about a lot of
5 these topics earlier when we were talking about
6 preparing your -- your declaration.

7 One thing that we discussed that you
8 considered while preparing your declaration that
9 doesn't appear to be listed here are the invalidity
10 contentions from the District Court case.

11 You recall that?

12 A. Are you referring to the -- the decision of
13 the board?

14 Q. No. Remember we were talking about that --
15 these two District Court cases in Mississippi? You
16 remember that, we talked about that --

17 A. Uh-huh (affirmative).

18 Q. -- where -- where Crest has sued QSC?

19 A. I -- I think I remember the conversation,
20 but I'm being a little bit confused by the term
21 "District Court" and "in Mississippi."

22 Q. What's confusing about it?

23 A. I guess now I'm less confused because I do
24 seem to recall -- I was thinking in terms of Atlanta,
25 and -- and I think if I've got it right, that

1 litigation took place in Mississippi.

2 Q. Correct.

3 A. And the documents you're referring to were
4 QSC's documents?

5 Q. Correct. QSC had submitted or provided to
6 Crest these invalidity contentions, which laid out
7 QSC's opinion as to why very -- the patents asserted
8 in those cases, specifically the '542 patent, was
9 invalid. And earlier, you said you had seen -- you
10 had been provided copies of those.

11 Do you recall that testimony?

12 MR. CRAIN: Object to form.

13 THE WITNESS: I believe that I said that I
14 probably did.

15 Q. (By Mr. Das) Okay.

16 A. My uncertainty here arises from the fact
17 that, largely, the earliest thing that I looked at
18 chronologically that was important to me was the
19 decision of the board with regard to the IPR.

20 Q. What is your understanding of the intent of
21 paragraphs 7 and 8? In other words, why did you
22 include this information?

23 MR. CRAIN: Object to form. Compound.

24 THE WITNESS: Quite frankly, I included
25 this information because the same type of

1 information was included in Dr. Ellis'
2 declaration.

3 I would point out, in case you don't know,
4 this is the first time I've testified in an
5 expert witness capacity --

6 Q. (By Mr. Das) Right.

7 A. -- anywhere, and everybody has to have a
8 starting point --

9 Q. And that's --

10 A. -- and --

11 Q. That's fair.

12 A. -- Dr. Ellis, you know -- and if -- you
13 know, to some extent I used his thing as a template.

14 Q. Okay. And that's perfectly fair.

15 A. Yeah.

16 Q. Part of what's meant to be included in a
17 declaration -- this is why I'm asking you all these
18 questions --

19 A. Uh-huh (affirmative).

20 Q. -- is what are all the facts that you
21 considered in arriving -- facts and data --

22 A. Sure.

23 Q. -- that you considered in arriving at the
24 opinions that you're expressing in this declaration.

25 A. Right.

1 Q. And so putting -- you know, with that
2 background -- and that's why we spent so much time
3 this morning --

4 A. Okay, sure --

5 Q. -- talking about that --

6 A. -- sure.

7 Q. -- this lists a number of things you
8 considered, but it seems like there may have been
9 other things you considered which are not listed
10 here.

11 For example, you considered -- you
12 considered your book, which is referenced in various
13 footnotes. That's not listed here.

14 A. Fair enough.

15 Q. And then you thought you may have been
16 provided copies of the invalidity contentions from
17 the litigation.

18 And I'm --

19 A. That's right.

20 Q. And I'm trying to -- now that we have this
21 in front of us, the listing of what you considered,
22 I'm trying to figure out if it jogs your memory as to
23 whether there were other facts or -- facts and data,
24 whether documents or otherwise, that you considered
25 in forming the opinions expressed in your

1 declaration.

2 MR. CRAIN: Object to form to the extent it
3 mischaracterizes former testimony.

4 THE WITNESS: All I can say, if I
5 understand you correct, what -- what you're
6 trying to get, what information you're trying to
7 get, you're trying to understand the source of
8 facts that caused me to write what I wrote in my
9 declaration.

10 And what I can tell you is that it's -- it
11 was very clear that, among all of these
12 documents that I listed, there was a great deal
13 of overlap, so the same fact may have appeared
14 in two or three of these.

15 As far as I know, if I overlooked, for
16 example, listing that -- what was the name of
17 it?

18 Q. (By Mr. Das) Invalidity contentions?

19 A. I'm sorry. Yes.

20 If I overlooked putting the invalidity
21 argument in here, that was an oversight, but at the
22 same time, I'm pretty darn certain that I didn't base
23 anything that I did that was in there.

24 As I said, the -- the primary source of --
25 of what I based my opinions on were the -- well, now

1 wait a minute here. I'm say- -- I'm seeing
2 petitioner's petition for interparty review.

3 Is that different than -- I'm getting
4 confused. I apologize.

5 Q. No, that's fine.

6 A. Is that different than the -- the thing
7 that you referred to as invalidity?

8 Q. So petitioner's petition was what was
9 submitted to the patent office.

10 A. Yes.

11 Q. I'm talking about with -- the invalidity
12 contentions is what was exchanged between petitioner
13 and patent owner, except in the litigation in
14 Mississippi.

15 A. Actually, I don't think I did see that.

16 Q. Okay. In addition -- you actually did a
17 good job of explaining what you relied on in -- for
18 the facts that are included in here.

19 But a -- a different reason why experts are
20 asked to list what they considered is there may be
21 stuff that was negative to your position that you
22 considered and didn't include.

23 A. Ah, I see what you're saying.

24 Q. I'm not saying that happened in your case,
25 but I'm trying to put this in context.

1 So what I'm asking for is not just what are
2 the sources of the facts that are included in your
3 declaration, but what are the sources of facts that
4 you considered in forming the opinion in your
5 declaration?

6 MR. CRAIN: Object to form. I think it's
7 been asked and answered.

8 THE WITNESS: If I understand your
9 correct -- your question correctly, I don't
10 believe that I saw any facts that would be
11 negative to Crest's position that I did not
12 include in my declaration.

13 Q. (By Mr. Das) Okay.

14 A. And -- and I -- I believe I was very
15 diligent in considering matters that were presented
16 or facts that were presented in a fair way as to
17 whether they really did have a negative influence on
18 Crest's position.

19 There probably were a couple of cases that
20 I can't recall where, you know, you read something
21 the first time and you say, "Oh, yeah," and then you
22 dig down deeper and, you know, it -- it -- it was,
23 you know, Dr. Ellis blowing smoke.

24 Q. Okay. How is that negative to Crest's
25 position?

1 A. Well, Dr. Ellis was QSC's expert and
2 Dr. Ellis, you know, was quite, shall we say, strong
3 in supporting QSC's position, and there were quite a
4 number of things that he said that, if they were
5 taken at face value, could have been against Crest.
6 I mean, that was his job as your expert.

7 And most of those things, he was incorrect.
8 I mean, Dr. Ellis overlooked the realities of
9 hardware and circuit design, and that's
10 understandable because he's in an academic
11 environment. I'm sure he's an expert on other areas,
12 but I -- in numerous places, I believe that -- that
13 he was incorrect.

14 So those are examples of where I read
15 something that was asserted against Crest's position,
16 I considered it, and decided, you know, Dr. Ellis is
17 wrong.

18 MR. DAS: Move to strike as nonresponsive.

19 MR. CRAIN: Object to form.

20 By the way, we're at an hour and 10, so
21 when you get an opportunity, let's stop for
22 lunch.

23 Q. (By Mr. Das) Mr. Cordell, do you believe
24 you have not strongly taken positions that are
25 favorable to Crest? Because you criticized Dr. Ellis

1 for taking positions strongly favorable to QSC.

2 MR. CRAIN: Object to form. Argumentative.

3 MR. DAS: Object to form of the objection.

4 That's not an appropriate objection under the
5 patent trial rules. You know that.

6 MR. CRAIN: That's just the pot calling the
7 kettle black right there.

8 MR. DAS: Andrew, that's also not a proper
9 objection.

10 MR. CRAIN: I think the objection is
11 proper.

12 Q. (By Mr. Das) Would you answer the
13 question?

14 A. I was not biased in evaluating all of this
15 material and come to the conclusions in my
16 declaration. I think that's evident by the fact that
17 I was very diligent in drilling down all of these --
18 these patents and materials.

19 It's also evident to me that Dr. Ellis only
20 spent, I believe -- it was a shocker to me that he
21 only spent about 20 hours on both patents, which led
22 me to believe that, you know, he was giving -- given
23 a strong starting point from QSC.

24 Q. Do you have any other factual bases for
25 arriving at that belief?

1 A. My experience in writing, and in particular
2 in writing these declarations, is that there's --
3 there's no way that somebody could have written and
4 done due diligence in writing a declaration in only
5 10 hours for the '542 patent.

6 But that's just my opinion and it is only
7 based upon what I know the speed at which I can
8 digest material and -- and write down.

9 Q. And do you know what speed Dr. Ellis can
10 digest material and write them down?

11 A. No, I don't.

12 Q. Okay. So you don't have a factual basis
13 for whether 10 hours was -- was inappropriate for
14 him?

15 MR. CRAIN: Object to form.

16 THE WITNESS: I don't think he's ten times
17 as fast as me.

18 Q. (By Mr. Das) But you don't know that?

19 A. That is correct.

20 MR. DAS: Why don't we take the break now.

21 MR. CRAIN: Okay.

22 VIDEOGRAPHER: We're off the record at
23 12:17 p.m. This is the end of Video 2.

24 (Thereupon, there was an interruption in
25 the proceedings.)

1 VIDEOGRAPHER: This is the beginning of
2 Video 3. We are on the record at 1:07 p.m.

3 (Petitioner's Exhibit 5 was marked for
4 identification.)

5 THE WITNESS: Thank you.

6 COURT REPORTER: You're welcome.

7 Q. (By Mr. Das) Mr. Cordell, on your break,
8 did you have a chance to speak with Crest's counsel?

9 A. Only about football.

10 Q. Okay. Did not discuss the substance of
11 your testimony, then?

12 A. That is correct, I did not.

13 Q. And you did not discuss how to answer any
14 questions in this deposition?

15 A. That is correct.

16 Q. And you've been handed what's been marked
17 as Exhibit 5. Can you please review it and let me
18 know when you're ready.

19 A. Okay. The '542 patent.

20 Q. Okay. You guessed my first question was
21 gonna be what is it?

22 A. I'm sorry.

23 Q. Yeah, but it's -- no, no, that's --

24 A. I didn't mean to jump the gun.

25 Q. That's fine. It moves us along.

1 So -- and I should point out we'll be going
2 back to your declaration quite a bit --

3 A. Sure.

4 Q. -- so you'll probably want to have that --

5 A. Sure. I'll keep that handy.

6 Q. -- handy. So...

7 Now, in your declaration in paragraph 10,
8 you say, "The '542 patent per- -- pertains to audio
9 power amplifiers...."

10 And I was -- I was wondering if you could
11 point out to me where the audio power amplifier is in
12 the '542 patent.

13 MR. CRAIN: Object to form.

14 THE WITNESS: The audio power amplifier
15 proper is Item No. -- I'm sorry, Item No. 260 in
16 Figure 2. And if I look in the spec -- just let
17 me verify that that's how they describe it.

18 Yes, they describe it as the power
19 amplifier.

20 Q. (By Mr. Das) Where -- where are you
21 looking?

22 A. I'm sorry. I looked for the 260 in the
23 spec and I'm looking at Column 5 at approximately
24 line 36.

25 Q. And that -- that actually refers to it as

1 power amplifier 260, and is there -- do you recall if
2 anywhere in the '542 patent it uses the term "audio
3 power amplifier"?

4 A. Not off the top of my head. It certainly
5 may have.

6 Q. Okay. Would it surprise you if I told you
7 that the term "audio power amplifier" does not appear
8 in the '542 patent?

9 A. No, it wouldn't surprise me.

10 Q. Now, is there any discussion in the '542
11 patent about the design of this power amplifier 260?

12 MR. CRAIN: Object to form.

13 THE WITNESS: When you say "design,"
14 what -- what specifically are you -- can you
15 give me an example of what you mean by the
16 design of 260?

17 Q. (By Mr. Das) Well, what do you understand
18 the term "design of audio power amplifiers" to mean?

19 A. I mean, I can give you some examples.

20 You know, it could be a -- a MOSFET power
21 amplifier or -- or bipolar power amplifier. It could
22 be a Class A amplifier or Class D amplifier.

23 Is -- is that sort of what you had in mind
24 when you said "design" of the amplifier?

25 Q. Again, I'm curious as to what you mean by

1 the term "design of audio power amplifier."

2 MR. CRAIN: Object to form.

3 THE WITNESS: It's -- I mean, it's just
4 really, really broad. I mean, in my book, you
5 know, designing audio power amplifiers, it's
6 like 600 pages.

7 Q. (By Mr. Das) Right.

8 A. But, you know, if I can, you know, be of
9 any help in, you know --

10 Q. Sure.

11 A. -- giving you the information you're
12 looking for --

13 Q. Yes.

14 A. -- ask me another question.

15 Q. Well, you mentioned that it could be a
16 MOSFET power amplifier.

17 A. Sure.

18 Q. Does the '542 patent mention whether 260 is
19 a MOSFET power amplifier?

20 A. No.

21 MR. CRAIN: Object to the form.

22 THE WITNESS: I'm sorry.

23 Q. (By Mr. Das) You also said it could be --

24 A. I apologize for jumping the gun there.

25 Q. You also mentioned that it could be a

1 bipolar power -- power amplifier?

2 A. That's right.

3 Q. Does it mention if it's a bipolar power
4 amplifier?

5 MR. CRAIN: Object to form.

6 THE WITNESS: I don't recall.

7 Q. (By Mr. Das) You mentioned it could be a
8 Class A power amplifier.

9 Do you have any recollection of whether the
10 '542 patent discusses what type of class of power
11 amplifier 260 is?

12 A. No.

13 Q. Do you know if it discusses what type of
14 class of power amplifier the 260 is?

15 A. I -- I don't know, but I can say that I
16 don't recall seeing that discussion in the '542
17 patent.

18 Q. Okay.

19 A. And I -- I think I read it pretty carefully
20 multiple times, so...

21 Q. And if you look to the third page of the
22 '542 patent, there's a couple of figures, Figure 3
23 and Figure 4.

24 A. Yes.

25 Q. Do those also discuss -- disclose, sorry,

1 power amplifiers?

2 MR. CRAIN: Object to form.

3 THE WITNESS: I'm just going to take a
4 moment here to -- to see what they're talking
5 about in regard to designation 16.

6 Q. (By Mr. Das) If it helps, there's a
7 discussion of what's shown in Figures 3 and 4 at the
8 top of Column 2.

9 A. Okay. Thank you, but I'm just looking for
10 the 16. Maybe I'm a little blind here.

11 MR. CRAIN: Just for the record, I would
12 also submit that Figure 3 is also referenced in
13 Column 1.

14 THE WITNESS: Okay. I found it.

15 They describe -- in the context of the
16 sentence, they describe item 16 as a power
17 amplifier.

18 Q. (By Mr. Das) Right.

19 And do you recall if there's any
20 distinctions drawn between the power amplifier 16 of
21 the prior art systems versus the power amplifier 260
22 of the claimed invention in the '542 patent?

23 MR. CRAIN: Object to form.

24 THE WITNESS: I don't recall seeing any
25 distinction being made.

1 Q. (By Mr. Das) In the '542 patent, we're
2 going to focus only on Claims 5 and 13, and I believe
3 that's -- that was how you approached it also.

4 A. That's correct. That's my understanding.

5 Q. So I'm going to ask you some preliminary,
6 just to make sure we're using the same vocabulary and
7 I'm just not off in --

8 A. Sure.

9 Q. -- left field just using vocabulary
10 incorrectly.

11 And also, I'm not a EE person, I'm a math
12 person, so I just want to make sure when I say --

13 A. You have my condolences.

14 Q. Thank you.

15 So this -- there's these concepts about
16 load impedance and power supplied to the load in
17 Claims 5 and 13; correct?

18 A. That is correct.

19 Q. So I'm trying to understand -- not trying
20 to understand, I'm just trying to make sure my
21 understanding of what's being described is correct,
22 that there is a -- a current being supplied by the
23 power amplifier and that current is being provided to
24 a load; is that correct?

25 MR. CRAIN: Object to form.

1 THE WITNESS: As far as I know, that is
2 correct.

3 Q. (By Mr. Das) Okay. And these detectors,
4 the voltage detector and current detector that are
5 discussed in Claims 5 and 13, those are within the
6 amplifier; correct?

7 A. Yes.

8 Q. And it talks about -- this is in Column 8,
9 Claim 5, a current detector for detecting current
10 delivered to a load --

11 A. Yes.

12 Q. -- and then a voltage detector for
13 detecting the voltage supplied to the load from the
14 power amplifier.

15 A. Yes.

16 Q. I just want to make sure that "voltage
17 supplied to the load" is the correct terminology. Is
18 that how we would talk about it?

19 MR. CRAIN: Object to form.

20 THE WITNESS: I think it would be more
21 accurate to say the voltage across the load.

22 Q. (By Mr. Das) Okay. But -- and the reason
23 I was asking is in your declaration, you talk about
24 it as the voltage across the load, and that's the
25 reason I was asking about that.

1 And so there's an output from the power
2 amplifier, and that's the current -- the current
3 output from the power amplifier is the current that's
4 being supplied to the load; correct?

5 MR. CRAIN: Object to form.

6 THE WITNESS: It's the current that's
7 flowing through the load.

8 Q. (By Mr. Das) Okay. Flowing through the
9 load.

10 Now, typically, you -- there would be some
11 kind of connector, maybe a wire or something between
12 the amplifier and the load, if the load was the
13 loudspeaker; correct?

14 MR. CRAIN: Object to form.

15 THE WITNESS: You know, it would be, you
16 know, maybe a banana jack or something like
17 that, if I -- if I understood your question
18 correctly.

19 Q. (By Mr. Das) Well, how does the current
20 get supplied from the power amplifier to the load?

21 MR. CRAIN: Object to form.

22 THE WITNESS: Basically, you have a speaker
23 cable that --

24 Q. (By Mr. Das) Okay.

25 A. -- interconnects the amplifier to the

1 loudspeaker.

2 Q. And that's what I was asking about, is the
3 speaker cable.

4 So is the output current from the amplifier
5 the same as the current flowing through the speaker
6 cable as the current that's being supplied to the
7 load?

8 MR. CRAIN: Object to form. Lack of
9 foundation.

10 THE WITNESS: I'm guessing that there are
11 possibly some cases where that might not be the
12 case.

13 Q. (By Mr. Das) Okay. What cases would that
14 be?

15 A. Well, for example, if you had two
16 loudspeakers connected to that same connector, some
17 of the current would be going through one
18 loudspeaker, some of the current would be passing
19 through the other loudspeaker.

20 Q. Well, would you refer to the two
21 loudspeakers combined as the load in that case?

22 A. I think that would be reasonable.

23 Q. Okay. And this -- this is where, again, we
24 talk about impedance and power and so forth, and this
25 is where I said I'm looking to you to correct me.

1 But my understanding is under Ohm's law,
2 the current -- output current of the amplifier would
3 be basically the output voltage of the amplifier
4 divided by the imped- -- output impedance of the
5 amplifier.

6 A. No.

7 Q. No? What would it be?

8 A. The reason I said no is because the
9 question -- I think it -- you know, it might say --
10 I'm not meaning to quibble here, but there was a term
11 or a usage in the question that wasn't quite
12 correct --

13 Q. Okay.

14 A. -- so...

15 Q. And what was the term or usage?

16 A. You referred to the output impedance of the
17 amplifier.

18 Q. Okay. Is that not a term one would use?

19 A. Not in the context of your question.

20 Q. Okay. So is there something called the
21 output voltage of the amplifier?

22 A. Yes.

23 Q. And there's something called the output
24 current of the amplifier?

25 A. Insofar as you mean the current flowing

1 through the load, yes.

2 Q. Okay. So the current flowing through the
3 load is the same as the current that's coming out of
4 the power amplifier?

5 A. In most cases.

6 Q. In most cases. Okay.

7 And for the load, the current flowing into
8 the load would be the voltage across the load divided
9 by the impedance of the load; correct?

10 A. The reason I'm hesitating is, you know, we
11 like to say that, but there's sometimes exceptions
12 that depend on the phase angle of the impedance.

13 Q. Right.

14 A. For example, if the load was a purely
15 resistive load, there would -- that statement would
16 be certainly correct.

17 When you use the term "impedance," that
18 opens the door to, you know, many more
19 characteristics of the load. So I'm just hesitating
20 because of that.

21 I would be cautious about -- about making
22 that a general statement, but in terms of, you know,
23 when people are talking informally, it is often the
24 case.

25 Q. And I'm struggling to find this in your

1 declaration, but at some point I believe you said the
2 impedance would be calculated as the voltage divided
3 by the current.

4 A. That's right.

5 Q. And I was just taking --

6 A. That's right.

7 Q. And I was just taking that equation, which
8 I believe is Ohm's law or one variant of Ohm's law --

9 A. That's right. That's right.

10 Q. -- and rewriting that as current equals
11 voltage divided by impedance.

12 A. Yes.

13 Q. Right.

14 And is that -- again, I understand with the
15 resistive versus the capacitive load --

16 A. Right, right.

17 Q. -- there could be a difference and if you
18 have a resistive load, then at least that would be
19 the case.

20 A. That's right. And, in fact, I believe that
21 Dr. Ellis referred to the same relationship --

22 Q. Right.

23 A. -- and I do not disagree with that.

24 Q. Right.

25 And so you've got the current that's coming

1 out of the power amplifier as -- basically, leaving
2 aside the -- if there's any sort of parasitic losses
3 in the wire --

4 A. Yeah.

5 Q. -- or something, is -- is basically the
6 current into the load.

7 And if the impedance of the load suddenly
8 drops -- in other words, if you get a sudden short --
9 that would lead to the -- that current spiking
10 upwards; correct?

11 A. Often. However, some amplifiers have
12 different kinds of protection circuits. One of the
13 types is called foldback current protection. So
14 rather than the amplifier attempting to maintain some
15 limited amount of current, the circuit actually
16 backs -- backs it down to an even lower level.

17 The only point that I'm making is that
18 there are many, many different kinds of -- of
19 circuits there and there's times when it's difficult
20 to make, you know, too much of a generalization.

21 Q. Right.

22 But this is where I was going to with
23 the -- I -- I'm curious about these protection
24 circuits.

25 So you said you'd have a protect- -- a

1 foldback protection circuit --

2 A. Right.

3 Q. -- you could have a foldback.

4 What -- what is the purpose of that
5 protection circuit? What is it trying to protect?

6 A. Most -- I mean, the first order of the
7 protection circuit is to try- -- is trying to protect
8 the transistors in the output stage. It's certainly
9 not limited to that, but that is the first thing that
10 comes to our mind.

11 I would add, however, that in the general
12 cate- -- category of protection circuits, there are
13 related protection circuits whose intention is to
14 protect the loudspeaker, because, in fact, the
15 loudspeaker costs more oftentimes than the amplifier.
16 So both of those things are very important.

17 Q. Okay. And you said the transistors in the
18 output stage.

19 And just to clarify, the output stage of
20 the amplifier?

21 A. That's true, yeah.

22 Q. At the time that the '542 patent was
23 filed -- or the application at issue as the '542
24 patent was filed, which was November 1994, were there
25 a variety of different current detectors or was there

1 a standard current detector?

2 A. There were very few current detectors.

3 Q. Okay. What were the ones that you know of
4 in that time period?

5 A. Actually, we have to, at this point, get a
6 little bit into semantics.

7 Q. Okay.

8 A. I would say that there were virtually no
9 current detectors. Let me explain that.

10 It's true that many power amplifiers have
11 protection circuits that are responsive to dangerous
12 conditions for the output transistors.

13 So, for example, you can envision a
14 protection circuit that acts to protect if the
15 current at the output exceeds a certain level. So
16 you do have protection circuits that are responsive
17 to certain currents, and they may not -- in fact,
18 often they are not the output currents, by the way,
19 as an aside -- but it would be wrong in the type of
20 vernacular that I'm familiar with to refer to those
21 as current detectors.

22 Q. Okay. And -- and why would you not
23 consider them to be current detectors?

24 A. When somebody tells me that something is a
25 current detector, that's usually telling me that it

1 is detecting like the value of the current, rather
2 than responding to a situation that involves an
3 overcurrent.

4 So, for example, you would not call a fuse
5 a current detector.

6 Q. Okay. Why not?

7 A. You would not call a circuit breaker a
8 current detector.

9 Q. And I'm trying to understand what --

10 A. Okay.

11 Q. -- the distinction you're drawing between a
12 fuse and a circuit breaker versus a current detector.

13 A. It really -- it really has to do with the
14 kind of information or, let's say, the result.

15 For example, a -- a current detector will,
16 in my mind, in some way indicate the magnitude of the
17 current.

18 Q. Okay.

19 A. Something that is just responsive to an
20 overcurrent, in my mind, is not a current detector.

21 Q. Let me understand what you mean by
22 "responsive to an over-" --

23 A. Sure.

24 Q. -- "-current."

25 A. Sure.

1 Q. So some- -- and, again, we -- we haven't --

2 A. Sure, understood.

3 Q. -- defined this very carefully, but this
4 something that's responsive to an overcurrent, are
5 you saying this is some kind of circuit that, if the
6 current goes above a certain amperage, it does take
7 certain protective actions? Is that what you mean by
8 "responsive to an overcurrent"?

9 A. That's correct.

10 Q. Okay.

11 A. I would add, just to make sure there's no
12 confusion, that the point at which it decides --

13 Q. Uh-huh (affirmative).

14 A. -- that the current is greater than it
15 should be is very often not a fixed value of current.

16 Q. Can you give me an example? Say for a
17 fuse, why would that not be a fixed value of current?

18 A. Well, for a fuse it would not be a fixed
19 value of current because the amount of time that it
20 takes for a fuse to blow is a strong function of how
21 much current is flowing.

22 Q. Okay.

23 A. So that's an example of time.

24 Q. Right.

25 And so if you're talking about in

1 amplifiers --

2 A. Uh-huh (affirmative).

3 Q. -- you were saying that they had circuits
4 that were responsive to dangerous conditions --

5 A. Right.

6 Q. -- right, for the transistors in the
7 output --

8 A. That's right.

9 Q. -- stage.

10 So one of those sort of -- what were those
11 called? If they weren't called current detectors in
12 November 1994, what would the -- these sort of --
13 we've -- you've referred to them as something, right,
14 so --

15 A. Yeah.

16 Q. -- I'm trying to put a label on these.

17 A. Probably the most common term that is used
18 is a so-called VI limiter.

19 Q. Okay.

20 A. And if you hear somebody, in the context of
21 an output stage, use the term "current limiter," the
22 usual meaning of that is that it will limit the
23 current to a particular value --

24 Q. Okay.

25 A. -- like 5 amps.

1 Q. Okay. So in that case, though, it is
2 reacting to the detected current because it's saying,
3 "I'm not going to let more than 5 amps go through
4 this circuit."

5 A. Well, it's -- it's referring to the current
6 that is flowing through the transistor. Again, I
7 prefer the term "responsive to."

8 And, in fact, oftentimes -- not always, but
9 oftentimes -- let's say in a bipolar output stage,
10 you have a resistor in series between the emitter and
11 the output node -- there's -- there's more to it than
12 that, but just to keep it simple -- and these
13 protection circuits are responsive to the voltage
14 across that resistor.

15 So they are -- with some level of
16 consistency or correlation, the voltage across that
17 resistor is inferred to be somewhat representative of
18 the current flowing through the transistor, and that
19 voltage is what actually causes the -- the
20 circuitry -- the protection circuitry to become
21 responsive.

22 Q. So we've got -- you said there's a resistor
23 that sits between the emitter and the output node?

24 A. That's right.

25 Q. Is -- is the emitter the transistor?

1 A. The emi- -- no, the transistor, I'm sorry,
2 is a three-terminal device --

3 Q. Right.

4 A. -- and --

5 Q. And the emitter off the transistor? I
6 should have --

7 A. Yeah.

8 Q. That was a terrible question.

9 A. That's okay.

10 Q. I jumped.

11 So the emitter off the transistor.

12 A. That's right. And -- and this is in just a
13 particular kind of output stage.

14 Q. Right.

15 A. Sometimes the output comes from the
16 collector.

17 Q. Right.

18 A. But in this very oversimplified example --

19 Q. Uh-huh (affirmative).

20 A. -- of one kind of typical output stage, the
21 current flowing through the emitter is also flowing
22 through this small resistor.

23 Q. Uh-huh (affirmative).

24 A. We usually refer to that as RE, the E
25 obviously being for "emitter," and this small

1 resistor is often in the range of .1 to .5 ohms.

2 Q. Okay. Current flowing through the emitter
3 flows through the resistor and through the output
4 node; correct?

5 A. Into the output node.

6 Q. Into the output node and --

7 A. That's right.

8 Q. -- through the --

9 A. And there are -- to be honest, you know,
10 there are some circuits where there are other
11 resistors or maybe even transistors --

12 Q. Right.

13 A. -- connected to the emitter. So you can't
14 make a totally universal statement that all the --

15 Q. Right.

16 A. -- emitter current flows through that
17 little resistor.

18 Q. No, no, no, I'm not -- I'm trying to
19 understand --

20 A. Sure.

21 Q. -- for this example --

22 A. Sure.

23 Q. -- we've got some kind of bipolar
24 transistor --

25 A. Yes.

1 Q. -- that's -- that the current flows through
2 the emitter --

3 A. Yes.

4 Q. -- through a resistor RE and to the output
5 node.

6 A. That's right.

7 Q. And if there was a load connected to the
8 output node, that would be -- the current at the
9 output node would be the current supplied to the
10 load.

11 A. No, not really. Once again, this goes to
12 some of the details of the output stage.

13 For example, that output -- in a push-pull
14 amplifier -- are you familiar with that terminology?

15 Q. No.

16 A. Okay.

17 Q. I was going to ask you about it, but keep
18 going.

19 A. You know, I apologize. I just don't always
20 know what to assume that you know.

21 Q. Assume I know nothing.

22 A. Okay. Most of these amplifiers are called
23 push-pull amplifiers. And when a positive output
24 current -- in other words, a current flowing to the
25 load -- is called for by the signal, the -- the top

1 transistor, which would be the -- oftentimes an NPN
2 transistor, and it's connected to the positive supply
3 rail -- will be turned on and it will be supplying at
4 least some of the current being demanded by the --
5 that needs to flow into the load.

6 Below that output node, you will have an --
7 a PNP transistor -- and again, in this particular
8 type of output stage -- that when say, for example,
9 on the negative half cycle of a signal, current has
10 to flow in the opp- -- opposite direction, i.e. from
11 the load into the amplifier and ultimately to the
12 negative power supply rail, you know, you could say
13 the top one is pushing and the bottom one is pulling.

14 Q. Right.

15 A. It's just a --

16 Q. Term that --

17 A. -- convenient term --

18 Q. Right.

19 A. -- that -- that people use.

20 Q. Right.

21 A. And -- but there are also currents that
22 flow from the top NPN transistor down through the
23 bottom PNP transistor. So you can't always say that
24 the current flowing in the transistor is the same as
25 current flowing in the load.

1 Further complicating that is that actually
2 most amplifiers, but certainly higher power
3 amplifiers, have multiple output transistors. So
4 it's not as simple as just one transistor with one
5 emitter resister. It -- it can get more complicated
6 than that.

7 Q. Right. Okay.

8 Let's see. So when the -- when Claim 5 and
9 Claim 13, I believe, both use the term "a current
10 detector for detecting current delivered to a
11 load" --

12 A. Yes.

13 Q. -- in a push-pull amplifier, what current
14 is that talking about?

15 MR. CRAIN: Object to form.

16 THE WITNESS: That term is referring to the
17 current that's flowing in the load.

18 Q. (By Mr. Das) Current that is flowing in
19 the load? Why --

20 A. That's right. In other words, the current
21 that is flowing from the output terminal of the
22 amplifier through the loudspeaker cable into the
23 speaker connected at the other end, assuming there's
24 only one speaker in a simple case.

25 Q. And I'm just trying to put that in the

1 context of this push-pull amplifier --

2 A. Sure.

3 Q. -- that you were talking about where you
4 said you had the positive current which is drawing
5 from the positive rail --

6 A. That's right.

7 Q. -- and you've got a negative current that's
8 drawing -- is basically delivering to the negative
9 rail.

10 A. That's right.

11 MR. CRAIN: Object to form.

12 THE WITNESS: I'm sorry.

13 Q. (By Mr. Das) And the "current delivered to
14 a load from the power amplifier," is that talking
15 about the positive current or the negative current or
16 both?

17 MR. CRAIN: Object to form.

18 THE WITNESS: The only thing you can say is
19 the current flowing into the load.

20 You know, oftentimes during a good part of
21 the cycle, one transistor is delivering most of
22 the current and the other transistor is
23 delivering or sucking very little current or --
24 or no current at all.

25 But with -- with different amplifiers, it's

1 a little bit more difficult to make that
2 generalization. So the -- the safest thing to
3 say is that it is the current flowing, let's
4 say, through the load or through the loudspeaker
5 cable.

6 Q. (By Mr. Das) Is there a difference between
7 current delivered to the load versus current flowing
8 through the load?

9 MR. CRAIN: Object to form.

10 THE WITNESS: I wouldn't -- I wouldn't
11 argue that there's a difference there.

12 Q. (By Mr. Das) You would not argue --

13 A. Yeah.

14 Q. -- there is a difference? There were a lot
15 of --

16 A. Right.

17 Q. -- double --

18 A. I'm sorry. I apologize.

19 Q. There were a lot of negatives there.

20 COURT REPORTER: One at a time, please.

21 THE WITNESS: Sorry.

22 I believe that those two terms or those --
23 yeah, those two terms you used or the phrases
24 you used are largely synonymous.

25 Q. (By Mr. Das) Okay. Going back to, you

1 know, where we started, where we were talking about
2 an emitter connected to a resistor connected to the
3 output node --

4 A. Uh-huh (affirmative).

5 Q. -- now, what's -- and -- and we were
6 talking in the context of these current limiter
7 circuits.

8 A. Right.

9 Q. And you said that it's really the voltage
10 across the resistor that's reported back.

11 MR. CRAIN: Object to form.

12 THE WITNESS: It's the voltage across that
13 emitter resistor that plays a role in
14 instigating the protective action.

15 Q. (By Mr. Das) Okay. And what role does
16 that voltage play?

17 A. Oftentimes -- let's see. I'm trying to,
18 you know, say this in a pretty straightforward way.

19 Oftentimes the -- the device, a
20 transistor -- not the output transistor, another
21 transistor -- in order to turn a transistor on, you
22 have to supply a base-to-emitter voltage of, if it's
23 a silicon transistor, more than about a half a volt.

24 So you can think of that transistor as
25 being a very sloppy comparator. In other words, in

1 really gross terms, if you think of that transistor
2 as being on or off, if -- if the voltage supplied to
3 its base compared to its emitter substantially
4 exceeds a half a volt, the -- the transistor begins
5 to conduct current.

6 So in many arrangements, if the voltage
7 across the emitter resistor exceeds a half a volt or
8 more -- and the "or more" does apply to -- to many
9 conditions -- that will be enough to turn on that
10 transistor that I was just talking about.

11 And when that transistor turn on -- turns
12 on, that is the beginning of the initiation of the
13 corrective action or the protective action.

14 Q. Okay. And the voltage across the emitter
15 resistor is -- assuming you know the resistance of
16 the resistor, would be representative of the current
17 flowing through the resistor; correct?

18 MR. CRAIN: Object to form.

19 THE WITNESS: If the emitter resistor -- I
20 can give you an example that I think will answer
21 the question.

22 If the emitter resistor was a tenth of an
23 ohm and there were 6 amps flowing in the power
24 transistor whose emitter is connected to that
25 transistor, then the voltage drop across that

1 emitter resistor would be about 6/10 of a volt.

2 And that 6/10 of a volt often, under --
 3 well, let's say under certain conditions, would
 4 be adequate to turn on that other transistor
 5 that I just discussed, which plays a role in
 6 initiating the protective action.

7 Q. (By Mr. Das) And the way you came up with
 8 those numbers was, again, using Ohm's law --

9 A. That's right.

10 Q. -- for --

11 A. That's right. I mean, it's much more
 12 complicated than that --

13 Q. Right.

14 A. -- but for the purposes of what I think
 15 you're trying to get at --

16 Q. Right.

17 A. -- it's probably adequate.

18 Q. Right.

19 Are -- are you saying Ohm's law doesn't
 20 properly represent the flow of electricity through
 21 circuits? Is that --

22 A. Oh, no, no. It's just that there's a lot
 23 more circuitry involved than what I told you about --

24 Q. I'm just --

25 A. -- in this example.

1 Q. -- trying to understand --

2 MR. CRAIN: Hang on. Would you please let
3 the witness finish. Let him finish. You can
4 ask more in a second.

5 MR. DAS: Yeah. I'm just trying to --

6 THE WITNESS: There's a lot more to the
7 example.

8 MR. CRAIN: Please let him finish.

9 MR. DAS: He was finished.

10 MR. CRAIN: He was talking and you're
11 talking over him. I mean, you've been talking
12 over him --

13 MR. DAS: No --

14 MR. CRAIN: -- a good bit. Just let him
15 finish his response and then get your question
16 out. I think that's what they've asked us.

17 MR. DAS: Andrew, now you're talking over
18 me, so that's not helpful either.

19 MR. CRAIN: Okay. So it's okay for you to
20 do to others, but you think it's a problem if I
21 do it to you?

22 I'm just asking would you please kindly let
23 him finish his response before you pose a
24 question. Thank you.

25 MR. DAS: I've been doing that and, again,

1 this is just wasting time. I'm trying to
2 understand Mr. Cordell's testimony and that's
3 why I'm asking him questions. That's what we do
4 at depositions, Andrew. You probably have
5 figured that out.

6 MR. CRAIN: Okay. That's insulting, but we
7 can agree to disagree. Please stop talking over
8 my witness.

9 Q. (By Mr. Das) Were you done, Mr. Cordell?

10 A. I forgot where I was, to be quite honest.
11 So maybe if you could ask that part of the question
12 again, maybe I could complete it if I hadn't
13 completed it.

14 Q. You had given an example using 6 amps and
15 the emitter resistor of .1 ohms and the voltage drop
16 would be .6 volts.

17 And as part of that answer, you also said,
18 "But it's more -- could be more complicated than
19 that."

20 A. That's right.

21 Q. And I asked you if you disagreed with Ohm's
22 law as being representative of current through
23 circuits.

24 Do you recall that?

25 A. I do not disagree with Ohm's law.

1 Q. Okay. And so what I was trying to clarify
2 is when I'm asking questions about these protection
3 circuits and the flow of current and whether the
4 voltage is representative of the current, I'm focused
5 on this particular example, not every potential
6 circuit. That's --

7 A. Right.

8 Q. -- all I was clarifying.

9 A. I understand.

10 And, you know, sometimes I have to inject
11 some -- some caveats, because these -- you know,
12 these things are not -- not as simple as -- as -- as
13 I would like to be able to explain to you.

14 But I also understand that, you know, what
15 we're talking about right now in many cases is
16 adequately covered by simple illustrations.

17 Q. Okay. So, again, in November 1994, I asked
18 you if there were sort of standard current detectors.

19 And if I remember correctly, you said there
20 were virtually no current detectors; is that correct?

21 A. That's correct.

22 MR. CRAIN: Object to the form.

23 Q. (By Mr. Das) And --

24 MR. CRAIN: Before you ask the question, if
25 you would, just be reminded that if I need to

1 object, to get the objection. That would be
2 helpful. Thanks.

3 Go ahead.

4 Q. (By Mr. Das) Were you aware of any current
5 detectors that were commercially available in
6 November 1994?

7 A. Well, "any" is a pretty broad term. So,
8 for example, you could buy an ammeter, right?
9 They -- they had clip-on ammeters if you wanted to
10 find out how much current your refrigerator was
11 taking, that sort of thing. So current detectors, in
12 the much larger sense of the world, did exist in
13 1994.

14 Q. How about -- so what was the basis of your
15 saying there were virtually no current detectors in
16 November 1994?

17 MR. CRAIN: Object to form.

18 THE WITNESS: What I meant was that, to my
19 knowledge, there were virtually no current
20 detectors used in audio power amplifiers.

21 Q. (By Mr. Das) Does the '542 patent provide
22 details about what sort of current detector to use --

23 MR. CRAIN: Object to --

24 Q. (By Mr. Das) -- in the amplifier?

25 MR. CRAIN: Sorry. Object to form.

1 THE WITNESS: As far as I know, it did not
2 provide details of what kind of a current
3 detector was anticipated for use in the '542
4 patent.

5 Q. (By Mr. Das) In November 1994, were you
6 aware of -- or would a person of ordinary skill in
7 the art, more correctly, know what sort of current
8 detector to use in the amplifier claimed in the '542
9 patent?

10 MR. CRAIN: Object to form.

11 THE WITNESS: In other words, if they had a
12 need to have a current detector that adhered to
13 the definition -- my definition of a current
14 detector, would a person of ordinary skill in
15 the art, let's just say, for example, prior to
16 1994, maybe '80s, '90s, whatever, would they be
17 able to come up with one if they were assigned
18 the task of coming up with one?

19 Is that a fair characterization of your
20 question?

21 Q. (By Mr. Das) Well, why don't you go ahead
22 and answer that question.

23 A. I believe the answer is yes. You know,
24 they may have -- they come with some disadvantages,
25 of course, but, yeah, I believe there were -- there

1 were ways of doing that that a person could come up
2 with.

3 But, again, the answer that I gave earlier
4 was that I did not know of any such current detectors
5 that measured the output current of an amplifier that
6 was -- that was used in a power amplifier.

7 Q. The Claim 5 also asks -- or one of the
8 limitations is "a voltage detector for detecting the
9 voltage supplied to the load."

10 That's the language from Claim 5; correct?

11 A. Right.

12 Q. Now, earlier I think you clarified in your
13 declaration, you also say probably more precisely
14 that would say "voltage detector for detecting the
15 voltage across the load"; is that correct?

16 A. Uh-huh (affirmative).

17 MR. CRAIN: Object to form.

18 Q. (By Mr. Das) You have to say "yes" or
19 "no." That was an example where you sort of made a
20 noise.

21 A. Oh, I'm sorry. I lost -- I actually lost
22 track of what the question was when Andrew distracted
23 me.

24 MR. CRAIN: Sorry about that.

25 MR. DAS: Could we have the question read

1 back, please.

2 (Whereupon, the record was read by the
3 reporter as follows:

4 Question, "Now, earlier I think
5 you clarified in your declaration, you also say
6 probably more precisely that would say 'voltage
7 detector for detecting the voltage across the
8 load'; is that correct?")

9 THE WITNESS: Yes.

10 MR. CRAIN: Same objection.

11 THE WITNESS: Yes.

12 Q. (By Mr. Das) Were there a variety of
13 different voltage detectors that could be used in an
14 amplifier in 1994?

15 A. Yes.

16 Q. And --

17 A. And -- and I think I can give you an
18 example that would -- that would probably better
19 answer your question, and that is that you've
20 probably seen many professional power amplifiers and
21 some consumer amplifiers that on the front panel they
22 have a meter or a bar graph display that gives an
23 indication of the relative amount of output that the
24 power amplifier -- output, you know, voltage that the
25 power amplifier is delivering. That would be an

1 example of a voltage detector.

2 And, of course, as -- as you can imagine,
3 that can amount to nothing more than putting a volt
4 meter -- an AC volt meter from the output node to
5 ground. So that's -- that's a very simple example.

6 Q. And these kind of volt -- voltage meters or
7 bar graph displays that you were talking about, were
8 these available on amplifiers before November 1994?

9 A. Yes.

10 Q. Now, if one measured just the voltage
11 across the load, but not the current delivered to the
12 load, could one compute the impedance -- load
13 impedance?

14 MR. CRAIN: Object to form.

15 THE WITNESS: The answer would be no.

16 Q. (By Mr. Das) And if one measured just the
17 voltage across the load but not the current delivered
18 to the load, could a person compute the power
19 supplied to the load?

20 A. No.

21 MR. CRAIN: Object to form.

22 THE WITNESS: I'm sorry. Apologize.

23 MR. CRAIN: That's all right. Go ahead.

24 THE WITNESS: By the way, I might add that
25 there is -- there's a situation that can mislead

1 a lot of people.

2 If you look at a professional power
3 amplifier that has analog meters, those meters
4 are, in -- in many cases, calibrated in watts,
5 and that would -- could lead somebody to believe
6 that that meter is measuring power.

7 What that meter is doing is it's calibrated
8 in watts as if the load was a resistive 8-ohm
9 load. So it's completely unreliable. It's
10 just -- you know, like, "Oh, Mom, you know, my
11 amplifier is, you know, knocking out 120 watts
12 into that speaker," and there's -- of course --

13 Q. (By Mr. Das) So if the load --

14 A. -- it's a fairytale to believe that
15 that's -- that's really the power.

16 Q. So if the load is not 8 ohms, then of
17 course the power would be --

18 A. That's right. And it's also true if the
19 load is not resistive, that power indication is
20 totally false.

21 Q. And you've mentioned a couple of times
22 loads that are not resistive.

23 So can you give me an example of a load
24 that's not resistive?

25 A. Just about all loudspeaker loads are really

1 not resistive over just about the entire band of the
2 frequency response.

3 And there's -- there are many technical
4 reasons why they're not resistive, and the industry
5 is quite sloppy or perhaps helpfully oversimplified
6 in saying, like, "This loudspeaker is an 8-ohm
7 loudspeaker." And there are some rough industry
8 standards about what would constitute an 8-ohm
9 loudspeaker. Most speaker manufacturers don't even
10 adhere to that.

11 But the point that I'm really trying to
12 make here is that the impedance of the loudspeaker --
13 in other words, you put -- let's say you put 1 volt
14 across that loudspeaker and you sweep the frequency
15 of that 1 volt. The current that is flowing through
16 that loudspeaker will be very different at different
17 frequencies.

18 And if you have a so-called 8-ohm
19 loudspeaker, the impedance that you would infer by
20 those measurements easily could vary from 4 ohms to
21 40 ohms.

22 Q. When you say sweep the frequency --

23 A. Right.

24 Q. -- frequency of what?

25 A. Oh. If you apply a test signal, a

1 sinusoidal test signal of, let's say, 1 volt RMS to
2 that loudspeaker and then you in some way measure the
3 current that's flowing in that loudspeaker, say with
4 an ammeter, and you change that frequency, sweep that
5 frequency from, let's say, 20 hertz to 20 kilohertz,
6 you will find that the current flowing in that
7 loudspeaker varies over a very large range over that
8 frequency span.

9 So another way of saying that is that the
10 impedance, the real load impedance that that
11 loudspeaker presents, is a strong function of
12 frequency.

13 Now, after all of that, I -- I don't
14 remember whether I actually adequately answered your
15 question.

16 Q. You did, but I just want to clarify one
17 other thing, which is: When you're doing this
18 sweeping of this test signal, the -- I think this is
19 implicit in your answer, but you're keeping the RMS
20 fixed at 1 volt, but you're changing the frequency of
21 the sinusoidal?

22 A. That is correct.

23 MR. CRAIN: Object to form.

24 THE WITNESS: Sorry.

25 MR. CRAIN: Just want to wait -- wait and

1 make sure he's done before I jump in.

2 THE WITNESS: By the way, just to add to
3 that, this is something that would -- would be
4 done in a lab.

5 Probably the most common way for the
6 ordinary person to be exposed to this is if you
7 get the magazine Stereophile, you know, they
8 will do -- every month they'll do a review on,
9 you know, one or two loudspeakers, one or two
10 amplifiers.

11 And, you know, part of the review is, "Man,
12 this really sounds good," or, "This is a little
13 harsh with this kind of music," but the other
14 part of the review, which I, of course, like the
15 most, is that they will do laboratory
16 measurements on the loudspeaker and they will
17 almost always present a graph of the impedance
18 of that loudspeaker as a function of frequency.

19 And if you look at that graph, you -- you
20 will see the large variations that I just
21 described.

22 Q. (By Mr. Das) And we had talked about this
23 before and I just found it in your declaration, which
24 is -- I don't have a question about this; I'm just
25 reading this out to you --

1 A. Sure.

2 Q. -- because we talked about this before. I
3 wanted to make sure I wasn't misleading you.

4 Paragraph 12, it says, "The value of the
5 load impedance is the ratio of the voltage across the
6 load to the current passing through the load."

7 Again --

8 A. I'm sorry. What paragraph was it?

9 Q. Paragraph 12.

10 A. Oh, okay.

11 Q. It's the very last sentence of that
12 paragraph.

13 A. Sure.

14 Q. Just because earlier I said, "Oh, I think I
15 saw it in your declaration." I just found it.

16 A. Got it.

17 Q. One quick point of clarification on
18 paragraph 18, the very last sentence. Please let me
19 know when you've had a chance to review it.

20 A. This is the sentence that begins with the
21 phrase, "The digital signal processor..."?

22 Q. "Must," right.

23 A. Yes.

24 Q. And the question I had is: Is that a
25 statement you're making about all digital signal

1 processors?

2 MR. CRAIN: Object to form.

3 THE WITNESS: Certainly not.

4 Q. (By Mr. Das) Okay. So is this specific to
5 the digital signal processor disclosed in the --
6 disclosed or claimed in the '542 patent?

7 MR. CRAIN: Object to form.

8 THE WITNESS: It's specific to the
9 amplifier architecture that's described in the
10 '542 patent.

11 Q. (By Mr. Das) Okay.

12 A. By the way, I didn't mean to interrupt, but
13 I guess that would be fairly clear because this was
14 in the section of the overview of the '542 patent.

15 Q. Right, right.

16 And, again, I just wanted to confirm
17 whether you were talking about the digital signal
18 processor in the '542 patent or generally --

19 A. Sure.

20 Q. -- about signal processors, that's --
21 that's all, and you've clarified it.

22 In paragraph 20, if you could just review
23 that, and I have some questions about that.

24 A. Yes.

25 Q. So the first sentence talks about, "The

1 '542 patent also addresses the need to make changes
2 in processing prog- -- programs and their parameters
3 in realtime, while the amplifier is operating and
4 delivering a signal to its loudspeaker(s)."

5 A. Yes.

6 Q. Is there any language in Claim 5 that talks
7 about making changes to processing programs and their
8 parameters in realtime?

9 MR. CRAIN: Object to form.

10 THE WITNESS: I do not see any reference to
11 "realtime."

12 Q. (By Mr. Das) How about in paragraph --
13 Claim 13, is there any reference to making changes to
14 signal processing programs and their parameters in
15 realtime?

16 MR. CRAIN: Object to form.

17 THE WITNESS: I do not see one. I do not
18 see a reference to "realtime" in Claim 13.

19 Q. (By Mr. Das) And the second part of
20 paragraph 20 of your declaration talks about remote
21 monitoring, where you talk about "setup technician to
22 listen to the effects of the changes being made, even
23 at a located -- location that is remote from the
24 amplifier...." The -- so that's what I mean when I
25 say "remote monitoring."

1 A. Uh-huh (affirmative).

2 Q. Is there --

3 A. I'm sorry. Yes.

4 Q. Thank you for correcting that.

5 Is -- is there any language in Claim 5 that
6 refers to remote monitoring?

7 MR. CRAIN: Object to form.

8 THE WITNESS: I do not see any language in
9 Claim 5 that refers to remote monitoring.

10 Q. (By Mr. Das) How about any language in
11 Claim 13 that refers to remote monitoring?

12 MR. CRAIN: Object to form.

13 THE WITNESS: I do not see any such
14 language in Claim 13.

15 Q. (By Mr. Das) The last sentence that talks
16 about the '542 patent also addresses the need to
17 perform monitoring, diagnosis, and testing in
18 realtime.

19 Now, based on your earlier testimony about
20 not seeing any reference to realtime --

21 A. Uh-huh (affirmative).

22 Q. -- in Claim 5, is it accurate to say Claim
23 5 doesn't talk about monitoring, diagnosis, and
24 testing in realtime?

25 MR. CRAIN: Object to form.

1 THE WITNESS: The sentence in Claim -- or
2 the sentence you're referring to, the last
3 sentence in paragraph 20, it says that the
4 patent addresses that need, that it -- that it
5 has the -- the amplifier so made has that
6 capability.

7 However, I agree that I do not see language
8 that refers to that in -- in those claims.

9 Q. (By Mr. Das) And -- and "in those claims"
10 meaning Claim 5 and Claim 13; correct?

11 A. That is correct.

12 Q. Okay. Does -- Claim 5 of the '542 patent,
13 is it directed to a protection circuit or a
14 protection scheme?

15 MR. CRAIN: Object to form to the extent it
16 calls for a legal conclusion.

17 MR. DAS: Objection to form.

18 THE WITNESS: I'm sorry. Your question was
19 is there any reference to a protection scheme in
20 Claim 5 --

21 Q. (By Mr. Das) Correct.

22 A. -- if I understood right.

23 No. No.

24 Q. Is there any reference to protection scheme
25 in Claim 13?

1 MR. CRAIN: Object to form.

2 THE WITNESS: No. And, of course, for
3 purposes here, I understand that Claim 5 and
4 Claim 13 have very little difference between
5 them.

6 Q. (By Mr. Das) What is the difference
7 between them?

8 A. Okay. Claim 5 refers to the calculation of
9 the impedance of the load and Claim 13 refers to
10 the -- I'm sorry. Oh, I'm sorry. I was looking at
11 the wrong part of it.

12 Claim 3 [sic] largely is referring to the
13 calculation of the power delivered to the load.

14 Q. You said Claim 3. I --

15 A. I'm sorry. I meant Claim 13.

16 Q. I think you --

17 A. Thank you for correcting me.

18 And, of course, I would point out that
19 Dr. Ellis was correct in -- I believe he also
20 indicated that those differences were very minor and
21 once you had the needed information, one required you
22 to perform a multiplication; the other required you
23 to perform a division.

24 Q. Which is, of course, a multiplication.

25 A. I'm sorry?

1 Q. Which is, of course, a multiplication to us
2 mathematicians, because it's just the inverse.

3 A. Okay.

4 Q. But, yeah, I -- I take it one --

5 A. Sure.

6 Q. -- is the ratio of voltage to current; the
7 other is the product.

8 A. That's right. That's right.

9 Q. If you could turn to paragraph 42 of your
10 declaration. It's on page 50 if that helps?

11 A. Sure. I just wanted to refresh my memory
12 as to what section.

13 Q. Oh, right. Yeah.

14 A. Okay. That paragraph is in the section
15 that I called "Terminology."

16 Q. And, in fact, Mr. Cordell, let me say this,
17 although I suspect Mr. Crain may have told you this.

18 Whenever I'm asking you about a specific
19 portion of your declaration or any other document,
20 feel free to read other parts of the document to make
21 sure you understand the context. I -- it's -- I --
22 I'm not --

23 A. Please it --

24 Q. -- picking a word out -- out of context --

25 A. Understood. Understood.

1 Q. -- and saying, "Aha, I got you." That's
2 not my --

3 A. I understand, but I appreciate you saying
4 that.

5 Q. And by the way, we were both talking over
6 each other.

7 A. It's human nature.

8 Q. You -- you mention, "A 'digital signal
9 processor' is an integrated circuit, or a subsystem
10 consisting of a group of integrated circuits,"
11 et cetera, and then you say, "The term 'DSP' is often
12 used to describe the integrated circuit where most of
13 the processing takes place."

14 A. That's correct.

15 MR. CRAIN: Object to form.

16 Q. (By Mr. Das) In your declaration, are you
17 using the term "digital signal processor" differently
18 from "DSP"?

19 A. I made an attempt. I can't say that I've
20 always been consistent, but just for my own
21 understanding, I like to lean toward the use of the
22 term "DSP" when most of what's in my mind is the
23 chip.

24 But the main purpose of me saying that was
25 to indicate that the digital signal processor could,

1 in some cases, consist of a single chip or a digital
2 signal processor could consist of a combination of
3 some chips. And different people use it different
4 ways.

5 Q. And keeping in mind your caveat that you --
6 you may not have been consistent --

7 A. Right.

8 Q. -- does that mean if we see the term "DSP"
9 in your declaration, the intent would have been to
10 refer to a chip?

11 MR. CRAIN: Object to form.

12 THE WITNESS: That would often be the case,
13 but I would not hang my hat on that.

14 Q. (By Mr. Das) Okay. And when the '542
15 patent is talking about a digital signal processor,
16 do you understand it to mean a single chip or could
17 it cover more than one chip used as a subsystem?

18 MR. CRAIN: Object to form.

19 THE WITNESS: I do not understand it one
20 way or the other. It -- I don't know any
21 details about whether Crest implemented this
22 patent and, if they did implement it, how they
23 implemented it. So I would have to just leave
24 open the possibility that it could be a single
25 chip or a group of chips.

1 Q. (By Mr. Das) So I guess in a different
2 context, let me reask that question.

3 A person of ordinary skill reading the '542
4 patent, would they understand the clause "digital
5 signal processor" to refer to a single chip or a
6 subsystem consisting of multiple chips?

7 MR. CRAIN: Object to form.

8 THE WITNESS: I think they would understand
9 it largely in the way that I just described it.
10 In other words, we're talking about slang and
11 semantics here, so it is -- it is quite likely
12 that a person of ordinary skill in the art would
13 realize that it could either be a single chip or
14 a collection of chips.

15 MR. DAS: Why don't we take a break.

16 THE WITNESS: Sure.

17 MR. CRAIN: Sure.

18 VIDEOGRAPHER: This is the end of Video 3.
19 We are off the record at 2:19 p.m.

20 (Thereupon, there was an interruption in
21 the proceedings.)

22 VIDEOGRAPHER: This is the beginning of
23 Video 4. We are on the record at 2:36 p.m.

24 Q. (By Mr. Das) Mr. Cordell, during this
25 break, did you have an opportunity to speak with

1 Crest's counsel?

2 A. Yes.

3 Q. And did you talk about the substance of
4 your testimony today?

5 A. No, we did not.

6 Q. Did you discuss the substance of the
7 testimony you're about to give?

8 A. No, we did not.

9 Q. Did -- were any recommendations made as to
10 how you should answer questions in this deposition?

11 A. No, they were not.

12 Q. If you could turn to paragraph 45 of your
13 declaration.

14 A. Yes.

15 Q. And if -- let me know when you've had a
16 chance to review that paragraph.

17 A. Yes.

18 Q. Now, the middle of that paragraph, it says,
19 "...virtually no programmability of the DSP function
20 (program) or parameters (coefficients)...."

21 Did I read that correctly?

22 A. Yes, you did.

23 Q. In your opinion, is there a difference
24 between a DSP function and a DSP program?

25 MR. CRAIN: Object to form.

1 THE WITNESS: There can be. And if you
2 would like me to give an example, I will.

3 Q. (By Mr. Das) That would be terrific.

4 A. In the context of this patent, the "DSP
5 function" is largely synonymous with "DSP program."
6 My insertion of the term "program" is an indication
7 that I want to be careful to make sure the term
8 "function" is semantically understood correctly.

9 Now, let me give you a counterexample.
10 In -- in electrical engineering, there are things
11 like transfer functions. So, for example, if you
12 have something that has a frequency response that is
13 not uniform across the band, it is often said that
14 that has a transfer function, and that is a different
15 semantical use of the term "function" than what we're
16 talking about here.

17 Q. Now, earlier we were talking about these
18 cir- -- current limiter circuits.

19 A. The protection circuits?

20 Q. The protection circuits, correct.

21 A. Yes.

22 Q. So -- and I think you've mentioned that
23 you'd have these transistors where if the difference
24 between the base and emitter voltage was greater than
25 .5 volts, current would start flowing, which would be

1 the initiation of the protection action.

2 You recall that?

3 A. Yes, I do.

4 Q. So in -- if one were to take -- and in that
5 example, you were using sort of a hardware solution,
6 because you've got a transistor that's getting
7 base -- base voltage and emitter voltage --

8 A. Yes.

9 Q. -- comparing it.

10 If one were to try to represent that as a
11 sort of a pseudocode -- and I'm going to take a shot
12 at this --

13 A. Okay.

14 Q. -- and I might screw this up -- but,
15 basically, it would say something like if base
16 voltage greater than -- if base voltage minus emitter
17 voltage is greater than .5 amps --

18 A. Volts.

19 Q. -- .5 volts, allow current to flow --

20 A. Yes.

21 Q. -- right?

22 A. It's highly oversimplified, but basically
23 correct.

24 Q. Right.

25 And so in that situation, I'm wondering if

1 you would consider the function to be base voltage
2 minus emitter voltage and the program to be this
3 whole "if/then" kind of statement?

4 MR. CRAIN: Object to form.

5 THE WITNESS: I think I would virtually
6 never make an analogy between the steps in a
7 software program and what happens in an analog
8 circuit, but that -- that's just me.

9 So, you know, a -- a third use -- the poor
10 word "function" gets used all over the place, so
11 one has to be very careful. You know, the
12 function of an LED is to provide light when
13 current is made to flow through the LED. That
14 is a third use of the word "function."

15 So I'm just saying we have to be cautious
16 about that word, "function."

17 Q. (By Mr. Das) And I appreciate that.

18 In the context of this patent --

19 A. Yeah.

20 Q. -- when it's talking about digital signal
21 processing functions, what is this patent referring
22 to?

23 MR. CRAIN: Object to form.

24 THE WITNESS: Digital signal processing
25 functions, in the context of the '542 patent and

1 as far as I understand it, is referring to the
2 program that is being executed by the digital
3 signal processor.

4 You might note that there is also the term
5 "function parameters," and that has to do with,
6 as an example, coefficients.

7 So does that answer your question or --

8 Q. (By Mr. Das) It -- it really doesn't,
9 because I'm trying to --

10 A. I'm sorry.

11 Q. No, and that's because, again, we're trying
12 to get to the bottom of this.

13 You're -- you seem to say that
14 "coefficients" and "parameters" mean the same thing.

15 MR. CRAIN: Object to form.

16 THE WITNESS: In the context of the '542
17 patent, I am largely using the term "function
18 parameters" and "coefficients" interchangeably.

19 Q. (By Mr. Das) And is that how a person of
20 ordinary skill would use the terms "function
21 parameters" and "coefficients"? Would they use them
22 interchangeably?

23 A. If that person of ordinary skill had read
24 this patent and understood the context in which words
25 are being used in this patent, then the answer is

1 yes.

2 Q. And what -- where -- where in the patent --
3 what language are you looking to in this patent that
4 tells you that digital signal processing functions
5 and coefficients are being used interchangeably?

6 MR. CRAIN: Object to form.

7 THE WITNESS: I can't -- I can't
8 specifically tell you that. I mean, I read the
9 patent many, many, many times and, you know, my
10 personal interpretation or translation was into
11 my own comfort zone language, and my comfort
12 zone language is "programs" and "coefficients."

13 And I deduced for my own convenience that
14 in this patent, when they say "function," that's
15 my -- what's going through my mind is "program"
16 and when they say "function parameters," what's
17 going through my mind is "coefficients."

18 And, you know, other -- other electrical
19 engineers that -- you know, that are familiar
20 with this sort of stuff might similarly be more
21 comfortable with the term "program" and
22 "coefficients."

23 Q. (By Mr. Das) So -- and I can give you a
24 pad because I'm about to ask you to look at -- write
25 down something so we can talk this through.

1 A. Okay.

2 Q. I'll give you some paper, too.

3 A. Oh.

4 Q. You may not need to write it down; you may.
5 I don't know.

6 A. All right. Sure.

7 Q. And, again, it goes back to the whole math
8 background thing and I apologize if what I'm asking
9 really doesn't make sense, but I -- I'm, again, just
10 trying to get to the bottom of this
11 function/program/coefficient/parameters.

12 A. Sure.

13 Q. So -- so if I had a program that said if F
14 of X is greater than K, do something; if F of X is
15 less than or equal to K, do something else -- okay?
16 You with me so far?

17 MR. CRAIN: Object to form.

18 THE WITNESS: I think I'm with you so far.

19 Q. (By Mr. Das) -- and F of X was given as a
20 function of AX squared plus BX plus C --

21 MR. CRAIN: Object to form.

22 THE WITNESS: Like a polynomial.

23 Q. (By Mr. Das) Like a polynomial.

24 -- would you differentiate between K as a
25 parameter and A, B, and C as coefficients or would

1 you treat those all the same?

2 MR. CRAIN: Object to form.

3 THE WITNESS: I really -- I really can't
4 say, because I -- I just don't do things that
5 way.

6 You know, I know a coefficient when I see
7 it, you know, like if it's in an FIR filter --

8 Q. (By Mr. Das) Uh-huh (affirmative).

9 A. -- but in the general context of a
10 mathematical equation or something, you know, I'm
11 sure if I gave it a lot more thought and maybe
12 brushed up on my, you know, mathematical skills or
13 whatever you want to call it, you know, I might be
14 able to come to that conclusion. But I -- I just --
15 in realtime, I'm a little bit hesitant to.

16 Q. (By Mr. Das) Okay. Then --

17 A. That -- that kind of a question, in terms
18 of the terminology, is a little out of my comfort
19 zone.

20 Q. You talked about FIR filters.

21 A. Yes.

22 Q. And do -- do FIR filters -- what would a
23 typical FIR filter look like if you wrote it out?
24 Can you write it out or --

25 MR. CRAIN: Objection. Compound.

1 THE WITNESS: I think I can describe it
2 better.

3 Q. (By Mr. Das) Okay.

4 A. In an FIR filter -- which, by the way, is a
5 form of digital signal processor, it's not a
6 general-purpose digital signal processor -- but you
7 might have, let's say for simplicity, four stages of
8 delayed versions of the signal.

9 And at each one of those -- the output of
10 each one of those stages, you take the signal, run it
11 through a multiplier, and then sum the outputs of all
12 of those multipliers to get a result.

13 The factors by which those multipliers are
14 multiplying those multiplicity of signals, those
15 would be coefficients.

16 Q. Would they also be referred to as
17 parameters?

18 A. In the context of this patent, if they're
19 talking about an FIR filter function, in this patent,
20 they would probably refer to those as function
21 parameters. That's -- that's the way I certainly
22 would interpret it.

23 Q. Okay. And if you change those multipliers,
24 the coefficients --

25 A. Yes.

1 Q. -- are you not getting a different
2 function?

3 MR. CRAIN: Object to form.

4 THE WITNESS: You are not getting a
5 different function in the context of the way the
6 term "function" is used in the '542 patent.

7 Q. (By Mr. Das) And why not?

8 A. As I said earlier, there are different
9 semantic interpretations of the word "function."

10 So when you change those coefficients that
11 we talked about, you get a different transfer
12 function, and the -- and this is the use of the term
13 "function" with respect to like a transfer function
14 and a frequency response.

15 But the -- the function, again, in the
16 context of the '542 patent of a four-stage FIR filter
17 is fixed, and because it's not a programmable or
18 general-purpose DSP, it is basically hard wired to
19 accomplish that function.

20 Q. What is not a general-purpose DSP?

21 A. If you build an FIR filter in the way that
22 I described, which, in fact, I have done at Bellcore
23 for video filtering, that is an example of what we
24 would call a special-purpose digital signal processor
25 which often is hard wired. In other words, it's a

1 circuit that has a fixed topology and interconnection
2 of -- of wires and values of resisters and so on.
3 It's -- it's -- it's basically not programmable.

4 Q. In that hard wired example --

5 A. Yes.

6 Q. -- would you be able to change the
7 coefficients?

8 A. Yes.

9 Q. And how would you do that?

10 A. In -- in the example where I did it at
11 Bellcore, the coefficients were held in a -- a
12 multi-bit shift register, as it were, with pretty
13 much the same number of stages as the order of the
14 FIR.

15 And the way we would choose those
16 coefficients or enter those coefficients is that we
17 would clock these different -- a sequence of 8-bit
18 words into -- into the front end of this shift
19 register so if it was eight-stage -- if it was an
20 eight-stage FIR filter, we would -- with eight
21 clocks, we would clock in eight different eight-bit
22 numbers.

23 So this FIR filter was a programmable FIR
24 filter in the sense of coefficients, but not in the
25 sense of function as we use the word "function" in

1 the '542 patent.

2 Q. And is there any express language in the
3 '542 patent that says when we -- we're talking about
4 digital signal processing functions, we're not
5 talk- -- a difference between the coefficients of two
6 FIR filters would not be considered different digital
7 signal processing functions?

8 MR. CRAIN: Object to form.

9 THE WITNESS: I'm not even sure that I
10 totally -- and I apologize -- totally got the
11 question. Maybe you could repeat the question
12 and maybe I can read back to you what I thought
13 the question was.

14 Q. (By Mr. Das) Okay. So let -- let me take
15 another shot at it.

16 A. Sure. Sure.

17 Q. I may not have gotten it right.

18 So, again, let's focus on the initial
19 example you gave, which was an FIR filter with four
20 stages of delayed versions of the signal.

21 If you had two such FIR filters with
22 different coefficients, so one had -- you know, 1, 2,
23 1, 4 and the other was 2, 1, 3, 4, is there any
24 express language in the '542 patent that tells you
25 that as far as the '542 patent is concerned, those

1 two FIR filters would be considered the same digital
2 signal processing function?

3 MR. CRAIN: Object to form.

4 THE WITNESS: I -- I don't think this
5 answers your question, but I'll say it anyway.

6 My understanding is that in the context of
7 the '542 patent, those two examples that you
8 gave me would have the same function, but
9 different function parameters.

10 Does -- is that an adequate answer?

11 Q. (By Mr. Das) Yeah, that's an --

12 A. Okay.

13 Q. -- adequate answer.

14 A. Maybe I can clarify one more thing.

15 Q. Uh-huh (affirmative).

16 A. If one of those FIR filters had eight
17 stages and the other one had four stages, once again,
18 in the context of the '542 patent, they would --
19 those would be examples of the functions being
20 different.

21 Q. Okay. So I'm curious. If you -- if I
22 understood how the FIR filter works, it's basically
23 the coefficients -- and I'm using language from one
24 of the references of -- the coefficients are alpha I
25 and these input data are DI; right? It's just sum of

1 alpha I times DI, is how the FIR filter works.

2 You multiply each --

3 A. Oh, yeah, like that.

4 Q. Yeah, yeah. Summation alpha I times DI?

5 A. Yeah, like 0 to 3 --

6 Q. Right.

7 A. -- for a 4 -- 4-tab guy.

8 Q. Right.

9 A. That's right.

10 Q. Right.

11 A. There's certainly other topologies that
12 would be possible that would still be called FIRs,
13 but for what we're talking about here, I think you're
14 correct.

15 Q. Okay. And so if I had two eight-stage FIR
16 filters, and so summation 0 to 7 --

17 A. Uh-huh (affirmative).

18 Q. -- alpha I, DI; correct?

19 A. Yes.

20 Q. And in one of the FIR filters, alpha 4, 5,
21 6, and 7 are set to zero, and in the other one, none
22 of the coefficients are zero.

23 Would the first FIR filter not just be a
24 four-stage FIR filter?

25 MR. CRAIN: Object to form.

1 THE WITNESS: It would still be an
2 eight-stage FIR filter, because the coefficients
3 that you're allowed to put into an FIR filter
4 are different values.

5 I mean, you could have the middle stage,
6 let's say alpha 4 --

7 Q. (By Mr. Das) Uh-huh (affirmative).

8 A. -- could be zero, but alpha 5 might be 2
9 and alpha 7 might be zero. That would still be an
10 eight-stage FIR filter.

11 Q. But I was -- if you could focus on the one
12 example that I was using, which was alpha 4, 5, 6,
13 and 7 were zero. So only summing the first four
14 stages because the last four stages are contributing
15 zero to this filter.

16 Why is that not considered a four-stage FIR
17 filter?

18 MR. CRAIN: Object to form. Improper
19 hypothetical.

20 THE WITNESS: Because, in fact, you are
21 summing all of those products. You're summing
22 eight products, a couple of which happen to be
23 zero.

24 But the hardware or in the case of a stored
25 program-controlled version of that, you're still

1 going to have and the function will be an
2 eight-stage FIR. That's -- it would be a
3 programmable FIR if you, you know, are -- if the
4 architecture allows you to put in whatever
5 coefficients you want. You always have the
6 choice to put in zeros, but it's still an
7 eight-stage FIR.

8 Now --

9 Q. (By Mr. Das) Go ahead.

10 A. -- if you want to say that the end result,
11 the frequency response of the FIR you described, is
12 the same as the frequency response of an -- of a
13 four-stage FIR filter because those coefficients --
14 those last four coefficients are zero, you're free to
15 do that, but that doesn't change the fact that the
16 former is, indeed, an eight-stage FIR filter.

17 Q. And four-stage FIR filter would be just
18 doing a sum of these products, pair products, of four
19 entries; correct?

20 MR. CRAIN: Object to form.

21 THE WITNESS: Well, there's a distinct
22 hardware difference, and, in fact, one would --
23 if one expands the -- the use of the term
24 "frequency response" to include the time domain
25 de- -- behaviors, these two filters -- in other

1 words, the -- the eight-stage filter with the
2 last four coefficients being zero and the
3 four-stage filter with, obviously, no additional
4 coefficients -- and if you put these two in a
5 black box and gave me that and put it in a lab,
6 I would immediately be able to tell you the
7 difference, which one was eight and which one
8 was four.

9 The reason I say that is because the --
10 when you talk about the complete transfer
11 function, you know, the transform or whatever,
12 there would be four additional stages of time
13 delay. The latency going through those filters
14 would be different.

15 So the point is that an eight-stage FIR is
16 an eight-stage FIR, whether or not it is
17 programmed to have zeros in any of the locations
18 of the FIR.

19 Q. (By Mr. Das) Okay. And excuse me if I --

20 A. Sure.

21 Q. -- asked this already.

22 Is there language in the '542 patent that
23 states, expressly or implicitly, that two eight-stage
24 FIR filters that have different coefficients are not
25 considered to be different DSP functions?

1 MR. CRAIN: Object to form.

2 THE WITNESS: I don't recall seeing the
3 term "FIR" in the '542 patent anyway.

4 The reason we brought all of this up was
5 either it behooved me or you asked me to give
6 you an example, which I tried to do. Not -- not
7 all the simple examples I can give you are going
8 to be drawn from the '542 patent.

9 Q. (By Mr. Das) And we were trying to
10 understand the difference between coefficients and
11 parameters.

12 A. That's right.

13 MR. CRAIN: Object to form.

14 (Petitioner's Exhibit 6 was marked for
15 identification.)

16 THE WITNESS: Thank you.

17 COURT REPORTER: You're welcome.

18 MR. CRAIN: What number is this one?

19 MR. DAS: Exhibit 6.

20 MR. CRAIN: Thank you.

21 Q. (By Mr. Das) Mr. Cordell, I've handed you
22 what's been marked as Exhibit 6. Please let me know
23 when you're done reviewing it.

24 A. This appears to be the data sheet for the
25 TMS320 second-generation series of digital signal

1 processors.

2 Q. Okay. And have you seen this document
3 before?

4 A. Yes, I have.

5 Q. And in what context have you seen it?

6 A. I believe it was -- I'm quite certain it
7 was one of the references that was supplied by QSC.

8 Q. Supplied to the board?

9 A. Yes. I mean, it ended up in my hands
10 from -- from --

11 Q. Crest's counsel?

12 A. -- from Crest's counsel, that's correct.

13 Q. Now, earlier when we were talking about
14 documents you may have found --

15 A. Yes.

16 Q. -- by doing searches, you mentioned you --
17 you weren't positive if it was -- if it was called a
18 user manual or an application note for TMS320.

19 A. That is correct.

20 Q. Is -- is that different from this document?

21 A. Yes, it is.

22 Q. And do you recall where you referenced that
23 in your declaration?

24 A. I'll -- let's see. I apologize.

25 Q. And --

1 A. This may take a couple of minutes.

2 Q. Right. And --

3 A. But I think I can find it.

4 Q. Okay.

5 A. I -- I'll -- I'll give it a shot.

6 Yes, I have found it. It's at the bottom
7 of page 34 and it is Footnote 61.

8 Q. And that references back to paragraph 98;
9 correct?

10 A. That is correct.

11 Q. Okay. And this is a discussion of 16-bit
12 data bus and 16-bit address bus?

13 A. I'm sorry. What was the word that you used
14 before the address bus and data bus? The -- the
15 what?

16 Q. This footnote is referencing the 16-bit
17 data bus and the 16-bit address bus; correct?

18 A. Yes. It's referencing, let's just say,
19 ways in which they can be used.

20 Q. Okay. Are you aware of any other places
21 where you reference this user's guide? In your
22 declaration, sorry.

23 MR. CRAIN: Object to form.

24 THE WITNESS: Well, with respect to this
25 declaration, I only have a few more pages to go,

1 so I'll take the liberty of doing that.

2 I do not see any other reference in this
3 declaration to that --

4 Q. (By Mr. Das) And -- and I'm --

5 A. -- document.

6 Q. -- not aware of any other either.

7 A. Okay.

8 Q. If you can go back to your declaration for
9 a minute, please.

10 A. Uh-huh (affirmative).

11 Q. Actually, you're in your declaration, so we
12 don't need to go back to it.

13 If you look at paragraph 45 and let me know
14 when you've had a chance to review it.

15 A. Yes.

16 Q. And you are referencing patent 5,822,775 to
17 Sudo, et al. in the footnote?

18 A. Yes.

19 Q. Do you recall why you were referencing the
20 Sudo in that context?

21 A. Well, this was the introduction to my
22 section on state of the art. I think I was just
23 referencing Sudo as an example of consumer
24 electronics where -- where that was the case.

25 Q. And we'll talk about Sudo --

1 A. Sure.

2 Q. -- a lot more tomorrow --

3 A. Sure.

4 Q. -- because that's one of the main
5 references in that. But, again, I was just curious
6 about the reference to Sudo in this context of the
7 '542.

8 The TMS320 data sheet that we were talking
9 about, when you're discussing that later, you -- in
10 paragraph -- in the Section G on page 34 -- that's
11 where you're talking about this data sheet --

12 A. Did you say page 34 --

13 Q. Yes.

14 A. -- or paragraph?

15 Q. Yes, page -- page 34, yes, Section G as in
16 George.

17 A. Okay.

18 Q. Now, in your discussion, you acknowledge
19 that the TMS320 includes both RAM and either ROM or
20 EPROM; correct?

21 MR. CRAIN: Object to form.

22 THE WITNESS: There are two versions of the
23 TMS320, the TMS320C25, which is ROM
24 programmed -- in the industry, we would call
25 that mask programmed -- and the TMS320E25, which

1 uses EPROM.

2 Q. Okay. And both of them, however, include
3 also RAM?

4 A. That is correct, yes.

5 Q. So if you could go -- look at Exhibit C and
6 look at page 6 of Exhibit C.

7 MR. CRAIN: Exhibit C?

8 MR. DAS: Exhibit 6.

9 THE WITNESS: Did you mean to say
10 Exhibit 6?

11 Q. (By Mr. Das) 6. I'm sorry.

12 A. Page 6 did you say?

13 Q. Page 6 of Exhibit 6.

14 A. Yes.

15 Q. And on the lower portion of this block
16 diagram, do you see where it discloses three blocks
17 of RAM?

18 MR. CRAIN: Object to form.

19 THE WITNESS: I see on the left-hand side a
20 block labeled "Data RAM."

21 Q. (By Mr. Das) And what's the block number
22 for that?

23 A. That is Block B2.

24 And I see another block labeled
25 "Data/Program RAM," and that is labeled Block B0.

1 And there's probably a Block B1 somewhere.

2 My eye hasn't caught it yet.

3 Q. At the risk of interrupting --

4 A. You said there were three.

5 Q. Right.

6 At the risk of interrupting you, actually
7 that big square that says Block B2, right, within the
8 same --

9 A. Uh-huh (affirmative).

10 Q. -- thing, it also says "Block B1."

11 A. Oh, I see the dotted line, yes.

12 Q. So if you could turn to page 7 of this
13 exhibit.

14 A. Yes.

15 Q. And do you see the subheading "Memory
16 Control"?

17 A. Yes, I do.

18 Q. Let me know once you've had a chance to
19 review that first paragraph.

20 And, again, feel free to read more than
21 that --

22 A. Okay.

23 Q. -- if you need to.

24 A. Thank you.

25 Yes.

1 Q. I'm really interested in the very last
2 sentence in that paragraph where it says, "When using
3 Block B0 as program memory, instructions can be
4 downloaded from external program memory into on-chip
5 RAM and then executed."

6 Do you see that sentence?

7 A. That's right. I do.

8 Q. And so based on this -- and -- and do you
9 have any reason to believe this inaccurately
10 represents how the TMS320 would be used?

11 A. No. I mean, the block diagram, you know, I
12 have no problem with that.

13 Q. Okay. And so if TMS320 was being used as a
14 digital signal processor in an amplifier, would it be
15 possible to store signal processing functions in this
16 Block B0?

17 A. I will assume that the answer is yes. What
18 I'm looking at here that I hesitate a little bit on
19 is that there are only arrows entering that block,
20 none leaving that block. And -- but, of course, it's
21 not a write-only memory.

22 Q. Right.

23 And -- and it does say that -- that
24 sentence I read in that paragraph does say, "When
25 using Block 0 as program memory, instructions can be

1 downloaded from external program memory into on-chip
2 RAM and then executed."

3 A. That's right. You can -- I read it to mean
4 that you can -- that DSP can execute out of RAM B0.

5 Q. Okay. And if you would go back to
6 Exhibit 5, which is the '542 patent, and if you were
7 to go to Claim 5.

8 A. Yes.

9 Q. Would you agree that this TMS320 chip would
10 meet this limitation of "a digital signal processor
11 capable of receiving and storing at least one of an
12 algorithm which defines at least one signal
13 processing function and signal processing function
14 parameters..."?

15 MR. CRAIN: Object to form. Calls for a
16 legal conclusion.

17 THE WITNESS: I'm sorry. Repeat the
18 question, please.

19 MR. DAS: Could we have the question read
20 back, please.

21 (Whereupon, the record was read by the
22 reporter as follows:

23 Question, "Okay. And if you
24 would go back to Exhibit 5, which is the '542
25 patent, and if you were to go to Claim 5."

1 Answer, "Yes."

2 Question, "Would you agree that
3 this TMS320 chip would meet this limitation of
4 'a digital signal processor capable of receiving
5 and storing at least one of an algorithm which
6 defines at least one signal processing function
7 and signal processing function parameters...'?")

8 THE WITNESS: I do agree.

9 Q. (By Mr. Das) Okay.

10 (Petitioner's Exhibit 7 was marked for
11 identification.)

12 THE WITNESS: Thanks.

13 COURT REPORTER: You're welcome.

14 Q. (By Mr. Das) Mr. Cordell, I should have
15 warned you, one of the main things about depositions
16 is managing piles of paper --

17 A. I can see that from my experience right
18 now. You haven't seen my office at home.

19 Q. I have not.

20 MR. CRAIN: And if you have, we have big
21 problems. I'm just saying.

22 MR. DAS: That would have been fun if I
23 would have said, "What are you talking about? I
24 was there last week."

25 THE WITNESS: Yeah, we met -- we met last

1 week. We didn't even know that we were gonna be
2 here together in a deposition.

3 Q. (By Mr. Das) But anyway, going back to
4 more serious topics, I've just -- I've handed you
5 what's been marked as Exhibit 7.

6 Can you please review it and let me know
7 once you're done with your review?

8 A. Yes, I recognize this as Black.

9 Q. And Black is one of the references, again,
10 that petitioner relied on in their IPR; correct?

11 A. That is correct.

12 Q. And do you recognize it from having been --
13 having seen this as part of preparing your
14 declaration?

15 A. That is correct.

16 Q. Black refers to something called
17 saturation.

18 A. Yes.

19 Q. Do you understand what "saturation" means
20 in the context of what's disclosed in the Black
21 reference?

22 A. I believe I do.

23 Q. And what does it mean?

24 A. My understanding is that when an amplifier
25 enters saturation, the change in the output voltage

1 of the amplifier will no longer accurately track the
2 change of the voltage being fed into that amplifier.

3 Q. And in an audio amplifier, is that what
4 would be referred to as clipping?

5 A. They are very much the same. They are not
6 quite identical, but in many cases, they can be
7 considered to be the same sort of thing.

8 In other words, the -- the amplifier is
9 unable to produce the output that is being called for
10 in correspondence with the amplitude of the input
11 signal and the nominal gain of the amplifier.

12 Q. If you -- this is the first one where we're
13 going to have different page numbers, so --

14 A. Okay. Thank you for warning me.

15 Q. -- so I'm going to use the page numbers on
16 the bottom of the document.

17 A. Got it.

18 Q. Okay. So if you could turn to page 5 of
19 the Black reference and the paragraph that starts at
20 approximately line 17 and goes through line 28. If
21 you could just review that and let me know --

22 A. Sure. Okay.

23 Q. The middle of that paragraph, it says,
24 "Satura-" -- "Saturation of the power amplifier can
25 cause two problems. Namely, the saturated power

1 amplifier may damage some properties of the power
2 amplifier (PA), subsequently reducing the efficiency
3 of the PA's operation."

4 You see that?

5 A. Yes, I do.

6 Q. And do you recall if Black discloses the
7 use of a DSP?

8 A. Let me double check here.

9 Yes, he does.

10 Q. And do you recall how the DSP is being used
11 in Black?

12 A. The DSP, in very general terms, is being
13 used to manage the turn on and turn off of the RF
14 power amplifier.

15 And it's -- it's a first order being used
16 to make that turn on and turn off avoid, to the
17 extent possible, having the amplifier enter
18 saturation. It's -- it may very well be doing other
19 things, but my recollection is that that is the --
20 the primary goal that I'm -- I'm familiar with in
21 Black.

22 Q. Okay. So, again, if I can point you to a
23 more specific portion and have you review it. On
24 pages 10 and 11, again using the page numbers on the
25 bottom, there's basically -- the paragraph starting

1 at line 11 on page 10 and then the following
2 paragraph, if you could just review those. And I
3 recognize they're a little bit long, but if you could
4 review those and I had some questions.

5 A. Oh, this is a rather long paragraph. I
6 apologize.

7 Q. No, I apologize for...

8 A. Yes.

9 Q. And the reason I had you review those two
10 paragraphs is it's our understanding, anyway, that
11 this ex- -- explains how the DSP works to try to
12 avoid saturation.

13 Would you agree with that?

14 MR. CRAIN: Object to form.

15 THE WITNESS: I think that's an incomplete
16 description.

17 Q. (By Mr. Das) Okay. What else?

18 A. I think you have to look at what a lot of
19 those elements are doing together.

20 The DSP is -- is just playing a role there,
21 and I'll -- I'll certainly agree that it's an
22 important role, but there's -- there's a lot more to
23 it than just the DSP.

24 Q. I agree.

25 A. We can probably go into that, you know,

1 further.

2 Q. Right. And I agree --

3 A. If you don't mind -- I'm sorry --

4 Q. Go ahead.

5 A. -- I will refer to what I said in my
6 declaration in the state of the art with respect to
7 Black, okay, on that page 25 in my -- my declaration
8 where my discussion of Black begins.

9 Q. Okay.

10 MR. CRAIN: Did you say page 25?

11 THE WITNESS: Page 25 of my declaration,
12 which is paragraph 72.

13 MR. CRAIN: Thank you.

14 Q. (By Mr. Das) So if you look at
15 paragraph 74 of your declaration, that's referring to
16 the language that --

17 A. That's right. I have a quote.

18 Q. Right.

19 And -- and that was part of the language I
20 just had you read about the detector 211 detects the
21 power level, et cetera; correct?

22 A. (Witness nodded head affirmatively.)

23 Q. And on the next --

24 MR. CRAIN: Object to the form if there was
25 a question there. You asked a question, he

1 didn't answer, and you went on.

2 MR. DAS: Oh, he actually nodded.

3 THE WITNESS: I should have realized that.

4 MR. DAS: Yeah, we should have caught that.

5 MR. CRAIN: I wasn't looking. I didn't see
6 the nod.

7 Q. (By Mr. Das) So when we look at -- I'll --
8 I'll just reask that question.

9 If you look at paragraph 74 of your
10 declaration, that's referring to the language that
11 was part of the language I just had you read about
12 detector 211 detected the power level; correct?

13 A. It is correct that I correctly quoted that
14 language.

15 Q. Yes.

16 And the top of page 11, it's -- the Black
17 reference says, "The DSP 223 contains an algorithm
18 which steps down the voltage of the AOC signal 231
19 until the voltage of the AOC signal 231 drops below
20 the saturated detector voltage 229."

21 Do you see that?

22 A. Yes.

23 Q. And that stepping down the voltage of the
24 AOC signal is to avoid saturation; correct?

25 A. I believe that is true.

1 Q. And the DSP 223 is doing that based on the
2 signal that the detector 211 sends to the DSP;
3 correct?

4 A. That is not correct.

5 Q. Okay. Why is that not correct?

6 A. Detector 211 is detecting a sample of the
7 voltage at the output of the RF amplifier. The
8 device 215 is making a comparison between whether the
9 output voltage of the RF amplifier changes when,
10 essentially, the command to change the output voltage
11 of the amplifier changes.

12 I almost lost myself there, but, basically,
13 my understanding is that comparator 215 is -- is
14 saying yes or no to the question is the output
15 voltage changing in correspondence with the requested
16 change.

17 And the inference is that if there is a
18 requested change of the output voltage of the
19 amplifier and the output voltage of the amplifier, in
20 fact, does not change, it is inferred that saturation
21 is occurring.

22 Q. So if you can go back to page 10 and 11
23 again of Black, and let's try to walk through this.

24 The first paragraph I had you read -- read
25 says, "The detector 211 detects the power level of

1 the RF output signals and creates a power level
2 signal 229 the voltage of which is responsive to the
3 amount of power in the RF output signals."

4 You see that?

5 A. Yes, I do.

6 Q. And then in the next paragraph, it talks
7 about, "The saturation...loop prevents the exciter
8 205 and power amplifier from exceeding beyond its
9 amplification limit because of the control signal
10 input 207."

11 Do you see that?

12 A. Yes.

13 Q. And in sort of talking about the comparator
14 215, it actually discusses the comparator 217 in the
15 next line.

16 A. Yes.

17 Q. And there it says, "Saturation with" --
18 actually, instead of me reading it, if you wanted to
19 read that again and address the issue of is the DSP
20 responding to the output power or a signal
21 representative of the output power?

22 MR. CRAIN: Object to form.

23 THE WITNESS: The DS- -- the DSP is
24 responding to an output of the saturation
25 detector, which is saying yes or no as to

1 whether it believes saturation is occurring.

2 Q. (By Mr. Das) And how does the saturation
3 detector determine whether it believes saturation is
4 occurring?

5 A. As I mentioned earlier, by inference. If
6 the requested amount of output changes and the output
7 does not change, the inference electrically is made
8 that saturation is occurring.

9 And I believe that's largely what I said in
10 my declaration, and --

11 Q. Right.

12 A. -- we can certainly go there if -- if you
13 would like to.

14 Q. Right. And, again, I'm just going back to
15 the -- sort of the original documents --

16 A. Sure.

17 Q. -- so I'm trying to understand.

18 And if I understood you correctly, that one
19 of the roles of the DSP is to step down the current
20 to avoid saturation; is that correct?

21 MR. CRAIN: Object to form.

22 THE WITNESS: One of the roles of the DSP
23 is to reduce the amount of power that is being
24 requested of the RF power amplifier.

25 Q. (By Mr. Das) And why --

1 A. I think you had used a different term, I'm
2 sorry, the current or something like that.

3 Q. Okay. So to phrase it in your response,
4 one of the roles of the DSP is to reduce the amount
5 of power that is being requested of the power
6 amplifier, is what you said.

7 Why does the DSP do that? In what
8 circumstance does the DSP do that?

9 MR. CRAIN: Object to form.

10 THE WITNESS: If the combination of the
11 circuitry and the DSP infer that saturation is
12 occurring through the various circuitry, the DSP
13 will act to reduce the gain of the exciter and,
14 in turn, reduce the amount of voltage that is
15 being fed into the output power amplifier.

16 Q. (By Mr. Das) And would that lead to the
17 output power amplifier avoiding saturation?

18 A. Eventually. And what I mean by
19 "eventually" is it's going to step it down until it
20 sees what it considers to be an adequate
21 correspondence between changes at the input and
22 changes at the output.

23 Q. Okay.

24 MR. CRAIN: Before you get into something
25 else, is this a good spot to take a break?

1 MR. DAS: I was having way too much fun and
2 I lost track of where we started.

3 MR. CRAIN: It's close to an hour, but, I
4 mean...

5 MR. DAS: Yeah, we -- yeah, why don't we go
6 ahead and take a break.

7 MR. CRAIN: Thank you.

8 VIDEOGRAPHER: This is the end of Video 4.
9 We are off the record at 3:41 p.m.

10 (Thereupon, there was an interruption in
11 the proceedings.)

12 VIDEOGRAPHER: This is the beginning of
13 Video 5. We were on the record at 3:59 p.m.

14 Q. (By Mr. Das) Mr. Cordell, during this
15 break, did you have an opportunity to speak with
16 your -- Crest's counsel?

17 A. Yes, I did.

18 Q. And did you discuss the substance of your
19 deposition today?

20 A. No.

21 Q. And did you discuss the substance of the
22 testimony you're about to give?

23 A. No.

24 Q. Did anyone suggest to you how you should be
25 answering questions?

1 A. No.

2 Q. At the very beginning of the day, we had
3 talked about if there was any corrections or
4 additions you wanted to make.

5 Since we're getting later in the day, I
6 wanted to circle --

7 A. Sure --

8 Q. -- back and see if there was anything you
9 wanted to correct or change at this point.

10 A. Not at this time.

11 Q. Okay.

12 (Petitioner's Exhibit 8 was marked for
13 identification.)

14 THE WITNESS: Thank you.

15 COURT REPORTER: You're welcome.

16 MR. CRAIN: 8?

17 COURT REPORTER: 8.

18 Q. (By Mr. Das) Mr. Cordell, I've handed you
19 what's been marked as Exhibit 8.

20 Please review it and let me know when
21 you're done reviewing it.

22 A. I recognize this as Van Hulle --

23 Q. And --

24 A. -- one of QSC's references.

25 Q. And, again, I apologize for interrupting

1 you. I thought you were done.

2 A. No problem.

3 Q. I have a very -- one specific thing that I
4 wanted to ask you about. If you go to paragraph 80
5 of your declaration. It's on page 28.

6 A. Yes.

7 Q. You state, "In my opinion, the 'signal
8 processing circuit' in 2 is likely a conventional
9 analog circuit."

10 Do you see that?

11 A. Yes.

12 Q. What is the basis for your saying that it
13 is likely a analog -- conventional analog circuit?

14 A. Nowhere in Van Hulle do the terms "DSP" or
15 "digital signal processor" appear.

16 Q. Now, you agree that the audio signal that
17 is coming into the device claimed in Van Hulle is a
18 digital signal; correct?

19 A. If I'm not mistaken, it could have been
20 either an analog signal or a digital signal, but...

21 Q. If you turn to --

22 A. I think I -- you know, I mentioned that an
23 ADC could be in there, so it could be a digital
24 signal. I recognize that it could be a digital
25 signal. It's capable of receiving digital signal.

1 Q. Okay. And you say -- what you were just
2 referring to was the language in paragraph 40 -- 80
3 that says, "Of course, that circuit may include an
4 ADC to enable it to receive input signals in digital
5 format and present them to the remaining analog
6 circuitry"; correct?

7 A. That is right.

8 Q. Now, is there any mention of an ADC in the
9 Van Hulle reference?

10 MR. CRAIN: Object to form.

11 THE WITNESS: I don't recall seeing the
12 mention of an ADC in there.

13 Q. (By Mr. Das) Does the word "ADC" appear in
14 the Van Hulle reference?

15 MR. CRAIN: Object to form.

16 THE WITNESS: If it does, I don't know
17 where it appears.

18 Q. (By Mr. Das) Does the term
19 "analog-to-digital converter" appear in the Van Hulle
20 reference?

21 MR. CRAIN: Object to form.

22 THE WITNESS: Not that I know of. And if
23 you're aware of its appearance, please direct me
24 to it.

25 Q. (By Mr. Das) And I will represent to

1 you -- to you that the word "ADC" or the term
2 "analog-to-digital converter" do not appear in the
3 Van Hulle reference.

4 A. I agree -- okay. I understand.

5 Q. And if you could look at Column 4, line 35
6 through 39 of Van Hulle, and let me know when you've
7 reviewed that.

8 MR. CRAIN: I'm sorry. What page?

9 MR. DAS: Line -- the reference was for 35
10 to 39.

11 MR. CRAIN: Thank you.

12 THE WITNESS: Yes. They're referring to an
13 ADS ADU signal.

14 Q. (By Mr. Das) And that is a digital audio
15 signal?

16 A. That is correct.

17 Q. Okay. And if you look at Van Hulle,
18 Column 4, lines 52 through 61, and let me know when
19 you finish reviewing that.

20 A. All right. Just down at the line 61?

21 Q. Yes.

22 A. Yes, I've read that.

23 Q. Okay. And, again, that portion I had you
24 read, part of it says, "The audio signal is processed
25 in the signal processing circuit 2 in response to

1 setting signals I in the form of gain factors, filter
2 coefficients and the like which are supplied by the
3 control circuit."

4 Do you see that?

5 A. Yes.

6 Q. How would a control circuit supply gain
7 factors, filter coefficients, and the like to an
8 analog digital processing circuit?

9 A. That was actually referred to in the
10 background of the art in the '542 patent. I believe
11 they referred to digitally-controlled potentiometers
12 and resisters.

13 So, for example -- in fact, in a lot of
14 cases you have volume controls in like an audio/video
15 receiver that are controlled by digital means, but
16 the con- -- the control itself isn't passive analog
17 part.

18 And there's other ways to do that, too.
19 For example, there are integrated circuits which will
20 provide requested amounts of attenuation depending
21 upon control words that may be presented to them.

22 Q. And is there any discussion of such an
23 analog circuit in the Van Hulle reference?

24 MR. CRAIN: Object to form.

25 THE WITNESS: When you say "such an analog

1 circuit," are you referring to something like --
2 something having digitally-controlled
3 potentiometers or -- or something like that?

4 Q. (By Mr. Das) Sure.

5 MR. CRAIN: Object to form.

6 THE WITNESS: I don't recall seeing that in
7 there. It -- it may be there, but I don't -- I
8 don't recall seeing it.

9 Q. (By Mr. Das) If you could look at
10 Column 7, line 58 through Column 8, line 1. And I
11 should say that paragraph continues beyond line 1,
12 but I'm just interested in Column 7, line 58 through
13 Column 8, line 1.

14 A. Beginning with, "Subsequently...?"

15 Q. Correct.

16 A. Just down to the word "ended" or did you
17 want me to go further?

18 Q. Further to the first couple of sentences of
19 the next paragraph.

20 A. Yes.

21 Q. And based on this discussion of -- let me
22 restart.

23 Do you understand that the control signal
24 that's being discussed in Column 7, line 58 through
25 64, is a digital control signal?

1 MR. CRAIN: Object to form.

2 THE WITNESS: Would you give me an example
3 of one of those? I think they're all in
4 carats -- or not car- -- what do they call
5 those?

6 Q. (By Mr. Das) Yeah, carats. I think they
7 are carats, right.

8 A. Could you give me an example of one of
9 those to focus on?

10 Q. So it's talking about the <I>, <ADC>,
11 <OPC>, <DTA>, that kind of a control signal.

12 A. And I take it that those are described in
13 one of the figures?

14 Q. I don't believe so.

15 A. I see <I> in Figure 6 --

16 Q. Oh, you're right, yes.

17 A. -- to the right of item 64.

18 Q. Right.

19 And, in fact, that's what's discussed in
20 this paragraph. It says, "...is composed and
21 transmitted in Step 68." So that's par- -- Figure 6,
22 you're correct.

23 And do you understand that signal, that
24 control signal, to be a digital control signal?

25 MR. CRAIN: Object to form.

1 THE WITNESS: That would be my initial
2 reaction, since it looks like what is happening
3 here is the illustration of a program flow in a
4 microcontroller.

5 Q. (By Mr. Das) Okay. And, again, the second
6 paragraph or second incomplete paragraph that I had
7 you read at the end of Column 7, top of Column 8,
8 talks about "...setting signals comprising an
9 operation code <OPC> and data <DTA> to be applied to
10 the signal processing circuit."

11 Do you see that?

12 A. Yes. If I can repeat it, "These are
13 setting signals comprising an operation code...and
14 data...to be applied to the signal processing
15 circuit."

16 Q. And my question is: Again, based on this
17 additional discussion of the setting signals that are
18 applied to the signal processing circuit, does that
19 change your opinion as to whether the signal
20 processing circuit in Van Hulle is a conventional
21 analog circuit?

22 MR. CRAIN: Object to form.

23 THE WITNESS: You know, it really doesn't,
24 and I'll tell you why. There are two reasons.

25 First of all, most of this stuff that's

1 being described here -- for example, in Figure
2 6, this is a program flow. And you not- -- you
3 might have noticed somewhere they talked about a
4 preamble.

5 What's really going on in -- in Van Hulle
6 is that they are sending control signals -- I
7 believe it was in frequency multiplex way, but
8 I'm not sure -- along with the audio signal that
9 would tell the -- instruct the microprocessor
10 what to do.

11 So, for example, my understanding is that
12 the microprocessor played a role in decoding the
13 digital preamble signal and acted on that and
14 that this business here is referring to the --
15 the program flow that's taking place in
16 microprocessor 7. That's my interpretation.

17 Q. (By Mr. Das) Okay. I appreciate that
18 interpretation.

19 But it also goes on to say that the setting
20 signals comprising an operation code and data are
21 applied to the signal processing circuit; correct?

22 MR. CRAIN: Object to form.

23 THE WITNESS: I think that the text you
24 read is the text that's -- that's written here.

25 Without a great deal of further thought and

1 possibly argument, it doesn't lead me to
2 conclude that the signal processing circuit is a
3 digital signal processing circuit.

4 Part of the reason I say that is that it's
5 very easy for people to confuse, in their
6 language that they're using, the term "signal
7 processing circuit" and "digital signal
8 processing circuit." A signal processing
9 circuit is just a circuit that alters the signal
10 in some way, and it can be analog or digital.

11 And, in fact, I recall a couple of places
12 where I believe Dr. Ellis confused those, as
13 well. So, you know, my -- my antenna is up for
14 looking at the terminology and what it implies.

15 Now, the fact that I did not see the term
16 "digital signal processor" or "DSP" anywhere in
17 this patent, I would find it rather shocking
18 that that would not appear there and then, in
19 fact, the signal processing circuit would be a
20 digital signal processor.

21 Q. (By Mr. Das) But it is processing a
22 digital audio input; correct?

23 MR. CRAIN: Object to form.

24 THE WITNESS: You know, in a lot of cases
25 when we see a block diagram, it's obviously an

1 abstraction. There's other patents where I've
2 seen this to be the case.

3 That item 2, signal processing circuit,
4 could have a whole bunch of stuff in it. It
5 certainly could include an A&D converter.

6 So I think there is certainly not enough
7 information here to make me believe that element
8 2 is a digital signal processor.

9 Q. (By Mr. Das) That was not the question I'd
10 asked.

11 A. I'm sorry.

12 Q. The question I'd asked was: What's
13 being -- the audio signal that's being processed by
14 this device that's disclosed in Van Hulle is a
15 digital audio signal; correct?

16 MR. CRAIN: Object to form. Asked and
17 answered.

18 THE WITNESS: Would you point to where in
19 the Van Hulle patent it describes the input as a
20 digital signal? I'm sorry. Maybe we did that
21 already.

22 Q. (By Mr. Das) But I can point to it again.

23 A. I'm sorry. Please go ahead.

24 Q. It's Column 4, line 35 through 39.

25 A. Yes. And I apologize for forgetting that.

1 Q. No, no apology is necessary.

2 The Van Hulle reference doesn't refer to a
3 digital signal processor in a DSP; is that correct?

4 A. That is correct.

5 Q. It also doesn't refer to an analog digital
6 converter or an ADC; correct?

7 A. That is correct.

8 Q. But based on the lack of the first
9 reference, you believe that the signal processing
10 circuit is an analog circuit; correct?

11 MR. CRAIN: Object to form.

12 Mischaracterization.

13 THE WITNESS: That is correct.

14 Q. (By Mr. Das) Why does the lack of
15 reference to an analog-to-digital converter not sort
16 of push you back the other way?

17 A. At the very least, the lack of any of these
18 terms muddies the water to the point where I would
19 not agree with somebody's assertion that this was a
20 digital signal processor in here.

21 Because I read through this patent and I --
22 I concluded that this was an analog circuit, so
23 another PHOSITA could have reached a different
24 conclusion, I suppose. Another PHOSITA could have
25 reached a different conclusion, I suppose.

1 Q. And "PHOSITA," you're referring to a person
2 having ordinary skill in the art?

3 A. Oh, I'm sorry. I apologize.

4 Q. No, that -- that's exactly the right term;
5 I just wanted to make sure we were on the same page.

6 A. I hate the length of that phrase.

7 (Petitioner's Exhibit 9 was marked for
8 identification.)

9 THE WITNESS: Thank you.

10 COURT REPORTER: You're welcome.

11 Q. (By Mr. Das) Dr. Cordell, you've been
12 handed what's been marked as Exhibit 9. Please
13 review it and let me know when you're done with your
14 review.

15 A. Yes. I understand this to be the Tsur- --
16 Tsurushima reference provided by QSC.

17 Q. Okay. Could you please turn to
18 paragraph 89, 8-9, of your declaration, and please
19 let me know when you're done reviewing it.

20 A. Yes.

21 Q. Do you see at the very begin- -- beginning
22 of this paragraph, you say -- and I'm probably
23 mispronouncing this name -- but, "Tsurushima
24 describes a high quality audio power amplifier based
25 on the Sony 'VFET' (Vertical Field Effect Transistor)

1 output transistor of the time."

2 Did I read that correctly?

3 A. Yes, you did.

4 Q. What is your basis for saying that
5 Tsurushima describes a power amplifier based on a
6 Sony VFET output transistor?

7 A. Well, first of all, I was very aware of
8 what was going on in audio at the time and, in fact,
9 I even remember ads for their line of amplifiers that
10 were based on the so-called VFETs.

11 Apart from that, however, I see this patent
12 is by Sony, and I look at Figure 2 and Figure 3 and
13 recognize that device structure in rough terms as
14 that of a VFET.

15 And I thought that -- let's see here. They
16 probably did not use the term "VFET" here, they used
17 the term a JFET power transistor that has a triode
18 characteristic, in -- in rough terms.

19 And I did, you know, based just on my
20 background knowledge, jump to the conclusion that it
21 was a -- a VFET -- or, I'm sorry -- yes, a VFET.

22 Q. But --

23 A. I'm quite sure that's true.

24 Q. Again, but it's -- why are you jumping to
25 the conclusion that it's based on the Sony VFET

1 output transistor at the time?

2 A. As far as I know, Sony were the only people
3 that made the -- the VFET.

4 Q. And you said the patent was by Sony.

5 Is that referen- -- a reference to the
6 assignee being Sony Corporation?

7 A. Yes.

8 Q. So going back to Van Hulle, which is --
9 yeah, Exhibit 8, do you see the assignee is U.S.
10 Philips Corporation?

11 A. Yes.

12 Q. And -- and you testified earlier that in
13 addition to your involvement with audio power
14 amplifiers, you were also very involved in
15 loudspeaker design; correct?

16 MR. CRAIN: Object to form.

17 THE WITNESS: That is correct.

18 Q. (By Mr. Das) And you even testified
19 about -- I think I used the term "active
20 loudspeakers." You used different terms, but those
21 are loudspeakers with amplifiers in them; correct?

22 A. That is --

23 MR. CRAIN: Object to form.

24 THE WITNESS: That is correct.

25 Q. (By Mr. Das) Are you familiar with

1 Philips' DSS 930 loudspeaker?

2 A. No.

3 Q. Okay.

4 (Petitioner's Exhibit 10 was marked for
5 identification.)

6 THE WITNESS: Thank you.

7 COURT REPORTER: You're welcome.

8 Q. (By Mr. Das) I'm handing you what's been
9 marked as Exhibit 10. Please review it and let me
10 know when you're ready.

11 MR. CRAIN: Just for the record, I don't
12 believe this has been attached as an exhibit.
13 So to the extent you need to review it
14 thoroughly, please take your time.

15 MR. DAS: Objection to form.

16 MR. CRAIN: What, do you want him to answer
17 a question on a document he's never seen before?

18 MR. DAS: Objection to form.

19 THE WITNESS: Yes.

20 Q. (By Mr. Das) Mr. Cordell, do you recognize
21 this document?

22 A. I was not at that AES convention, so I --
23 this is the first time I've ever seen this document.

24 Q. Okay. What do you understand this document
25 to be?

1 A. It -- they're describing a -- excuse me.
2 They're describing a powered -- powered loudspeaker,
3 a powered loudspeaker that appears to contain a DSP
4 in the signal path.

5 Q. Okay. And this is a powered loudspeaker
6 that was developed by Philips Audio; correct?

7 MR. CRAIN: Object to form.

8 THE WITNESS: Well, I don't know that for
9 sure, but it says that the author was from
10 Philips Speaker Systems, which may or may not be
11 the same corporate entity as Philips Audio.

12 Q. (By Mr. Das) If you turn to the second
13 page and look under the introduction and let me know
14 when you've reviewed that first paragraph.

15 A. The one that begins with, "Three years
16 ago..."?

17 Q. Uh-huh (affirmative).

18 A. I believe I've read the complete paragraph.
19 There is one part of it that I don't understand. It
20 said, "...introducing a high quality and payable
21 digitally assisted loudspeaker system." I don't -- I
22 don't know what the word "payable" means in the -- in
23 the context of this paragraph.

24 Q. Okay. But that paragraph does say that
25 three years ago, Philips Audio decided to develop an

1 active loudspeaker fitted with DSP; correct?

2 A. Yes.

3 Q. So, again, going back to my question, this
4 was a loud- -- the speaker is describing a
5 loudspeaker that was developed by Philips Audio;
6 correct?

7 MR. CRAIN: Object to form. Calls for
8 speculation.

9 MR. DAS: Object to form.

10 THE WITNESS: It sounds to me like they're
11 describing a powered loudspeaker that includes a
12 DSP and that was discussed by an author who
13 appears to work for Philips Speaker Systems.

14 Q. (By Mr. Das) Could you flip to Figure 1 of
15 this paper.

16 A. I see Figure 1.

17 Q. And could you compare that to Figure 8 of
18 the Van Hulle reference?

19 A. Yes.

20 Q. And based on that comparison, do these
21 figures seem to be representing the same loudspeaker
22 system?

23 MR. CRAIN: Object to form. Calls for
24 speculation.

25 MR. DAS: Objection. Objection to form.

1 Mr. Crain, again, that's not a proper objection.
2 You know that from the trial guidelines.

3 MR. CRAIN: I disagree with you and I can
4 think of at least 25 times in the first day of
5 the deposition of Dr. Ellis where you did that
6 and more. So I -- I take either you're going to
7 be a hypocrite or, you know --

8 MR. DAS: Mr. --

9 MR. CRAIN: -- I'm not sure where you're
10 coming from.

11 MR. DAS: Mr. Crain, Mr. Ellis --
12 Dr. Ellis' deposition is not at issue here. The
13 issue is the objection you're making.

14 MR. CRAIN: You make it one way one time
15 and you're going to hold someone else to --

16 MR. DAS: I admit nothing. That is not the
17 issue. You're objecting in a way that is
18 expressly forbidden under the trial guidelines.

19 MR. CRAIN: Okay.

20 MR. DAS: Do you want me to read that
21 language to you?

22 MR. CRAIN: I'm aware of the trial
23 guidelines.

24 MR. DAS: Apparently you're not, because
25 you're continuing to object.

1 MR. CRAIN: Did you just learn about them
2 or something?

3 MR. DAS: Exam- -- examples of objections
4 that would not be proper are, "Objection. I
5 don't understand the question. Objection.
6 Vague. Objection. Take your time answering the
7 question. Objection. Look at the document
8 before you answer." Those are objections that
9 you've been making.

10 MR. CRAIN: I disagree with that.

11 MR. DAS: You objected --

12 MR. CRAIN: It's in the record. If you
13 want to take it up, take it up, but preserve the
14 record.

15 MR. DAS: We will preserve our record.

16 MR. CRAIN: Okay. Well, go back and read
17 the Daniel Ellis transcripts before you do.

18 Q. (By Mr. Das) Mr. Cordell, going back to
19 the question I posed to you, comparing Figure 1 of
20 Exhibit 10 and Figure 8 of Van Hulle, the Van Hulle
21 reference appeared to be discussing the same speaker
22 system as is disclosed in Exhibit 10.

23 MR. CRAIN: Object to form. Calls for
24 speculation.

25 MR. DAS: Objection. Object to the form.

1 THE WITNESS: Figure 1 in the powered
2 loudspeaker -- what was this, an AES
3 preprint? -- describes a link referred to as a
4 DSS link, and the -- the interconnection between
5 the two depictions of a loudspeaker in the
6 Figure 8 of the Van Hulle patent does not
7 describe A to B as a DSS link.

8 So just because the pictures look the same,
9 I cannot and will not draw a conclusion that
10 these are one in the same.

11 Q. (By Mr. Das) Could you turn to Figure 2 of
12 the AES preprint and compare that to Figure 7 of Van
13 Hulle.

14 MR. CRAIN: Object to form.

15 THE WITNESS: Compare Figure 7 of Van Hulle
16 to Figure 2 of --

17 Q. (By Mr. Das) No. Actually, I -- I
18 apologize. Figure 3 of the --

19 A. Oh.

20 Q. -- AES preprint. I may have misspoken --

21 A. Thank you.

22 Q. -- and said Figure 2.

23 A. So we're comparing Figure 7 of Van Hulle to
24 Figure 3 of the AES preprint?

25 Q. Correct.

1 MR. CRAIN: Objection. Foundation.

2 THE WITNESS: I'm not picking up on any
3 conclusion that you're wanting me to draw.

4 Q. (By Mr. Das) Well, I haven't asked you any
5 conclusions.

6 A. Okay. I'm comparing them and --

7 Q. Right.

8 A. -- you're going to have to ask me some
9 questions.

10 Q. Right.

11 A. I apologize. I'm getting ahead of you and
12 I apologize for that.

13 Q. And my question is: Based on this
14 comparison, does it change your opinion as to whether
15 the Van Hulle patent is referring to the Philips
16 DSS 930 active speaker described in this AES
17 preprint?

18 MR. CRAIN: Objection. Foundation.

19 THE WITNESS: I see no resemblance between
20 Figure 7 in Van Hulle and Figure 3 in the AES
21 preprint that would lead me to conclude
22 anything. If I'm missing something, please
23 direct me to it.

24 Q. (By Mr. Das) Well, both of them show
25 remote control units; correct?

1 MR. CRAIN: Objection. Foundation.

2 THE WITNESS: My dog has a remote control
3 unit.

4 Q. (By Mr. Das) What does your dog use your
5 remote control unit for? I'm curious.

6 A. Technology has run totally amuck. It's one
7 of these training collars.

8 MR. CRAIN: Oh, okay.

9 THE WITNESS: If you don't like what
10 they're doing, you give --

11 Q. (By Mr. Das) Right. But --

12 A. It's kind of like the electronic fence.
13 They've got all this stuff. They've got collars that
14 will give them a shock or a squirt if they bark. I
15 mean, it's like -- anyway, I apologize for, you know,
16 trying to be cute there. Everything these days has a
17 remote control. I mean, that's of absolutely no
18 significance.

19 Q. But this is not from now, this is going
20 back quite a few years; correct?

21 A. In 1994 we're talking, everything had a
22 remote control.

23 Q. And you -- you asked me to point out --

24 A. Sure.

25 Q. -- similarities --

1 A. Okay, sure.

2 Q. -- and that's all --

3 A. Sure.

4 Q. -- I'm trying to do.

5 A. Okay.

6 Q. Both of them disclose a number of
7 loudspeakers in a daisy chain arrangement.

8 MR. CRAIN: Objection. Foundation.

9 THE WITNESS: Yes, both of them appear to
10 include -- appear to show loudspeakers in a
11 daisy chain configuration.

12 Q. (By Mr. Das) And the -- both these -- both
13 Figure 3 and Figure 7 show a control unit.

14 MR. CRAIN: Object to form. Foundation.

15 THE WITNESS: I see a control unit in
16 Figure 7 of the Van Hulle patent. I do not see
17 a control unit in Figure 3 of the AES preprint.

18 Q. (By Mr. Das) Okay. So, again, if you turn
19 to Figure 4 of the AES preprint, it actually gives a
20 description of the DSC.

21 MR. CRAIN: Object to form.

22 THE WITNESS: Figure 4 -- Figure 4 gives a
23 description of the DSC 950 product. It does not
24 give a description of the DSS link, if that's
25 what you were --

1 Q. (By Mr. Das) No --

2 A. -- referring to.

3 Q. -- I'm referring to the DSC in Figure 3
4 that's sitting right above the CD player.

5 A. Oh, I apologize. Yes, I see.

6 MR. CRAIN: Object to form.

7 THE WITNESS: But nevertheless, just for
8 the record, I would point out that what we see
9 in Figure 4 is what appears to be a list of
10 features for the product; right? Isn't it true
11 that Philips DSS 930 -- and, in fact, in this
12 figure they're talking about the -- the DSC --
13 I'm sorry. There's -- there's confusion, but it
14 looks to me like Figure 4 is describing the
15 characteristics of a product that's being
16 discussed.

17 Q. (By Mr. Das) Turn to page 2 of the
18 preprint, please. And once you get to the paragraph
19 right before sub- -- subheading 2.1, if you would
20 review that and let me know when you're ready.

21 A. This is the paragraph that begins with the
22 word, "The 'minimum'," in quotes?

23 Q. Correct.

24 MR. CRAIN: What page are you on again?

25 THE WITNESS: We're on page 2 of the AES

1 preprint. Okay.

2 Q. (By Mr. Das) Based on your review of that
3 paragraph, do you understand Figure 3 of this paper
4 to be showing what's referred to as a control center?

5 MR. CRAIN: Objection. Foundation.

6 THE WITNESS: I'm sorry. Would you repeat
7 the question?

8 (Whereupon, the record was read by the
9 reporter as follows:

10 Question, "Based on your review
11 of that paragraph, do you understand Figure 3 of
12 this paper to be showing what's referred to as a
13 control center?")

14 THE WITNESS: All I see in the paragraph is
15 a reference to "digital system controller," not
16 the term "digital control center."

17 Q. (By Mr. Das) I didn't say digital control
18 center, I said control center.

19 The sentence says, "The loudspeaker can be
20 used with analogue sources too by using a Digital
21 System Controller (DSC 950) which is a control
22 centre" --

23 A. Oh, I apologize.

24 Q. -- "that contains mainly an A/D converter
25 and a digital and analog source selector. Volume

1 control is also possible with the endless volume
2 knob. See Figures 1, 2, 3, 4, and 5."

3 Do you see that?

4 MR. CRAIN: Object to form. Foundation.

5 THE WITNESS: Endless volume knob, okay.

6 Q. (By Mr. Das) And it references the Figures
7 1, 2, 3, 4, 5 also; correct?

8 A. I'm not seeing the term "endless volume
9 control knob" in that -- in the figures.

10 Q. That -- that's fine. I was asking you if
11 you were seeing "control center" in Figure 3.

12 MR. CRAIN: Object to form. Foundation.

13 THE WITNESS: I -- I do not see the term
14 "control center" in Figure 3.

15 Q. (By Mr. Das) Do you see --

16 A. Am I missing an association that I'm
17 supposed to be making?

18 Q. I -- I -- I don't know if it's an
19 association you're supposed to be making, but do you
20 see a reference to the DSC in Figure 3?

21 A. Yes, I do.

22 Q. Okay. And the paragraph that you're
23 reading on page 2 is talking about the DSC 950, which
24 is a control center; correct?

25 MR. CRAIN: Object to form. Foundation.

1 THE WITNESS: I do see that.

2 Q. (By Mr. Das) And it refers to using a
3 digital system controller; correct?

4 A. Yes.

5 MR. CRAIN: Same objection.

6 Q. (By Mr. Das) And in light of that, my
7 question is: In Figure 3, do you -- is there
8 illustrated what's being referred to as a digital
9 system controller or a control center?

10 MR. CRAIN: Objection. Speculation.

11 THE WITNESS: I believe the answer is yes
12 to that.

13 Q. (By Mr. Das) Okay. And, again, this is
14 going back to your --

15 A. Sure.

16 Q. -- request that I tried to --

17 A. Understood.

18 Q. -- point out things which may be common.

19 MR. CRAIN: Object to form.

20 Q. (By Mr. Das) And one of the things we
21 talked about were the IR control. Another thing we
22 talked about were speakers that were in a daisy
23 chain --

24 A. Right.

25 Q. -- configuration.

1 Another thing that appears to be common to
2 both is the disclosure of a CD player?

3 MR. CRAIN: Object to form. Testifying.

4 THE WITNESS: In 1994, any audio system
5 that didn't have a CD player was -- you know,
6 you couldn't even buy something that bad in Best
7 Buy.

8 Q. (By Mr. Das) Right.

9 A. Do you have Best Buy out there in Seattle?

10 Q. Yes, we do.

11 And --

12 A. The fact that -- the point I'm making is
13 the fact that there's a CD player in there is of
14 absolutely no consequence.

15 Q. Right.

16 And both of them show a control unit to
17 which the CD player is connected, both of them being
18 Figure 3 of the preprint and Figure 7 of the Van
19 Hulle patent.

20 MR. CRAIN: Object to form. Foundation.

21 THE WITNESS: Well, in Figure 3 of the
22 preprint, all it shows is two pieces of
23 equipment, one stacked on top of the other.

24 Q. (By Mr. Das) Okay.

25 A. It doesn't -- it doesn't say that they're

1 connected.

2 Q. Right.

3 So in your opinion, Figure 3 doesn't change
4 your opinion as to whether Van Hulle -- or let me
5 restart. Strike that.

6 So it's your testimony that Figure 3 of
7 this preprint doesn't change your opinion as to
8 whether Van Hulle is directed to the active
9 loudspeaker described in this preprint?

10 MR. CRAIN: Objection. Speculation.

11 THE WITNESS: Actually, it strengthens my
12 opinion, and I'll tell you why. If --

13 Q. (By Mr. Das) Sorry. I interrupted.

14 A. I apologize.

15 MR. CRAIN: Go ahead and finish if you want
16 to go on.

17 THE WITNESS: In the preprint, they use the
18 term "DSP" or "digital signal processor" all
19 over the place.

20 If you're asserting that the same people
21 did this as came up with Van Hulle, how do you
22 explain that the word "DSP" or "digital signal
23 processor" doesn't even exist at all in here?
24 Why -- I mean, if they're bragging about digital
25 signal processing, which they do here all over

1 the place, why didn't they mention it here?

2 Q. (By Mr. Das) Is -- is that your response?

3 A. My response -- I'm sorry. I'm -- I should
4 not have couched my response as a question, and I
5 apologize for that.

6 My response is that I conclude that the
7 difference in the use of the language in the patent,
8 as opposed to the preprint, is suggestive that the
9 lack of the term "DSP" and "digital signal processor"
10 in the patent is suggestive that, in fact, there is
11 no DSP or digital signal processor in the Van Hulle
12 patent.

13 Q. Could you turn to Exhibit 9.

14 A. Is that Tsurushima?

15 Q. Uh-huh (affirmative). Yes, it is.

16 A. Yes.

17 Q. And a question about subheading in -- on
18 page 31 of your declaration, subheading F
19 specifically.

20 A. Yes, "Tsurushima-Protective Circuit for
21 JFET Amplifier."

22 Q. And I was wondering why you use that
23 subheading, given that the name of the pat- -- the
24 title of the patent is "Protective Circuit for Field
25 Effect Transistor Amplifier"?

1 A. Just as a matter of convenience. As we
2 discussed earlier and based on the language that I've
3 seen in the patent, I think it was entirely ordinary
4 for me to use the term "JFET" instead of, you know,
5 spelling out all of their stuff.

6 But other than me being lazy in typing,
7 there's no particular reason.

8 Q. Okay. And what's the difference between
9 JFET and VFET?

10 A. Actually, a VFET, as I think probably
11 adequately described in Tsurushima -- first of all,
12 let me explain to you from a device point of view my
13 understanding of the difference.

14 Most junction field-effect transistors have
15 a lateral geometry. That means that if you look at
16 an approximately flat surface of silicon, you have
17 the source over here, the drain over here, and a gate
18 that overlaps what is called the channel that's
19 located between the source and the drain. And you
20 can easily see why that's referred to as a lateral
21 JFET.

22 The vertical JFET -- and, in fact, let me
23 just say that the -- the length of the channel has
24 a -- plays a very big role in how much current can be
25 made to flow and how responsive to gate voltage that

1 current can be made. That -- that's the
2 transconductance of the device.

3 The size of that gate, the length of the
4 channel, is determined by the photolithography that
5 you can apply in defining that gate region. So there
6 are practical limitations in JFETs in terms of what
7 they're capable of doing.

8 Sony's VFET was a moderately successful
9 attempt to overcome that by making the channel be
10 vertically oriented so that the length of the channel
11 was defined by, for example, the depth of diffusion
12 of the dopants. So you could readily get a channel
13 that was much shorter so you could end up with a
14 device that could handle higher amounts of current
15 and would be able to change that current more
16 responsively to input voltages.

17 Now, all of this ends up meaning that it
18 gets the -- the JFET closer to the objective of what
19 you would want to see in a -- in a power transistor.

20 Q. And what would you want to see in a power
21 transistor?

22 A. In a power transistor, you want to see
23 significant -- significant current-carrying capacity
24 and significant transconductance.

25 So the VFET was a development that enabled

1 FETs to be used in output stages of power amplifiers
2 instead of bipolar transistors.

3 Q. Okay. And you -- you mentioned that in a
4 horizontally-aligned JFET, one of the sort of
5 limiting characteristics is channel width.

6 A. That's right.

7 Q. And that's based on limits of
8 photolithography?

9 A. Right.

10 Q. And you also mentioned that the VFET was
11 reasonably successful?

12 A. Yes.

13 Q. Now, is one of the reasons that VFET is no
14 longer being used that much is the fact that
15 photolithography techniques have just gotten a lot
16 better and channel -- channel widths have gotten
17 really narrow?

18 A. No, but that's a very good question.

19 Q. First one. Sorry.

20 A. No, all of your questions have been good.

21 MR. CRAIN: Object to form.

22 THE WITNESS: I failed to give you praise
23 when I should have.

24 First of all, a VFET was more of a
25 special-purpose device and, consequently, more

1 expensive.

2 The reason for seeking to use a FET, rather
3 than a bipolar transistor, is that a FET is a
4 majority carrier device, whereas a bipolar
5 transistor depends on minority carriers. This
6 means that the FET, in general, can be faster,
7 and the faster the output device, the easier it
8 is to achieve high sound quality.

9 Now, with respect to the economics, the
10 marketplace for amplifiers using the VFET
11 technology was limited. It was fairly limited
12 to high-end home entertainment systems and audio
13 file nuts like myself.

14 However, as technology developed further,
15 the VFET was actually displaced by what's called
16 the MOSFET. In fact, in the audio business,
17 David Hafler was one of the very first
18 manufacturers to use MOSFETs.

19 Now, the MOSFETs -- there's two kinds of
20 MOSFETs. There's lateral MOSFETs, which in some
21 ways are similar as what I described as lateral
22 JFETs, and there are vertical MOSFETs. David
23 Hafler used lateral MOSFETs.

24 But because of the difference in
25 technology, you know, numerous advancements, it

1 was possible to have lateral MOSFETs that were
2 entirely suitable as alpha transistors. So I
3 believe that the availability of the newer
4 technology of MOSFETs really, you know, was the
5 final nail in the coffin of the VFETs. I -- I
6 don't mean to assert that the VTECH -- the VFET
7 technology was an inferior technology or that it
8 had reliability problems or anything like that.

9 Q. (By Mr. Das) One clarification, in that
10 you -- actually, two.

11 One -- one, you said what you previously
12 referred to as lateral JFETs --

13 A. Yes.

14 Q. -- but earlier you said horizontal JFETS.
15 Are those --

16 A. Same term.

17 Q. -- the same term?

18 A. Yes.

19 Q. And then you said FETs are responsive to
20 minority carriers; bipolar transistors are responsive
21 to minority carriers.

22 What is a majority carrier versus a
23 minority carrier?

24 MR. CRAIN: Object to form.

25 THE WITNESS: A majority carrier -- if you

1 have a resistor -- like a JFET acts like a
2 resistor. It -- it acts like a resistor whose
3 value is changed by the presence of an electric
4 field. But that channel where the current flows
5 through is largely like a resistor, and a
6 resistor is a majority carrier device.

7 In contrast, when you turn on a bipolar
8 transistor, you are forward biasing the base
9 emitter junction and you are injecting minority
10 carriers into the region between the emitter and
11 the collector. And those minority carriers are
12 what cause the current to flow in a bipolar
13 transistor.

14 The pro- -- that process is -- tends to be
15 slower and, in fact, one of the most significant
16 problems in output stages that use bipolar
17 transistors is that when you want to turn them
18 off, you have to sweep out, suck out, all of
19 those minority carriers.

20 So the only point that I'm trying to make
21 here is that the -- the FET technologies in
22 general are inherently faster, and I personally
23 believe and a lot of other people personally
24 believe that FET technologies in the output
25 stages of power amplifiers can lead to a

1 superior sound.

2 Q. (By Mr. Das) Superior compared to bipolar
3 transistors?

4 A. That is correct.

5 Q. And -- and you said bipolar transistors are
6 forward biasing the emitter voltage, I think.

7 Did I get that correct?

8 MR. CRAIN: Object to form.

9 THE WITNESS: You turn on a bipolar
10 transistor by forward biasing the base emitter
11 junction.

12 Q. (By Mr. Das) Okay. What does forward
13 biasing the base emitter junction mean?

14 A. That junction, in very simplistic terms, is
15 like a diode, and a diode, to first order, only
16 conducts current in one direction. When the diode is
17 conducting its junction, it has been forward biased.

18 Q. Okay. And so if you have an NPN bipolar
19 transistor versus a PNP bipolar transistor, are they
20 both forward biased on the emit- -- emitter junction?

21 A. They are both turned on by forward biasing
22 the base emitter junction of the respective devices,
23 but the polarities are opposite.

24 Q. Right. Okay. And -- and that's what I was
25 trying to figure out.

1 A. Sure.

2 Q. I -- I'm not -- I wasn't familiar with
3 forward biasing, but...

4 A. Sure.

5 Q. If you could turn to Figure 6 of the
6 Exhibit 9, the Tsurushima reference.

7 A. Figure 6?

8 Q. Correct.

9 And we're going to look at this figure in
10 the context of your discussion of the sort of state
11 of the art of the background reference.

12 So in your declaration, Tsurushima's on --
13 the discussion starts on page 31.

14 A. Yes.

15 Q. So in paragraph 92 -- and please review
16 that and I'll ask you some questions about that.

17 A. Yes.

18 Q. In that paragraph, you say, "In my opinion,
19 Tsurushima's circuit does not determine -- detect,
20 determine or measure the current through the load."

21 Do you see that?

22 A. Yes, I do.

23 Q. Would you agree that Tsurushima's circuit
24 detects, determines, or measures the current
25 delivered to the load?

1 A. No.

2 Q. And why not?

3 A. The -- Tsurushima's circuit is only
4 responsive to the current flowing in the output
5 transistors, not in the load.

6 Q. Okay. And the current that's flowing --
7 and -- and just to make sure, because we're looking
8 at the picture but it's not going to be in the
9 transcript --

10 A. Sure.

11 Q. -- the -- when you refer to the output --
12 output transistors, you're talking about R9A, R9B,
13 R10A, and R10B; correct?

14 A. That's right.

15 MR. CRAIN: Object to form.

16 THE WITNESS: I'm sorry.

17 That is correct and, in fact, those
18 resistors are what I referred to as RE in our
19 earlier discussion, but because of the different
20 technology here, we would probably call them RS
21 since they're connected to the source of the
22 JFET transistor.

23 Q. (By Mr. Das) And your testimony was
24 Tsurushima's circuit is only responsive to the
25 current flowing in the output transistors, not in the

1 load?

2 A. That is correct.

3 MR. CRAIN: Object to form.

4 THE WITNESS: Sorry.

5 MR. CRAIN: Give me just a moment.

6 THE WITNESS: I apologize.

7 MR. CRAIN: Thank you.

8 Q. (By Mr. Das) Now, what is the current
9 being delivered to the load in the Tsurushima device
10 as illustrated in Figure 6?

11 MR. CRAIN: Object to form.

12 THE WITNESS: The current being delivered
13 to the load would be the current flowing in
14 the -- the drawn wire link between the dark dot
15 and the box denoting the load.

16 Q. (By Mr. Das) And the dark dot is the one
17 that's to the right of what's marked as T3?

18 A. That is correct.

19 MR. CRAIN: Object to form.

20 THE WITNESS: I'm sorry.

21 MR. CRAIN: That's okay. You know I'm
22 going to object.

23 Q. (By Mr. Das) And why is the current that's
24 flowing on the wire link between that dark dot and
25 the load not equal to the sum of the currents flowing

1 through these four output transistors?

2 A. Because any current that is flowing between
3 those output transistors -- for example, you can have
4 current that is flowing through R10A and then through
5 R10B into the F2B transistor -- that shouldn't be
6 counted because it's -- it's current that's flowing
7 in the output transistors, but it's not flowing into
8 the load.

9 Q. And that was actually a great example.

10 What -- in the Tsurushima device that's
11 described in this patent, in your opinion, what
12 percentage of the current flowing through R10A would
13 flow into, say, resistor R10B?

14 MR. CRAIN: Object to form. Speculation.
15 Foundation.

16 THE WITNESS: What percentage of what
17 current?

18 Q. (By Mr. Das) Well, there's -- there's
19 current flowing through R10A; correct?

20 A. That is right.

21 Q. And when I was asking you why is current
22 flowing under the wire connecting that black dot to
23 the load, not the sum of these currents, one of the
24 examples you gave was current flowing through -- some
25 of the current flowing through R10A might flow into

1 R10B.

2 Do you recall that?

3 A. Yes.

4 MR. CRAIN: Object to form.

5 THE WITNESS: Sorry.

6 Q. (By Mr. Das) And I -- the question I'm
7 asking is: What percentage of the current flowing
8 through R10A would be flowing into R10B?

9 MR. CRAIN: Object to form. Foundation.
10 Speculation.

11 THE WITNESS: This really does call for
12 speculation and, in fact, this -- this question
13 is not answerable without precisely defining
14 signal conditions.

15 Q. (By Mr. Das) What signal condition factors
16 would you need to know to answer this question?

17 A. When the signal is very, very small, the
18 relative amount of current flowing through R10A and,
19 hence, through R10B is very large compared to the
20 signal flowing into the load.

21 And what governs these relationships is the
22 bias current, the -- what's called the idle bias
23 current that the amplifier is set up to conduct under
24 no signal conditions.

25 And in amplifiers with -- of a Class AB

1 nature that use field effect transistors, this bias
2 current can be a fairly high current. So the -- the
3 only point I'm making is that when you ask what
4 percentage of current flowing in the transistors is
5 going where, you -- at the very minimum -- and -- and
6 you're still in rough territory -- at the very
7 minimum, you have to take into account the signal
8 level.

9 MR. DAS: I'm going to actually interrupt
10 you because I broke the machine, so I need some
11 help with getting this...

12 VIDEOGRAPHER: We're off the record at
13 5:11 p.m. This is the end of Video 5.

14 (Thereupon, there was an interruption in
15 the proceedings.)

16 VIDEOGRAPHER: Stand by, please.

17 This is the beginning of Video 6. We're on
18 the record at 5:22 p.m.

19 Q. (By Mr. Das) Mr. Cordell, during this
20 break, did you have a chance to speak with Crest's
21 counsel?

22 A. Yes.

23 Q. And did you discuss the substance of your
24 testimony to this point?

25 A. No.

1 Q. Did you discuss the substance of the
2 testimony you're about to give?

3 A. No.

4 Q. Did you discuss or were you instructed on
5 how to answer any questions?

6 A. No.

7 Q. Before the break, we were talking about the
8 current flowing through these output transistors and
9 so forth and then, unfortunately, this machine
10 stopped working, so I'm going to try to scroll back
11 and ask you --

12 A. Sure --

13 Q. -- a couple of questions --

14 A. -- sure.

15 Q. -- about your testimony.

16 This was in the general context of a
17 discussion where I was asking you about what
18 percentage of the current through R10A were going to
19 R10B, et cetera, and you said -- you know, you
20 pointed out that you would need to know things about
21 defining signal conditions.

22 Do you recall that?

23 A. Right.

24 Q. And I'd asked you about, you know, what
25 signal conditions would you need to know about and

1 you pointed out that when the signal is very, very
2 small, the relative amount of current flowing through
3 R10A and, hence, through R10B is very large compared
4 to the signal flowing into the load.

5 MR. CRAIN: Object to form.

6 Q. (By Mr. Das) Do --

7 MR. CRAIN: Sorry. I thought you were
8 done.

9 Q. (By Mr. Das) I was going to ask: Do you
10 recall that testimony?

11 MR. CRAIN: Object to form.

12 THE WITNESS: I do recall that testimony.

13 Q. (By Mr. Das) I just wanted to clarify.

14 When you said the amount -- relative amount
15 of current flowing through R10A and, hence, through
16 R10B is very large, you're not saying all of the
17 current flowing through R10A would flow into the
18 R10B, are you?

19 MR. CRAIN: Object to form.

20 THE WITNESS: I'm not sure that the use of
21 the word "hence" was the right word to use.

22 Q. (By Mr. Das) Okay. And you also pointed
23 out in amplifiers of a Class AB nature that use field
24 effect transistors, this bias current can be fairly
25 high current.

1 When -- and the bias current is what
2 governs the relationship between these output
3 transistors; correct?

4 MR. CRAIN: Object to form.

5 THE WITNESS: The bias current is the
6 current flowing through the transistors, and
7 that bias current is flowing whether or not
8 there's a signal. The signal could be zero and
9 that bias current is still flowing.

10 So it's easy to see that the relationship
11 between the currents flowing in R10A and R10B,
12 when expressed as a percentage, can be all over
13 the place.

14 Q. (By Mr. Das) And -- and is the bias
15 current a fixed current?

16 A. In many amplifiers, it is. And, in fact, I
17 would point out that that bias current that we've
18 been talking about is very, very high in a Class A
19 amplifier, so there, the correspondence that we're
20 talking about is altered even more.

21 Q. Now, this is not what's disclosed -- or the
22 figure that's shown in Figure 6 of Tsurushima is not
23 a Class A amplifier; is that correct?

24 MR. CRAIN: Object to form.

25 THE WITNESS: Actually, I cannot discern

1 from this schematic that it is not a Class A
2 amplifier.

3 Q. (By Mr. Das) If you can turn to
4 paragraph 92 of your declaration, please --

5 A. Yes.

6 Q. -- and let me know when you finish
7 reviewing it.

8 A. Yes.

9 Q. In the second sentence in that paragraph,
10 you say, "Tsurushima's protection circuit responds to
11 the currents flowing in the output transistors of the
12 positive and negative halves of the Class AB output
13 stage."

14 Do you see that?

15 A. Yes, I do.

16 Q. And so do you understand Tsurushima to be
17 disclosing a Class AB amplifier?

18 A. That was my assumption at the time.

19 Q. Okay. Is -- do you have a reason to have
20 changed your assumption?

21 A. Well, I didn't change it, but Class AB
22 amplifiers are four -- far more predominant than
23 Class A amplifiers. So, you know, when I instantly
24 looked at this the very first time, yeah, it's a
25 Class -- Class AB amplifier.

1 Q. Okay. So going back to our discussion
2 about bias currents, in a Class AB amplifier, would
3 a -- given a specific model of a Class AB amplifier,
4 would the bias current be known?

5 MR. CRAIN: Object to form. Speculation.

6 THE WITNESS: The level of bias current
7 that's set is entirely up to the individual
8 manufacturer for any -- even for a given circuit
9 design.

10 Oftentimes, you will -- it's not disclosed
11 here, probably for reasons of simplicity, but
12 there's usually an adjustment potentiometer that
13 is adjusted to achieve the -- the bias current
14 that's desired by the manufacturer.

15 Q. (By Mr. Das) But for a given model, it
16 would be fixed; correct?

17 A. More than likely.

18 Q. Okay. And if you knew the bias current for
19 a given amplifier using this same circuit design
20 that's shown in Figure 6, would you be able to figure
21 out what percentage of the current flowing through
22 R10A would flow into resistor R10B?

23 MR. CRAIN: Objection. Speculation.

24 THE WITNESS: I think that would still be
25 dependent upon what particular signal level we

1 would be talking about.

2 You know, that's a very good question, but
3 it's -- it's -- there are just a lot of unknowns
4 here that make me a little bit hesitant to -- to
5 give a specific answer.

6 Q. (By Mr. Das) And, again, I'm trying to --
7 we -- we had started by talking about signal --

8 A. Sure.

9 Q. -- characteristics and you had pointed to
10 the bias current, and so --

11 A. That's correct.

12 Q. -- I was just trying to figure out if you
13 knew the bias current, could you answer that
14 question? And it seems like you're saying that you'd
15 need to know more information.

16 MR. CRAIN: Objection. Speculation.

17 THE WITNESS: It would be speculation on my
18 part.

19 Q. (By Mr. Das) What would be speculation on
20 your part?

21 A. To -- to say that I would potentially be
22 able to -- to -- to know what that is.

23 In other words, if I knew that the bias
24 current in this amplifier was 500 milliamperes, I --
25 I can't right now sit here and say that I would be

1 able to tell you what percentage of the current is
2 flowing among the transistors, as opposed to into the
3 load.

4 Q. But would a person of ordinary skill be
5 able to figure that out, given sufficient time?

6 MR. CRAIN: Object to form.

7 THE WITNESS: You know, it calls for
8 speculation on my part and it also gets into the
9 zone of a person of ordinary skill.

10 But I can tell you that if it was me, who I
11 believe is more than a person of ordinary skill,
12 I would resort to a circuit simulation to find
13 that out.

14 Q. (By Mr. Das) Again, looking at Exhibit 9,
15 which is Tsurushima, if you could look to the top of
16 Column 2 and let me know when you've finished
17 reviewing that first full paragraph.

18 A. Yes.

19 Q. That first sentence says, "In a preferred
20 embodiment of the invention, the detecting circuit
21 detects the current through, and the voltage across
22 the load, that is, the load impedance, and the
23 switching circuit is made operative, as aforesaid,
24 when the load impedance declines below a
25 predetermined value, for example, in response to a

1 short circuit in the load."

2 Did I read that correctly?

3 A. Yes, you did.

4 Q. Would a person of ordinary skill in the art
5 reading that sentence understand that Tsurushima is
6 disclosing a circuit in which the current through and
7 the voltage across the load are being detected?

8 MR. CRAIN: Object to form.

9 THE WITNESS: A person of ordinary skill in
10 the art who knew anything about power amplifiers
11 would read this paragraph and conclude that
12 Tsurushima, what he's saying here, is dreadfully
13 wrong.

14 And, you know, it may have something to do
15 with the translation from the Japanese. I'm not
16 saying that Tsurushima is stupid; it's just that
17 it could have gotten here by way of a different
18 route.

19 Q. (By Mr. Das) What translation from the
20 Japanese?

21 A. Well, sorry about that, I was assuming that
22 he was Japanese. Yeah, he's in Japan.

23 All I'm saying is that there is more than
24 one way in which this statement, which is incorrect,
25 could have gotten to be incorrect. One of those ways

1 is that, you know, it could have gotten screwed up in
2 the translation from Japanese.

3 And, of course, I fully admit that I'm
4 making assumptions that this patent started out in
5 the Japanese language and was -- was translated
6 for -- for foreign consumption.

7 Q. And -- and do you have any basis for that
8 assumption other than Mr. Tsurushima being based in
9 Japan?

10 A. No. And -- and, in fact, I'm allowing --
11 I'm just allowing for the possibility that it was not
12 Tsurushima who was ending up with this phraseology.
13 I'm not saying that it happened because he was stupid
14 or that -- because he was trying to claim something
15 that -- that wasn't; I'm just saying it is what it is
16 and, you know, I -- I needn't have speculated on how
17 it got that way.

18 Q. But let me just make sure, to close out
19 this loop, you believe this sentence -- this first
20 sentence on the beginning of Column 2 does not
21 correctly reflect what's disclosed in Tsurushima?

22 A. That is absolutely correct.

23 Q. Can you turn to Column 10 and look at the
24 paragraph that begins at Column 33 -- line 33,
25 Column 10.

1 A. Column 10, line 33?

2 Q. Correct. And I'll tell you it's a long
3 paragraph and I'm going to be interested in really
4 the first couple of sentences.

5 A. Are you referring to the paragraph that
6 begins with, "When the impedance..."?

7 Q. Yes.

8 A. Okay. Yes.

9 Q. That very first sentence, again, says,
10 "When the impedance of load ZL is lowered to a
11 predetermined value, for example, 1 ohm or less, due
12 to a short-circuit or the like, the voltage across
13 the load is also lowered and hence the emitter
14 potential of transistor Q4a is extremely lowered."

15 Do you see that?

16 A. Yes.

17 Q. And so, again, why would a person of
18 ordinary skill reading this not understand that this
19 Tsurushima circuit is detecting the impedance of load
20 ZL?

21 A. In my mind, it's hard for me to even
22 understand what he's saying here. And, you know, if
23 you put a screwdriver across the load, you're --
24 you're lowering the impedance and -- and it's going
25 to have consequences, which usually will result in

1 protection.

2 What I -- what I think he is saying here --
3 and I apologize for speculating -- is that under any
4 condition of a very -- what we would call a very low
5 impedance load, let's say lower than it should be,
6 for want of a better term, the likelihood is that
7 large current will flow in either -- any of these
8 R10a or b, R9a or b.

9 And he's describing in a very, you know,
10 complex and difficult-to-understand way what I said
11 quite a while back, and that is that the voltage --
12 when the voltage across in this case the source
13 resistors and in a bipolar case across the emitter
14 resistors, when the current flow through that
15 resistor is high, the voltage drop across that
16 resistor between the output node and in this case the
17 source of the transistor will be a significant
18 voltage drop.

19 And in this case, the voltage drop will be
20 significant enough to forward bias one of these
21 diodes and, in turn, provide enough voltage to
22 forward bias the base emitter junction of Q4a.

23 And as I explained earlier, when Q4a begins
24 to conduct current, that is the onset of the
25 protection action.

1 Q. Correct.

2 And this language is explaining that that's
3 based on the impedance of the load ZL being lower to
4 some predetermined value; correct?

5 A. Well, that's -- that is only one condition
6 that can cause this to happen. I mean, he's citing
7 the impedance as an example. He cited one ohm as an
8 example.

9 But protection -- when a protection circuit
10 goes off or when it acts to protect, you -- you don't
11 know that the impedance or the resistance of the load
12 had -- is causing that to go off because it's -- it's
13 below a fixed value. There's other conditions that
14 can cause these protection circuits to enter their
15 protection mode.

16 For example, the -- the phase angle of the
17 load, the -- in -- in this circuit, recall that I
18 said earlier that this is the form of a VI limiter.

19 Q. Uh-huh (affirmative).

20 A. Now, the basic operation of this is, in --
21 in the most basic terms, really not any different
22 than that of Gittleman. This is a little bit
23 different circuitry and it's -- it's been adapted to
24 the use of these different output devices.

25 And, in fact, I believe Tsurushima, in the

1 beginning of his patent, says that, you know,
2 there's -- there's well-known protection circuits,
3 but because we're using VFETs rather than bipolars,
4 we have to alter the circuit a little bit and so
5 forth. But it's the same concept and it is a VI
6 limiter.

7 And as I thought I explained earlier, the
8 current at which a VI limiter will begin to take
9 protective action is a function of the voltage across
10 the output transistors, not a function of the voltage
11 across the load. Two very different things.

12 And, by the way, that has to do with the
13 safe area characteristics of the transistors. I
14 think we touched on that earlier.

15 Q. I don't think we necessarily talked about
16 that --

17 A. Okay.

18 Q. -- but that's in your declaration.

19 A. Sure.

20 Q. I certainly recall seeing that.

21 So that actually segues into another
22 question I had, which is on paragraph 93 of your
23 declaration -- and it's somewhat long, so I will just
24 tell you the statement that I am curious about is the
25 very last sentence in paragraph 93. It says,

1 "Moreover, the circuit is responsive to the voltage
2 across the output transistors, but does not detect
3 the voltage across the load."

4 Do you see that?

5 A. Yes, I do.

6 Q. I was wondering if you could review the
7 disclosure in Tsurushima in Column 10 between lines 5
8 and 17, I believe, that first full paragraph on
9 Column 10.

10 A. Yes.

11 Q. That paragraph seems to suggest that the
12 volt -- and I'm just reading this -- "...the voltage
13 across load ZL is supplied to the other end of
14 capacitor C3a (at the emitter electrode side of the
15 transistor Q4a) by a closed loop constituted by
16 resistor R7a, diode R3a [sic], capacitor C3a, and
17 load ZL."

18 Do you see that?

19 A. I largely see it -- see it. I lost track
20 of a little bit of it, but let's say that I saw it.

21 Q. Right.

22 And so why is that not saying that the
23 voltage across the load is being detected in the
24 Tsurushima circuit?

25 A. The Tsurushima circuit, its action -- as I

1 explained earlier, its action is responsive to the
2 voltage across the output transistors.

3 Now, it is true that it is often the case
4 that if there's a change in one, there may be a
5 corresponding change in the other, but they're not
6 the same.

7 And, in fact, the way this is really
8 working here is that if you look at -- for example,
9 if you just look at the top half, you have R7a
10 connected to ground and you have it connected to the
11 base of Q4a through a diode.

12 And realize that this whole protection
13 circuit 14, all of its reference is largely floating
14 up and down with a signal, okay, but the ground is
15 not.

16 So if the signal is at a significant
17 positive level with respect to ground, there will be
18 a greater amount of current flowing through R7a. And
19 what that will do is that will retard the turn on of
20 Q4a, because it's -- it's stealing base current from
21 that transistor.

22 And the reason for this is to allow a
23 current protection threshold that increases when the
24 condition is such that there is less voltage across
25 the power transistors.

1 So -- and this gets into the safe area
2 thing. The power transistors are less -- in less of
3 a danger zone conducting high current if they have
4 lower voltage across them.

5 Q. And again --

6 A. That's why it's called the VI limiter. I
7 apologize.

8 Q. I -- I interrupted you. I thought you were
9 finished. Are you finished?

10 A. Yes.

11 Q. So I understand that your -- your position
12 is that this protective circuit is responsive to the
13 voltage across the output transistors, and that's the
14 first half of the last sentence in paragraph 93 of
15 your declaration. The second half is, "...but does
16 not detect the voltage across the load."

17 And that's what I'm asking, is: Why is
18 this paragraph on the top of Column 10 not showing
19 that the voltage across the load is being detected as
20 part of the -- because it states the voltage across
21 the load is supplied to the other end of the
22 capacitor 3 -- C3a.

23 A. That's right. But remember that the -- the
24 reference for this circuit, the -- if you will, the
25 voltage of the emitter of these -- these transistors,

1 is all going up and down. So the -- the reference
2 point for this protection circuit floats up and down
3 with the -- the output voltage.

4 But that doesn't mean that this circuit is
5 measuring the output voltage. All it means is that
6 this circuit is a current limiter and they've added
7 in R7a and a couple of other things to cause the
8 current limit to increase when the output signal is
9 high and to decrease when the output signal is low,
10 since when the output signal is high, one normally
11 would expect that the voltage across the power
12 transistors is less.

13 But in -- in -- you know, in no way is the
14 fact that C3 is connected to the output mode does
15 it -- is it suggestive that somehow the output
16 voltage is being measured.

17 Q. And that may be where we're having a little
18 bit of a miscommunication. I --

19 A. Right.

20 Q. I wasn't asking about the term "measured,"
21 I was asking about the determine "detected."

22 Would you agree that the output -- the
23 voltage across the load is being detected --

24 A. No.

25 Q. -- in this Tsurushima circuit?

1 A. No.

2 Q. Why not?

3 A. This circuit -- the proper language, in my
4 opinion, is that this protection circuit is
5 responsive to the output voltage, but it's re- --
6 it's responsive to a combination of output voltage
7 and current through the transistors -- actually, when
8 I say output voltage, I should have said voltage
9 across the transistors -- and current through the
10 transistors.

11 There is a combination of those two that
12 defines a dangerous condition, and the values of the
13 voltage and the current that make up that combination
14 are changing under different conditions.

15 But the circuit is just trying to define a
16 situation that is dangerous. The circuit is not
17 trying to measure anything, but the circuit is,
18 indeed, responsive to those current and voltage
19 conditions.

20 Q. When you say "those current and voltage
21 conditions," current and voltage across the output
22 transistors? Is that what you're talking about?

23 A. The voltage across the output transistors
24 and the current through the output transistors.

25 Q. And -- but the voltage across the load is

1 being supplied to one end of capacitor C3A; correct?

2 A. Yeah, but that's absolutely of no
3 significance.

4 Q. Why is it of no significance?

5 A. Well, it's of no significance if one is
6 trying to ascertain the output voltage. The -- the
7 function of C3a, which is connected from base to
8 emitter of Q4a, is to delay the onset of the
9 protective action.

10 And the reason it's there -- with any of
11 these protective circuits, you really don't want it
12 to act to protect unless it absolutely has to,
13 because once that happens, bad things happen to the
14 sound and sometimes to the speakers.

15 So everybody -- well, most people recognize
16 that a transistor is capable of withstanding a higher
17 current -- higher set of current voltage conditions
18 for a short period of time than it is for a longer
19 period of time. So the role of this capacitor is to
20 sort of keep this circuit from being trigger happy.

21 Q. But -- and maybe I'm misunderstanding your
22 testimony, but I thought that earlier you said that
23 this voltage across the load sort of acts as moving
24 some kind of measure up and down, which then controls
25 how the protective cir- -- circuit functions.

1 MR. CRAIN: Objection.

2 Mischaracterization.

3 Q. (By Mr. Das) Go ahead.

4 A. Certainly, I didn't say it that way or I
5 didn't mean to say it that way.

6 The -- this entire circuit, its reference
7 is floating with the signal. So, for example,
8 whether it turns on or not, Q4a is responsive to a
9 difference in voltages, both of which are floating up
10 and down.

11 I'm not sure -- I hope I answered your
12 question. I -- I -- I apologize. These -- these
13 circuits, you know, are not -- not always
14 straightforward.

15 Q. But, again, Q4a allows current to flow
16 through it when the base potential is greater than by
17 some predetermined amount than the emitter potential;
18 correct?

19 A. That is --

20 MR. CRAIN: Object to form.

21 THE WITNESS: That is correct.

22 Q. (By Mr. Das) And the base potential for
23 Q4a is -- according to, again, the language in
24 Column 10, is -- the voltage across the load is
25 what's being supplied to the capacitor 3a -- sorry.

1 I -- let me restart.

2 The emitter potential is the load -- the
3 voltage across the load ZL that's being supplied to
4 the other end of capacitor 3a; correct?

5 MR. CRAIN: Object to form.

6 THE WITNESS: You're closer to being on the
7 right track.

8 Q. (By Mr. Das) Okay.

9 A. The right track -- you got closer to the
10 right track when you said that the output voltage was
11 being applied to the emitter of the transistor.

12 Just -- for the purposes here, just forget
13 about that capacitor. I mean, there's a lot of stuff
14 in this patent that's kind of ob- -- obfuscating. It
15 wasn't even easy for me to read it. But because I
16 know how these circuits generally work -- there's a
17 whole chapter in my book on these circuits -- you
18 know, I was able to sort of, you know, skim through
19 what he said. I -- I don't really mean skim, but --
20 I read it thoroughly, but those parts of it that were
21 borderline incomprehensible I was able to understand
22 because I know how these circuits usually work.

23 Q. So taking advice about forget about the
24 capacitor --

25 A. Right.

1 Q. -- if you forget about the capacitor, then
2 the voltage across the load is being supplied to the
3 emitter of Q3a -- Q4a; correct?

4 MR. CRAIN: Object to form.

5 THE WITNESS: Actually, that's not quite
6 even right either. And -- and the problem is
7 that -- when you said "the voltage across the
8 load."

9 All you can really say without going even
10 deeper, I suppose, is that the voltage at the
11 output of the amplifier is applied to the
12 emitter of Q4a.

13 Q. (By Mr. Das) Okay. And why is the voltage
14 at the output of the amplifier not the voltage across
15 the load?

16 A. Because Q4a doesn't really know anything
17 about ground. It -- as I said earlier, this whole
18 circuit is floating up and down with a signal.

19 The only thing that you see there, as I
20 mentioned earlier, is you see this resistor R7a and
21 R7b connected to ground to -- as a twiddle for the
22 circuit, but it is not a reference for this circuit.
23 The circuit is going up and down like this and to
24 first order, it doesn't know anything about ground.

25 Q. What's a twiddle?

1 A. That's a technical term. A twiddle means
2 that R7a is trying to alter the threshold at which
3 this transistor will begin to limit current flow of
4 the output stage.

5 Q. And "this transistor," you're referring to
6 Q4a?

7 A. Yes, that's right.

8 Q. Okay. And the voltage across resistors R9A
9 and R10a are being supplied to the base of Q4a;
10 correct?

11 A. That is not correct.

12 Q. Okay. Why not?

13 A. They're passing through diodes --

14 Q. Okay.

15 A. -- that introduce a -- a junction drop.

16 Q. Okay.

17 A. Second of all, I might point out that even
18 as a given, that, you know, these diodes each
19 introduce, you know, a voltage drop in that -- in
20 that chain, that the only thing that is ultimately
21 provided to Q4a is an indication of the current
22 flowing through the transistor that's conducting the
23 most current.

24 In other words, these -- these diodes here
25 are basically performing an operation of whichever is

1 greater, and these transistors are often not well
2 matched.

3 So, for example, you could have -- under
4 certain conditions of the -- of the signal swing, you
5 could have F2a carrying a substantially amount -- a
6 larger amount of the load current than F1a.

7 So by the time you get to the cathodes of
8 those two diodes, i.e., the right end of R3a, all
9 you're responding to is the larger of -- of the
10 current flowing in either of the output transistors.

11 MR. CRAIN: Before you ask another
12 question, just for purposes -- you know, there
13 is a larger figure. It looks like you're having
14 trouble seeing it.

15 THE WITNESS: I'm sorry. I'm sorry.

16 Q. (By Mr. Das) Yeah, it's a few pages.

17 MR. CRAIN: You're looking at the face of
18 the patent and it's a small figure.

19 THE WITNESS: Oh, yes, yes.

20 MR. DAS: Thank you, Mr. Crain. That's
21 actually -- I -- I was wondering why Mr. Cordell
22 was looking at the smaller figure.

23 MR. CRAIN: Well, when I saw him squinting,
24 I said, "You know what...."

25 THE WITNESS: Yeah, thank you.

1 Q. (By Mr. Das) So I was going to ask: You
2 said the resistor R3a, but is that the resistor R8a?

3 A. Yes.

4 Q. Okay. Hence, the smaller figure is --
5 probably looked like a 3, so...

6 A. Yeah.

7 Q. Okay.

8 A. Thank you.

9 MR. DAS: Why don't we go off the record
10 for a minute.

11 MR. CRAIN: Okay.

12 VIDEOGRAPHER: This is the end of Video 6.
13 We're off the record at 6:02 p.m.

14 (Thereupon, there was an interruption in
15 the proceedings.

16 VIDEOGRAPHER: This is the beginning of
17 Video 7. We're on the record at 6:14 p.m.

18 Q. (By Mr. Das) Mr. Cordell, during this
19 break, did you have a chance to speak with Crest's
20 counsel?

21 A. Yes, I did.

22 Q. And did you discuss the substance of your
23 testimony to this point?

24 A. No.

25 Q. Did you discuss the substance of any

1 testimony you'll be giving going forward?

2 A. No.

3 Q. And did anyone suggest to you how you
4 should answer any questions?

5 A. No.

6 Q. Now, if you could turn back to the Van
7 Hulle reference, which is Exhibit 8.

8 And in your declaration discussing the Van
9 Hulle reference at paragraph 80, 8-0 --

10 A. Yes.

11 Q. -- you say, "In my opinion, the 'signal
12 processing circuit' in 2 is likely a conventional
13 analog circuit. Of course, that circuit may include
14 an ADC to enable it to receive signals in digital
15 format and present them to the remaining analog
16 circuitry."

17 Do you see that?

18 A. Yes.

19 Q. So at the time the application that issued
20 as the '542 patent was filed, was it well known to
21 take --

22 A. I'm sorry. I was just confused by one of
23 these numbers. I apologize.

24 Q. Oh, yeah, the Van Hulle is '524. That --

25 A. Yeah, and that's --

1 Q. I hadn't even noticed it.

2 A. My dyslexia, "Oh, wait a minute. Is it
3 '544 we're talking about?"

4 Q. No, the '5 -- '542 patent --

5 A. Yes.

6 Q. -- the thick patent, at the time it was
7 filed, was it known to convert digital signals to
8 analog using an A/D converter?

9 A. Oh, yes.

10 Q. And was it also known to convert analog
11 signals to digital using D/A converters?

12 A. Yes.

13 Q. And the output from a D/A converter would
14 be sent to some sort of input port for DSP; correct?

15 MR. CRAIN: Object to form. Speculation.

16 THE WITNESS: Actually, it's -- the answer
17 is no.

18 Q. (By Mr. Das) Where would the output from
19 the D/A converter be sent?

20 A. Well, you said that the output from the D/A
21 converter would be sent to a DSP.

22 Q. And I misspoke, so -- that's a really good
23 point. I misspoke because I think you misspoke,
24 because you said in your statement that "the 'signal
25 processing circuit'...is likely a conventional analog

1 circuit...[The] circuit may include an ADC to enable
2 it to receive input signals in digital format..." So
3 you tripped me up.

4 A. Bingo.

5 Q. You meant, I think, a D/A converter.

6 A. D/A converter.

7 Q. Okay. Good. So --

8 A. Two points.

9 Q. Thank you.

10 Now, so would the output from -- would
11 it -- let's just start this whole chain over.

12 A. Okay.

13 Q. Was it well known to convert analog signals
14 to digital using an A/D converter?

15 A. Yes.

16 Q. And would the output from that A/D convert
17 be sent to an input for a digital signal processor?

18 MR. CRAIN: Objection. Speculation.

19 THE WITNESS: It could be sent to a whole
20 variety of other pieces of equipment.

21 Q. (By Mr. Das) Fair enough, and that's an
22 excellent point.

23 So if an analog signal was being converted
24 to digital using an A/D converter and if that signal
25 was being sent to a DSP, in that circumstance, would

1 the signal from the A/D converter -- converter be
2 sent to an input board for the DSP?

3 MR. CRAIN: Object to form. Foundation and
4 speculation.

5 THE WITNESS: Not necessarily.

6 Q. (By Mr. Das) Where else would it be sent?

7 A. It could be sent to all kinds of circuitry
8 that precedes the DSP. It could be sent to circuitry
9 that changes its format in some way. I mean,
10 ultimately, there are many different ways in which it
11 could make its way to the pins of a DSP.

12 Q. And would the pins of a DSP be considered
13 input ports for the DSP?

14 MR. CRAIN: Object to form.

15 THE WITNESS: I think the answer is yes, it
16 could be considered, yes.

17 MR. DAS: All right. We have no further
18 questions on the '542 patent at this time.

19 MR. CRAIN: We have no questions either, so
20 we'll consider this deposition concluded.

21 MR. DAS: Okay.

22 VIDEOGRAPHER: That is the end of the
23 deposition for the day. We are off the record
24 at 6:20 p.m.

25 (Whereupon, the deposition was concluded at

1 6:20 p.m.)

2 (Pursuant to Rule 30(e) of the Federal
3 Rules of Civil Procedure and/or O.C.G.A.

4 9-11-30(e), signature of the witness has been
5 reserved.)
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C E R T I F I C A T E

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COUNTY OF FULTON:

I hereby certify that the foregoing transcript was taken down, as stated in the caption, and the questions and answers thereto were reduced to typewriting under my direction; that the foregoing pages represent a true, complete, and correct transcript of the evidence given upon said hearing, and I further certify that I am not of kin or counsel to the parties in the case; am not in the regular employ of counsel for any of said parties; nor am I in anywise interested in the result of said case.

LEE ANN BARNES, CCR B-1852, RPR, CRR

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Our Assignment No. 1923727

Case Caption: QSC AUDIO PRODUCTS, LLC vs. CREST
AUDIO, INC.

DECLARATION UNDER PENALTY OF PERJURY

I declare under penalty of perjury
that I have read the entire transcript of
my Deposition taken in the captioned matter
or the same has been read to me, and
the same is true and accurate, save and
except for changes and/or corrections, if
any, as indicated by me on the DEPOSITION
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Signed on the _____ day of
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_____, 2014

To: N. Andrew Crain, Esq.

Case Name: QSC Audio Products v. Crest Audio, Inc.

Veritext Reference Number: 1923727

Witness: Robert Cordell Deposition Date: 9/17/2014

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If the jurat is not returned within thirty days of your receipt of this letter, the reading and signing will be deemed waived.

Sincerely,

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Encl.

Cc: K.M. Das, Esq.