

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,

Petitioner

v.

JAWBONE INNOVATIONS, LLC,

Patent Owner.

Case No. IPR2022-01027

Patent No. 8,467,543

Filing Date: March 27, 2003

Issue Date: June 18, 2013

Inventor: Gregory C. Burnett, Nicolas J. Petit,

Alexander M. Asseily, and Andrew E. Einaudi

Title: MICROPHONE AND VOICE ACTIVITY DETECTION (VAD)

CONFIGURATIONS FOR USE WITH COMMUNICATION SYSTEMS

DEPOSITION OF DAVID V. ANDERSON, Ph.D.

Atlanta, Georgia

Wednesday, March 1, 2023 - 10:00 a.m.

Reported by:

F. Renee Finkley, RPR, RMR, CRR, CLR, CCR-B-2289

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THE WITNESS: DAVID V. ANDERSON, Ph.D.

EXAMINATION

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By Mr. Lambrianakos

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1 DAVID V. ANDERSON, Ph.D.,
2 having been first duly sworn, was examined and
3 testified as follows:

4 EXAMINATION

5 BY MR. LAMBRIANAKOS:

6 Q. Good morning, Dr. Anderson.

7 A. Good morning.

8 Q. Would you please state your full name for
9 the record?

10 A. David Verl Anderson.

11 Q. You've been deposed before, correct?

12 A. Yes.

13 Q. And you've been deposed in connection with
14 IPR proceedings against patents owned by Jawbone; is
15 that right?

16 A. Yes.

17 Q. How many times?

18 A. Twice for the Jawbone one.

19 Q. In total how many times have you been
20 deposed?

21 A. I'm not sure. It's probably on the order
22 of 20.

23 Q. You're familiar with the process of a
24 deposition, right?

25 A. I believe so.

1 Q. I'll just give you some of the basic
2 ground rules if that's okay.

3 A. Okay.

4 Q. You understand that I'll be asking
5 questions and you'll be providing answers?

6 A. Yes.

7 Q. If you don't understand any question,
8 please let me know and I'll try to rephrase it. If
9 you do answer a question, I will assume that you
10 understood it; is that fair?

11 A. Yes.

12 Q. You understand that your attorney may
13 object from time to time, but you're still to answer
14 my questions unless she objects and instructs you not
15 to answer and you take her instruction. You
16 understand that?

17 A. Yes.

18 Q. If you'd like to take a break at any time,
19 just let me know and we'll take a break as soon as we
20 can. Does that work for you?

21 A. Yes.

22 Q. Are you on any medications that would
23 prevent you from giving truthful and accurate
24 testimony?

25 A. No.

1 Q. Is there any other reason that you cannot
2 give truthful and accurate testimony today?

3 A. No.

4 Q. How did you prepare for your deposition?

5 A. Over the past couple days I reviewed my
6 declaration and the art and the institution decision.

7 Q. Did you meet with any attorneys at
8 Finnegan Henderson?

9 A. I did.

10 Q. And you met with them in connection with
11 your preparation for today?

12 A. Yes.

13 Q. And when did you meet with those
14 attorneys?

15 A. Friday by phone or teleconference, Monday
16 and then a short meeting yesterday by teleconference.

17 Q. And how much time in total did you spend
18 meeting with the Finnegan attorneys?

19 A. Over the past few weeks or total -- or
20 past few days or in total?

21 Q. Over the past few days in the
22 communications that you just described.

23 A. Probably on the order of six to ten hours.
24 I don't recall exactly.

25 Q. Which attorneys did you communicate with?

1 A. Primarily with Sonja.

2 Q. Where do you currently work?

3 A. Georgia Tech.

4 Q. What's your position there?

5 A. Professor.

6 Q. Is that your full title, just professor?

7 A. Yes.

8 Q. You teach classes at Georgia Tech?

9 A. I do.

10 Q. Which classes are you teaching currently?

11 A. I'm teaching fundamentals of digital
12 signal processing and adaptive filtering.

13 Q. Are those undergraduate level classes?

14 A. The fundamentals of digital signal
15 processing is a senior level class. The adapter
16 filtering is a graduate class.

17 Q. You understand that we're here today for a
18 deposition in connection with IPR 2022-01027?

19 A. Yes.

20 Q. And that proceeding relates to U.S. patent
21 number 8,467,543?

22 A. Yes.

23 Q. And we'll call that the '543 patent, is
24 that okay?

25 A. Yes.

1 Q. Now, in that proceeding the petitioner has
2 asserted three grounds of invalidity; isn't that
3 right?

4 A. Yes.

5 Q. All of those are based on obviousness?

6 A. Yes, they are.

7 Q. You submitted a declaration in support of
8 the petition, correct?

9 A. I did.

10 Q. And you included all of your obviousness
11 opinions in your declaration, right?

12 MS. SAHLSTEN: Objection, form.

13 THE WITNESS: Can you restate that?

14 Q. (By Mr. Lambrianakos) Did you include in
15 your declaration all of your opinions regarding the
16 three obviousness grounds that are included in the
17 petition?

18 A. I've included in here all of the grounds
19 we're asserting in this case.

20 Q. And the grounds that you included include
21 all of your opinions which support those grounds?

22 A. I do not intend to offer further opinions,
23 but I may offer clarification on them.

24 Q. So you won't offer any further opinions
25 regarding obviousness to support the grounds in the

1 petition here at this deposition, correct?

2 MS. SAHLSTEN: Objection, form.

3 THE WITNESS: I'm not sure what you mean
4 when you say "offer further opinion." You're
5 going to be asking me questions, and I'm going
6 to do my best to answer them and they should be
7 relative to these grounds.

8 Q. (By Mr. Lambrianakos) But you don't
9 intend to offer any further opinions that are not
10 included in your declaration, correct?

11 MS. SAHLSTEN: Objection, asked and
12 answered.

13 THE WITNESS: As I said, my opinions are
14 in here. Inasmuch as you ask for information
15 about them or clarification, I may provide that,
16 but I'm not going to introduce new grounds.

17 Q. (By Mr. Lambrianakos) Are you going to
18 introduce any new evidence to support your opinions?

19 A. I'm going to rely on the prior art that
20 we've already cited as well as my personal experience
21 in the area.

22 Q. Is it true that all of the evidence that
23 you rely on for your opinions in your declaration are
24 cited in your declaration?

25 A. I am not certain if you're asking -- I'm

1 not exactly certain what you mean by that. I'll
2 explain my uncertainty. I'm relying on the exhibits
3 and I cite to the exhibits, and in many places I use
4 example cites. There may be additional information
5 or clarification within those exhibits that I'm
6 citing to that would help answer any questions you
7 have.

8 Q. Do you intend to cite to evidence in
9 support of your opinions which is not cited in your
10 calculation?

11 MS. SAHLSTEN: Objection, form, calls for
12 speculation.

13 THE WITNESS: I don't know what you're
14 going to ask and I can't recall all the
15 citations right now, but I'm not going to cite
16 outside of the exhibits that I've already cited.

17 Q. (By Mr. Lambrianakos) Did you conduct any
18 prior art searches against the '543 patent?

19 A. I did conduct prior art searches relative
20 to the '543 patent.

21 Q. Did your searches yield any of the
22 references that you cite in your declaration?

23 A. Yes.

24 Q. Which of the references that you cite were
25 located during your own prior art search?

1 A. I don't recall which ones I found and
2 which ones were found by Finnegan or the search firm.
3 I do remember that some of them I found that was over
4 a year ago.

5 Q. You don't remember which ones you found?

6 A. Not perfectly.

7 Q. Did you find any references that
8 anticipated the '543 patent in your opinion?

9 MS. SAHLSTEN: Objection, scope.

10 THE WITNESS: I've only -- I haven't done
11 anticipation analysis, only obviousness analysis
12 as included in here.

13 Q. (By Mr. Lambrianakos) Did you find any
14 references that anticipated the '543 patent in your
15 opinion?

16 A. I haven't formed an opinion about
17 anticipation.

18 Q. The question was whether you've found any
19 references that anticipated the '543 patent in your
20 opinion. Would you please answer that question?

21 MS. SAHLSTEN: Objection, asked and
22 answered.

23 THE WITNESS: In order to answer that
24 question, I would have had to have an opinion on
25 whether or not something anticipates which I

1 have not evaluated or decided.

2 Q. (By Mr. Lambrianakos) When you did your
3 prior art searching, did you do so with the goal of
4 finding only obviousness references?

5 A. I did so with the goal of finding relevant
6 technology.

7 Q. Did you find relevant technology that
8 anticipated the '543 patent?

9 MS. SAHLSTEN: Objection, asked and
10 answered.

11 THE WITNESS: I found many pieces of
12 technology that were prior art and relevant.
13 What we decided to use in the petition and in my
14 declaration were these, their obviousness. I
15 did not form an opinion about anticipation.

16 Q. (By Mr. Lambrianakos) When were you
17 retained?

18 A. It would have been mid to late 2021.

19 Q. Who retained you for this proceeding?

20 A. Finnegan & Henderson.

21 Q. Have you also been retained in the
22 infringement case between Jawbone and Google?

23 A. Yes.

24 Q. When were you retained in this case?

25 Strike that.

1 You have an opinion in your declaration
2 regarding the level of skill of a person of ordinary
3 skill in the art, right?

4 A. Yes.

5 Q. And it's your opinion that you meet that
6 definition, right?

7 A. Yes.

8 Q. And you meet the definition of a person of
9 ordinary skill in the art as of the time of the
10 filing of the '543 patent; is that correct?

11 A. Yes.

12 Q. Does your level of skill exceed that of a
13 person of ordinary skill in the art?

14 MS. SAHLSTEN: Objection, form, scope.

15 THE WITNESS: It definitely meets. When
16 you say exceed, that could -- I'm not sure what
17 you mean. For example, do I have more
18 experience than one of -- that I've identified
19 as ordinary skill in the art? The answer to
20 that, for example, would be yes.

21 Q. (By Mr. Lambrianakos) So at the time of
22 the filing of the '543 patent, did you have more than
23 just a Bachelor's degree in computer engineering,
24 computer science, electrical engineering, mechanical
25 engineering or a similar field?

1 A. Yes.

2 Q. What degree did you have at that time that
3 exceeds the Bachelor's degree?

4 A. I had a Ph.D.

5 Q. Is that all? Any other degrees?

6 A. And a Master's degree.

7 Q. So as of the time of the filing of the
8 '543 patent, you had a Master's degree and a Ph.D. in
9 addition to a Bachelor's degree; is that right?

10 A. Yes.

11 Q. Did you have more than three years of
12 industry experience or academic experience in a field
13 that relates to acoustic, speech recognition, speech
14 detection, or signal processing?

15 A. Yes.

16 Q. Approximately how much experience did you
17 have?

18 A. Say nine or ten years.

19 Q. You provided your opinions in this
20 declaration from a point -- from the point of view of
21 a person of ordinary skill in the art as of March 27,
22 2002, correct?

23 A. Yes.

24 Q. What process did you go through in order
25 to put yourself in the position of someone who has

1 only ordinary skill in the art?

2 MS. SAHLSTEN: Objection, form.

3 THE WITNESS: So ordinary skill in the art
4 would encompass a lot. It does not say would
5 have only a Bachelor's degree. It says at least
6 a Bachelor's degree. It doesn't say that you
7 can have like just a certain limited amount of
8 experience. But more to answer to your
9 question, I was one of ordinary skill in the art
10 at the time and also I worked as a consultant
11 during much of this time and was working as a
12 consultant in 2002 and in the years immediately
13 prior with companies who are endeavoring to do
14 similar type of operations. So I was very
15 familiar with what one of ordinary skill in the
16 art would do, what resources they would look at,
17 how they would approach a problem, and what type
18 of problem solving capabilities they would have.

19 Additionally as a professor, I worked with
20 those who had a Bachelor's degree or were
21 earning a Bachelor's degree so I knew what they
22 knew. I also worked with people who were
23 working on graduate degrees, postgraduate work
24 and knew what several years of experience would
25 give someone of ordinary skill in the art.

1 Q. (By Mr. Lambrianakos) Did you do anything
2 to ensure that when you were applying your
3 understanding of a person of ordinary skill in the
4 art that you were not applying expertise that would
5 exceed that of a person of ordinary skill in the art?

6 A. Yes.

7 Q. What did you do?

8 A. Well, for one thing the technology in the
9 '543 patent would have been obvious without looking
10 at other references to someone of extra ordinary
11 skill in the art. So I found citations that would
12 have made it clear to somebody who did not have that
13 information at their fingertips how to do the various
14 steps or why I didn't really use the '543 as -- as a
15 template but rather found that to do -- to meet those
16 goals of having a noise supression system, I found
17 references that taught all the elements or made
18 obvious all the elements of the '543 patent.

19 Q. Did you do anything else to ensure that
20 when you were applying your understanding of a person
21 of ordinary skill in the art that you were not
22 applying expertise that would exceed that of a person
23 of ordinary skill in the art?

24 MS. SAHLSTEN: Objection, asked and
25 answered.

1 THE WITNESS: I applied my understanding,
2 which was extensive, of what one of ordinary
3 skill in the art at the time would know and the
4 procedures in evaluating the obviousness of this
5 patent.

6 Q. (By Mr. Lambrianakos) And how did you
7 make sure that when you did that you weren't also
8 applying knowledge that you have which a person of
9 the ordinary skill in the art would not?

10 A. Well, for one thing there's the standard
11 that I described in my declaration. I'm looking at
12 paragraph 29 where it says: I have been asked to
13 consider the '543 patent's claims and prior art
14 through the eyes of a person of ordinary skill in the
15 art. I have considered factors such as education
16 level and years of experience of those working in the
17 pertinent art, types of problems encountered in the
18 arts, the teaching of the prior art, patents and
19 publications of other persons or companies and
20 sophistication of the technology. I've been asked to
21 assume a person of ordinary skill in the art is not a
22 specific real individual but rather a hypothetical
23 individual having the qualities reflected by the
24 factors discussed above. That's the standard I used.

25 Q. Are you familiar the Andrea reference?

1 A. Yes.

2 Q. That was Exhibit 1005 to the IPR; isn't
3 that right?

4 A. Yes.

5 Q. It's your opinion that Andrea discloses a
6 voice detection subsystem, correct? I'll direct you
7 to page 31 of your declaration which may be helpful
8 in answering the question.

9 A. Thank you. Yes.

10 Q. The voice detection subsystem in Andrea is
11 in your opinion the VOX which is numbered 1950?

12 A. I wrote that it includes the VOX circuit,
13 yes.

14 Q. Well, you wrote in paragraph 74 that
15 Andrea's noise cancelation apparatus includes a voice
16 detection system, open parentheses, quote, VOX
17 circuit 1950, close quote, close parentheses; is that
18 right?

19 A. Correct.

20 Q. So should I take that to mean that the
21 voice detection subsystem disclosed in Andrea is the
22 VOX circuit 1950?

23 A. Yes.

24 Q. Referring to Andrea, what is the input to
25 the VOX? You may want to look at Figure 28 for this.

1 A. It's the output of something labeled AWC
2 mic amp.

3 Q. What is that output?

4 A. It would be a speech signal or speech plus
5 noise. It would be a microphone signal.

6 Q. What is the output of the VOX?

7 A. It's labeled speech signal. It's a signal
8 that indicates whether or not there is speech.

9 Q. What form does a speech signal take in its
10 output from VOX?

11 A. So it would be output of the VOX controls,
12 the transmission gate. So that would be a logical
13 signal indicating whether or not the transmission
14 gate should be active to allow through speech or
15 inactive to prevent noise from being transmitted.

16 Q. So the speech signal that is output from
17 the VOX is a logical signal, is that your testimony?

18 MS. SAHLSTEN: Objection, form.

19 THE WITNESS: So I'd like to correct that.
20 It appears that the VOX circuit determines
21 whether or not there is speech and incorporates
22 all those operations internally so that the
23 output would be the actual speech audio signal
24 as near as I can tell.

25 Q. (By Mr. Lambrianakos) Is it your

1 understanding that Andrea's noise suppression system
2 works by subtracting the speech and noise
3 signal -- strike that.

4 Is it your understanding that Andrea's
5 noise suppression system works by subtracting the
6 signal from mic 14 from the signal from mic 12?

7 A. Where are you looking?

8 Q. I'm looking at Figure 2. So just to
9 re-ask the question so the record's clear, is it your
10 understanding that Andrea's noise suppression system
11 works by subtracting the signal from mic 14 from the
12 signal obtained from mic 12?

13 A. So Figure 2 shows a high level simple
14 diagram that shows that the signal coming out of the
15 block labeled mic 12 -- rather the signal coming out
16 of the block labeled mic 14 is subtracted from the
17 one coming out of the block named mic 12, but mic 12
18 and mic 14 actually refer to -- and that subtraction
19 circuit have more electronics around them so that
20 what is actually subtracted is a normalized or
21 calibrated noise reference signal from mic 14.

22 Q. What normalization or calibration do you
23 contend is done to the noise signal?

24 A. Referring to Andrea column 21 that refers
25 to -- I'm looking around line 22, and that also

1 refers to Figure 10. It says: As shown on
2 Figure 10A, the signal produced by the first
3 microphone is supplied to an input terminal 600 and
4 is supplied therefrom through a Capacitor C1 and
5 resistor R to an inverting input of an operating
6 amplifier V1A. The signal produced by the second
7 microphone is supplied to an input terminal 602.
8 Such input terminal 602 is coupled to a potentiometer
9 RA which, in turn, is connected to ground.

10 It goes on to explain -- I don't want to
11 read the whole thing into the record, but that that
12 potentiometer is put in there to allow matching so
13 that when subtracted, the second microphone has a
14 noise estimate that is subtracted from the first
15 microphone that has speech plus noise.

16 Q. Explain what you mean by matching.

17 A. The idea of Andrea is to have one
18 microphone that substantially picks up the noise and
19 another that picks up the speech corrupted by the
20 noise. These microphones are near each other but may
21 have different characteristics, different gains or
22 pick up the noise slightly differently. So
23 converting the noise from the noise reference
24 microphone to match the level of the noise in the
25 speech plus noise or main microphone is an important

1 task. If you want to subtract the noise using
2 simplified numbers, if the noise level was five and
3 the reference was always 10 percent lower than that,
4 say 4.5, subtracting would not remove all of the
5 noise. So matching could include changing the gain
6 of the reference microphone, the noise reference
7 microphone, slightly so that the noise levels in the
8 two microphones were as close as possible.

9 Q. So by matching, are you referring to
10 matching the gain between the two microphones?

11 A. I'm referring to matching the noise levels
12 so that the noise level from the noise reference
13 microphone after the circuit described is an estimate
14 of the noise in the primary microphone. I should
15 probably add that the noise reference microphone has
16 an estimate of the noise without further gains being
17 required. Andrea adds in the further potentiometer
18 to allow that estimate to be improved.

19 Q. Does Andrea assume that the noise
20 microphone receives noise only?

21 A. It assumes that it receives substantially
22 noise.

23 Q. So you agree that the noise microphone
24 could receive a mixture of speech and noise, right?

25 A. Andrea discloses that it receives the

1 noise.

2 Q. Does Andrea disclose that the noise
3 microphone receives only noise?

4 A. Sorry, can you ask your question again?

5 Q. Does Andrea disclose that the noise
6 microphone receives only noise?

7 A. Andrea discloses that it is a noise
8 reference microphone to receive the noise. It also
9 discloses that if not -- if the angles aren't used
10 correctly, it could receive some speech as well but
11 implies that when it's correctly set up, it receives
12 noise.

13 Q. Is it your understanding from Andrea that
14 if the microphones are set up correctly, then the
15 noise microphone will not receive any speech?

16 MS. SAHLSTEN: Objection, form.

17 THE WITNESS: So I'm going to have to talk
18 about one of ordinary skill in the art at this
19 point. It is not possible to have an active
20 microphone in a room with another signal and not
21 get some of that signal, whether that's in the
22 '543 patent, Andrea or anything else. It's the
23 level that matters. If you can detect one part
24 in a billion, is that what you're asking? In
25 which case, I know of no system on earth that

1 does that. If you are saying does it
2 substantially receive the noise such that any
3 residual speech is inconsequential, then I think
4 one of ordinary skill in the art would
5 understand that that's how that and any other
6 microphone system would work.

7 Q. (By Mr. Lambrianakos) In paragraph 132 of
8 your declaration, do you say that generating a noise
9 waveform estimate is done in Andrea by converting
10 background noise supplied to the second microphone
11 into a corresponding electrical signal?

12 A. Are you asking if I say what I wrote?

13 Q. I want to make sure that I understand and
14 am properly interpreting your opinion. Should I
15 re-ask the question?

16 A. Just point me to the sentence you're
17 looking at.

18 Q. The first sentence of --

19 A. Thank you.

20 Q. -- paragraph 132 which happens to be the
21 only sentence in paragraph 132.

22 A. Oh, yeah, it's kind of long. I was
23 looking at 131 -- 133, I apologize. I'm with you
24 now. Okay, now ask your question again.

25 Q. Is it your opinion that generating a noise

1 waveform estimate is done in Andrea by converting the
2 background noise supplied to the second microphone
3 into a corresponding electrical signal?

4 A. That's one of the ways it could be
5 interpreted. I mentioned two. The first is that the
6 fact that we are getting a waveform that is from the
7 noise microphone, that is an estimate of the noise
8 that would be obvious to one of even less than
9 ordinary skill in the art. So that is one estimate.
10 The claim terms are also met or Andrea also provides
11 an improved estimate by going through the circuits as
12 I describe in Figure 10.

13 Q. And where in your declaration do you
14 disclose the second means that you say provides an
15 improved estimate?

16 A. If you look in paragraph 133, a POSITA
17 would have understood that the corresponding
18 electrical signal from the second microphone 14
19 and/or the level matched signal from the second
20 microphone 14 is a waveform representing the
21 background noise and is therefore a noise waveform
22 estimate of the background noise.

23 Q. In your opinion that the output of the
24 second microphone 14 is comprised primarily of noise;
25 is that right?

1 A. The output of microphone 14 is a waveform
2 representing the background noise.

3 Q. And that's true even if the noise
4 microphone picks up some speech?

5 A. It is an estimate of the background noise.
6 Estimates don't have to be perfect. So I didn't
7 consider that it -- to me that was irrelevant. As
8 long as it is an estimate of the background noise and
9 Andrea discloses that microphone receives the
10 background noise, then it's an estimate of the
11 background noise.

12 Q. So whether it's an estimate of the
13 background noise depends entirely on the ability of
14 the noise microphone to pick up primarily noise,
15 correct?

16 MS. SAHLSTEN: Objection, form.

17 THE WITNESS: Andrea discloses a
18 microphone and the microphone configuration
19 designed to pick up background noise; therefore,
20 it is an estimate of the background noise.

21 Q. (By Mr. Lambrianakos) So there's no other
22 processing that is done that ensures that the output
23 is an estimate of the background noise, correct?

24 A. Incorrect. I've already explained that.
25 That estimate is then -- which would be the signal

1 from the microphone, then goes through a circuit that
2 has a means for adjusting the estimate -- the circuit
3 behavior so that the estimate is an improved estimate
4 of the background noise.

5 Q. But that's done just by matching the gain
6 from the noise microphone with that of the speech and
7 noise microphone, correct?

8 A. The part that's adjusted is the gain to
9 make it a level matched estimate to the background
10 noise.

11 Q. Does the circuit know which portion of the
12 noise microphone's output is noise versus speech?

13 A. Circuits don't know things.

14 Q. So it's just matching the gain of the
15 output of one microphone to the gain of the output of
16 the other microphone; isn't that right?

17 A. No.

18 Q. So what gains are being matched?

19 A. The noise level is being -- in the one
20 microphone is being matched to the noise level in the
21 other microphone so that it is an improved noise
22 waveform estimate.

23 Q. How does the circuit match the noise of
24 the noise microphone with the portion of the output
25 of the speech and noise microphone that comprises

1 noise?

2 A. I've already explained so you must be
3 asking something different, and I don't understand
4 your question.

5 Q. Well, you agree that one of the
6 microphones picks up speech and noise by design,
7 right?

8 A. Yes.

9 Q. So how does the circuitry match the output
10 of the noise microphone with the noise portion of the
11 output of the speech and noise microphone?

12 A. That's what we discussed in column 21 and
13 in Figure 10.

14 Q. So you're saying that the answer to my
15 question is included in the text in column 21 between
16 lines 22 and 55; is that right?

17 MS. SAHLSTEN: Objection, form, misstates
18 testimony.

19 THE WITNESS: I'm saying we discussed
20 Figure 10 and we discussed column 21 which
21 describes -- it's described elsewhere, but here
22 it's actually describing the circuit which was
23 more your question. It describes that we have
24 to level match the signal from the second
25 microphone so that the noise level estimate

1 matches the noise level in the primary
2 microphone.

3 Q. (By Mr. Lambrianakos) Where exactly in
4 Figure 21 are you referring for that answer -- strike
5 that.

6 Where exactly in column 21 are you
7 referring for your answer?

8 A. I just -- I'm giving you the context. Let
9 me back up and we can go through this whole patent.
10 First we can start with column 12 starting at line
11 55, acoustic signals composed of speech or the like
12 and background noise are supplied to the first
13 microphone 12 -- by the way, I've been referring to
14 that as the primary microphone -- and converted
15 therein into a corresponding electrical signal which
16 is thereafter supplied to the plus terminal of op-amp
17 16. The background noise is supplied to the second
18 microphone 14 and converted therein into a
19 corresponding electrical signal which is thereafter
20 supplied to the minus terminal of op-amp 16. Op-amp
21 16 is adapted to subtract the noise signal from the
22 second microphone 14 from the speech and noise signal
23 from the first microphone 12 and to supply therefrom
24 an electrical signal representing substantially the
25 speech to the telephone unit.

1 And then if we move forward to
2 column 14 -- actually that describes more -- column
3 15 is I think what I'm looking for. Looking about
4 line 29, the limiting resistor 208 is preferably a
5 variable current limiting resistor which enables the
6 level of the output signal from the second microphone
7 to be matched to within a predetermined value the
8 level of the output signal the first microphone.

9 Q. So --

10 A. So then you asked about 21. 21 goes on to
11 show the circuits in detail with that variable
12 resistor that one can use to match those circuits in
13 such a way that the level of the microphone, the
14 noise reference, is matched to the noise in the
15 primary microphone primary microphone.

16 Q. Right. And I asked you where in 21 does
17 it say that you're matching the level of noise in the
18 noise microphone to the level of noise in the primary
19 microphone?

20 A. You asked that while I was in the middle
21 of explaining something prior and what I was
22 explaining is that 21 shows the circuit. The
23 description is elsewhere. I just gave you the
24 elsewhere.

25 Q. Okay. Well, let's go back to column 15.

1 Is that part of your elsewhere?

2 A. Yes, that's part of it.

3 Q. And you say that there's disclosure that
4 there is a limiting resistor which enables the level
5 of the output signal from the second microphone to be
6 matched to within a predetermined value to the level
7 of the output signal of the first microphone,
8 correct?

9 A. Yes.

10 Q. So we are matching output signals or the
11 level of output signals of both microphones here,
12 correct?

13 A. Yes.

14 Q. So this doesn't disclose that you're
15 matching the level of the output from the noise
16 microphone with only the level of the output of the
17 speech and noise microphone that relates to noise
18 only, correct?

19 MS. SAHLSTEN: Objection, form.

20 THE WITNESS: Incorrect.

21 Q. (By Mr. Lambrianakos) Why is that
22 incorrect?

23 A. If someone is not speaking and there's
24 background noise and the noise levels are matched,
25 the two microphone levels are matched so the upper

1 levels are the same, the noise levels are matched, if
2 you add speech to the other microphone, it does not
3 change the gain. Those noise levels remain matched.

4 Q. So you're saying that the matching is done
5 only during periods of non-speech?

6 A. I'm using that as an illustration to show
7 that if they are matched, they are matched during
8 speech and non-speech.

9 Q. Are you saying that the matching is done
10 only during periods of non-speech?

11 MS. SAHLSTEN: Objection, asked and
12 answered.

13 THE WITNESS: I'm saying that the
14 microphones are matched so that -- and an
15 illustration of what happens when they're
16 matched is that during noise only periods, the
17 noise signal from the two microphones will have
18 the same level if they are matched. It says
19 they are matched. That's what that means. If
20 they are matched, then the noise level from the
21 second microphone will match the noise level in
22 the first microphone during speech and noise
23 just as it did without speech.

24 Q. (By Mr. Lambrianakos) When does the
25 matching take place?

1 A. When somebody adjusts the variable
2 resistor.

3 Q. Who is somebody?

4 A. Whoever has access, probably during
5 design. Once that matching has occurred, the
6 physical characteristics of the microphone and the
7 circuit should remain the same and the matching
8 should remain in place.

9 Q. So you're saying that the matching of the
10 levels between the two microphones is designed at the
11 time of production and is not variable during the
12 operation of the device?

13 A. I can't assume to say when they would have
14 it done, but if I were doing it, I would probably do
15 it during production or testing or some other period.
16 Once that's done, then the levels are matched, the
17 circuit is matched so that all of the noise reference
18 signals coming into the noise reference microphone,
19 all the noise signals would be level matched with the
20 noise in the primary microphone and therefore would
21 be a very good estimate of the noise in the primary
22 microphone.

23 Q. So, in your view, that matching is done
24 during production and that matching would work during
25 operation regardless of the level or origin of the

1 noise that is reaching the two microphones?

2 MS. SAHLSTEN: Objection, misstates
3 testimony.

4 THE WITNESS: I don't know exactly when
5 they did it, whether it was during production or
6 at another time. I stated that I would probably
7 choose to do it during production. Once that is
8 in place, then the gains of the microphones
9 would be matched in such a way that the noise
10 signal that comes out of the second microphone
11 circuit would be a close match or within a
12 tolerance, as it states, to the noise in the
13 primary microphone. Since it's a linear system,
14 a POSITA would know, POSITA would know that that
15 would work if the noise levels were small or if
16 they were large.

17 Q. (By Mr. Lambrianakos) When the matching
18 is done during production, does it assume that the
19 noise microphone is picking up only noise?

20 MS. SAHLSTEN: Objection, misstates
21 testimony, form.

22 THE WITNESS: I think you've already asked
23 that and I've tried to explain several times.
24 What part isn't clear?

25 Q. (By Mr. Lambrianakos) It's a yes or no

1 question, sir.

2 MS. SAHLSTEN: Same objection.

3 THE WITNESS: Well, then re-ask it,
4 please.

5 Q. (By Mr. Lambrianakos) When the matching
6 is done during production, does it assume that the
7 noise microphone is picking up only noise?

8 A. Let me read exactly what it says. The
9 first microphone 12 -- I'm reading in column 15 -- is
10 coupled through resistor 202 which is adapted to
11 function as a current limiting resistor so as to
12 correct the bias of an output from the first
13 microphone. The input -- to an input power terminal
14 200. The first microphone 12 is further coupled
15 through resistor 210 to plus terminal of the op-amp
16 and through a resistor -- to a variable resistor 214.
17 The second microphone 14 is coupled through a
18 variable resistor 208 which is adapted to function as
19 a current limiting resistor so as to correct the bias
20 of an output of the second microphone to an input
21 terminal and to the minus terminal of the op-amp 16.
22 The limiting resistor 208 is preferably a variable
23 current limiting resistor which enables the level of
24 the output signal from the second microphone to be
25 matched to within a predetermined level value to the

1 level of the output signal of the first microphone.

2 So it says you can match them. Once
3 they're matched, the noise levels match. If your
4 question is would it be matched while somebody is
5 speaking, if this was done in the manufacturing
6 situation, they would set up a small anechoic testing
7 or calibration room. They would present a signal to
8 it and they would match the levels. That signal
9 would most likely represent the noise, but this would
10 be easy for one of ordinary skill in the art to set
11 up and do.

12 The alternative that your question seems
13 to be dancing around would be that we have various
14 signals coming from different directions and we're
15 trying to match it. It wouldn't make sense. You
16 would rather have one signal that you would use that
17 would represent -- that would be picked up by both
18 microphones to match levels. If you had speech, then
19 both signals aren't going to be picked up by both
20 microphones and, therefore, matching would be a
21 futile endeavor. This isn't tricky. It's not hard
22 to understand. This is what one would understand if
23 they were of ordinary skill in the art.

24 Q. So in paragraph 132 you say that
25 generating a noise waveform estimate associated with

1 noise of the acoustic signals is achieved by
2 converting the background noise supplied to the
3 second microphone into a corresponding electrical
4 signal; is that right?

5 A. That's what it says and that is correct,
6 but as we also talked about, that is one of two
7 estimates of the noise that's produced by the Andrea
8 circuit. The first is the microphone signal coming
9 from the noise microphone and the second is the level
10 matched signal coming from the circuitry attached to
11 the second microphone or the noise microphone.

12 Q. According to what you say in
13 paragraph 132, the generation of a noise waveform
14 estimate is achieved simply by converting the noise
15 into an electric signal as done by the microphone; is
16 that right?

17 A. Are you just restating what I wrote?

18 Q. You keep answering my questions with more
19 questions. You can just answer the questions or I'll
20 have the board tell you to answer my questions --

21 A. I'll just read it again.

22 Q. -- without commentary.

23 A. It looked like you were just asking if I
24 had -- had written what I wrote. What I wrote is
25 that Andrea discloses a de-noising method that

1 includes generating a noise waveform estimate
2 associated with the noise of the acoustic signals,
3 open paren, converting the background noise supplied
4 to the second microphone into a corresponding
5 electrical signal, close paren, and subtracting the
6 noise waveform estimate from the acoustic signal.

7 Q. Is it your opinion that every microphone
8 produces a waveform estimate?

9 A. It's my opinion that an operating
10 microphone will produce a waveform.

11 Q. And what makes the output of the noise
12 microphone a noise waveform estimate?

13 A. Andrea discloses a physical setup of the
14 microphones which angles are specified, the positions
15 are specified such that one microphone picks up the
16 speech and the noise in its vicinity. The other
17 microphone is configured in such a way that it picks
18 up the noise. The way it's configured is that that
19 noise at the second microphone is substantially the
20 same as the noise in the first microphone that has
21 speech and noise. Therefore, by its construction,
22 the signal that comes out of the noise microphone is
23 an estimate of the noise in the primary microphone,
24 the first microphone.

25 Q. What makes that output an estimate?

1 A. It's impossible to have exactly the noise,
2 but it is very close to the noise. It was designed
3 in such a way that it is as close as possible to the
4 noise by its construction; therefore, it is an
5 estimate of the noise, a value that is very close to
6 the actual value.

7 Q. The design you're referring to is the
8 design of the microphones, correct?

9 A. The design of the whole system, but I've
10 been talking about the design in particular. I
11 mentioned that he's -- he has a system in which the
12 microphones are placed so that one receives speech
13 and noise and one receives an estimate of the noise
14 only.

15 Q. Do you agree that the noise waveform at
16 the speech and noise microphone and the noise
17 microphone must have the same phase at any given
18 frequency for the noise waveform estimate to be
19 subtracted out properly?

20 A. The closer the phase matches, the better
21 the cancellation will be.

22 Q. How close do the phases have to be in
23 order for the system to effectively cancel noise?

24 A. That's subjective. If the phases match
25 perfectly and the levels match perfectly, the

1 cancellation is perfect. Inasmuch as the levels are
2 off and the phases match perfectly, there will be
3 noise cancellation but it will not complete noise
4 cancellation, but it is still noise cancellation. If
5 the phases are off, then you will have somewhat of
6 the same effect. If they're off a little bit, then
7 the noise cancellation -- the noise will be cancelled
8 but not perfectly or entirely. If the phases were
9 completely opposite, for example, then the noise
10 wouldn't be cancelled at all, but Andrea discloses
11 microphones that are very close together to ensure
12 that the phases between the two microphones are very
13 similar.

14 Q. As the frequency of the noise increases,
15 does the phase shift between the noise signal picked
16 up by mic 12 and mic 14 increase?

17 A. As you get to higher and higher
18 frequencies, the distances will have a larger impact
19 on the phase, but we -- we spoke about that. One of
20 the reasons for combining the arrangement of Andrea
21 with the processing of Hussain was to deal with that
22 problem. It's something that Andrea also
23 acknowledges and discusses.

24 Q. Does Andrea teach that its noise
25 cancellation at high frequencies is poor?

1 MS. SAHLSTEN: Objection, form.

2 THE WITNESS: Andrea teaches that its
3 noise cancellation at higher frequencies is not
4 as effective as it is at lower frequencies.

5 Q. (By Mr. Lambrianakos) And you mentioned
6 the combination with Hussain?

7 A. Yes.

8 Q. Is it your opinion that a person of
9 ordinary skill in the art would have had a reasonable
10 expectation of success in incorporating Hussain's
11 sub-band processing and VAD voice activity signals
12 into Andrea's noise cancellation apparatus?

13 A. Absolutely.

14 Q. Would a person of ordinary skill simply
15 add all of Hussain's noise cancellation apparatus to
16 Andrea?

17 A. Hussain requires primary channel that has
18 speech plus noise and reference channel that has
19 noise, which is exactly what Andrea provides. So
20 this would be a drop-in replacement to take the --
21 Andrea's headset or handset configuration with its
22 microphones and its microphone pre-amps, drop them
23 directly into Hussain as the microphone array, and
24 that's exactly what Hussain was designed for.

25 MS. SAHLSTEN: Counsel, I'm sorry to

1 interrupt, but I looked over and noticed that
2 the copy of the declaration that you brought
3 isn't in color. So with your permission, can
4 Dr. Anderson use his clean copy of the
5 declaration which is in color?

6 MR. LAMBRIANAKOS: Sure.

7 MS. SAHLSTEN: Okay. Thank you.

8 MR. LAMBRIANAKOS: Absolutely.

9 THE WITNESS: Could we take a short
10 restroom break?

11 MR. LAMBRIANAKOS: Yes, absolutely.

12 (A recess was taken.)

13 Q. (By Mr. Lambrianakos) In the drop-in
14 replacement that you mentioned between Andrea and
15 Hussain, would the op-amp of Andrea be included in
16 the combination?

17 A. So Andrea has multiple op-amps. Are you
18 referring to the one shown in Figure 2?

19 Q. Yes, I am.

20 A. No.

21 Q. Aside from the microphones and the
22 pre-amps of Andrea, what portions of Andrea's noise
23 suppression apparatus would be included in your
24 combination of Andrea with Hussain?

25 A. So Andrea put a lot of engineering work

1 into its physical configuration. That's an important
2 part of the Andrea invention in order to have close
3 microphones so that you have good phase performance
4 between them and good match in your noise estimate
5 and conditioning of those microphones. That's all
6 important and fundamental.

7 Then Andrea using what was used -- I'm
8 sorry. Andrea used an op-amp to subtract the
9 two -- or the two signals. That's where you would
10 instead use Hussain. So Andrea's -- I guess to
11 answer your question, Andrea's microphones and the
12 microphone circuitry and the physical configuration
13 of these microphones that enabled it to provide noise
14 and speech plus noise signals would be combined with
15 Hussain.

16 Q. Hussain's system uses two microphones as
17 well, correct?

18 A. Hussain's system discloses that it would
19 take the inputs of two microphones.

20 Q. Does Hussain disclose that one of the
21 microphones picks up primarily noise and the other
22 speech and noise?

23 A. Hussain discloses using two closely spaced
24 microphones, one of those is used as a noise
25 reference. Hussain makes the more general

1 assumption, I believe, that speech could contaminate
2 both and he deals with that as well.

3 Q. Looking at Figure 1 in Hussain, is mic 2
4 the reference microphone or noise reference that you
5 just referred to?

6 A. Mic 2 is the reference microphone and that
7 generally means it's the noise reference. It is
8 going to be used in estimating the noise that would
9 be subtracted from the signal received in microphone
10 one.

11 Q. That's similar to mic 14 in Andrea in that
12 it assumes that it's picking up primarily noise?

13 MS. SAHLSTEN: Objection, form.

14 THE WITNESS: As I said, it assumes the
15 more general case in which speech may also
16 corrupt the signal in the reference microphone.

17 Q. (By Mr. Lambrianakos) Andrea's noise
18 microphone mic 14 also assumes that speech may also
19 corrupt the signal in that microphone, right?

20 A. Andrea discloses the case where the
21 reference microphone is substantially free from
22 speech.

23 Q. Does Andrea's noise microphone assume that
24 speech may also corrupt its signal?

25 A. Andrea's situation works best when the

1 noise corrupting the reference channel is minimized.
2 As I explained earlier, one of ordinary skill in the
3 art would understand that the reason it's an estimate
4 is because that condition in physical reality is
5 never perfect, but it's a noise reference microphone
6 because it picks up substantially the noise.

7 In the case of Hussain, if such a signal
8 were available in the reference channel, the
9 performance one would understand would necessarily
10 improve, but Hussain deals with the case where there
11 may be actually more than trivial amounts of speech
12 present in the reference channel as well.

13 Q. So my question is does Andrea assume that
14 speech may corrupt the signal at its noise
15 microphone?

16 A. As I mentioned earlier, Andrea talks about
17 a condition where if the microphones aren't placed
18 correctly, substantial speech could be picked up on
19 the noise reference microphone. But if it's designed
20 correctly, then that second microphone would provide
21 a noise estimate.

22 Q. If placed properly, will the noise
23 microphone of Andrea pick up speech?

24 A. I've also answered that previously. Any
25 microphone in the environment will pick up residual

1 amounts of any signal, but Andrea discloses that that
2 second microphone is substantially noise and is a
3 noise estimate.

4 Q. And the reference microphone of Hussain is
5 also substantially noise?

6 A. I've answered that also. The reference
7 microphone of Hussain is a noise reference microphone
8 and is used in generating a noise estimate, but
9 Hussain considers the more general case where there
10 are non-trivial amounts of speech that might leak
11 into that microphone.

12 Q. Using your term which was substantially
13 noise, my question is does the reference microphone
14 of Hussain pick up substantially noise, yes or no?

15 A. I've already answered that question.

16 Q. No, you haven't. You said something else.
17 I asked you that specific question which you can
18 answer yes or no.

19 A. I'm not going to answer yes or no because
20 I want to make sure I'm very clear. I want to be
21 very accurate because I'm under oath. Hussain deals
22 with the case where the second or reference
23 microphone can have speech. It also deals with the
24 case where there is no speech. Hussain is a more
25 general and comprehensive teaching that teaches that

1 microphone 2 can have speech plus noise or only
2 speech and it operates in both cases.

3 Q. When you say that microphone 2 can have
4 speech plus noise or only speech, did you mean to say
5 speech plus noise or only noise?

6 A. Yes, thank you.

7 Q. But in reality it would never have only
8 noise cause there would always be some speech that
9 could be picked up during a period of speech; isn't
10 that right?

11 A. As I said, any system would have some
12 amount. We're not talking absolutes in any physical
13 system. It could have substantially speech so
14 that -- or substantially noise so that any speech
15 that leaks in would be inconsequential. Or, it could
16 have a mixture of both in which both signals could be
17 perceived in the microphone output. Either of them
18 are accounted for in the teachings of Hussain.

19 Q. It's your opinion that Hussain discloses a
20 voice activity detector or VAD?

21 A. It's my opinion that he discloses that one
22 is needed and it is assumed that an effective one
23 would be available. He does not teach what that
24 would be because that was a very common thing in the
25 art.

1 Q. Figure 1 of Hussain discloses a
2 speech/noise only box, correct?

3 A. Yes.

4 Q. Is that where the functionality of a VAD
5 would be located in Hussain?

6 A. Yes.

7 Q. And Hussain uses sub-band processing?

8 A. Yes.

9 Q. And you say that Andrea uses full-band
10 processing, right?

11 A. Yes.

12 Q. And your opinion is that sub-band
13 processing is superior to full-band processing?

14 A. That is what Hussain teaches.

15 Q. Would a person of ordinary skill in the
16 art understand that sub-band processing is superior
17 to full-band processing?

18 A. That's a complex nuanced question. In
19 this scenario and especially based on the teachings
20 of Hussain, one would understand that the sub-band
21 processing is superior to the full-band processing of
22 Andrea.

23 Q. Does that mean that the de-noising that
24 Hussain provides is superior to the de-noising of
25 Andrea?

1 A. That means that one would expect when
2 combining the Andrea reference microphone signal and
3 the Andrea primary microphone signal having speech
4 plus noise into Hussain's system that that would work
5 better than using Andrea's combiner alone.

6 Q. Is it your opinion that combining Andrea
7 with Hussain provides a superior system than just
8 Hussain's system alone?

9 A. Hussain describes processing mechanism and
10 assumes that somebody else will be providing the
11 primary channel, the reference channel, and the voice
12 activity detector. So speaking of it in isolation
13 doesn't make sense. Speaking of the combination, the
14 combination of Hussain with Andrea would work better
15 than Andrea alone.

16 Q. Doesn't Hussain describe that there are
17 two microphones?

18 A. Yes.

19 Q. Where does Hussain disclose that someone
20 else is providing the microphones?

21 MS. SAHLSTEN: Objection, form.

22 THE WITNESS: Hussain is an article,
23 complete article, talking about signal
24 processing theory. He assumes that you have --
25 he shows that you have two microphones coming

1 in, but he does not disclose how those would
2 be -- he doesn't disclose anything other than we
3 would have the microphone signals. This is
4 consistent with what you would see in the art.
5 Somebody describing the processing system might
6 do so in the context of a physical system but
7 not describe the physical system, much as
8 somebody who's describing a car engine wouldn't
9 necessarily describe the seats of the car.

10 Q. (By Mr. Lambrianakos) So I asked you
11 where in Hussain discloses that someone else is
12 providing the microphones. Does he say that
13 anywhere?

14 A. Hussain describes a system that requires
15 two microphones as an input. He shows where those
16 inputs would be. He never describes the microphones.
17 As one of ordinary skill in the art would know, that
18 means that his is a processing system that would take
19 the input of microphones and one could easily infer
20 that those microphones would be whatever microphones
21 you've decided to use in your particular system.

22 Q. So those microphones could be those
23 disclosed in Andrea or could be microphones that are
24 disclosed in some other reference, correct?

25 A. Yes.

1 Q. So in Hussain the first page of his
2 article below heading two he writes: Two or more
3 relatively closely spaced microphones may be used in
4 an adaptive noise cancellation scheme to identify a
5 differential acoustic path transfer function during a
6 noise only period in intermittent speech. Do you see
7 that?

8 A. Yes.

9 Q. And then after he refers to the two or
10 more relatively closely spaced microphones used in an
11 adaptive noise cancellation scheme, he has four end
12 note references, right?

13 A. Yes.

14 Q. And you reviewed all those references,
15 didn't you?

16 A. No. I should say I reviewed the
17 references, what they were, but I did not -- and I
18 read some of them, but I did not read all of them.

19 Q. Did the references referred to here
20 disclose microphones in a microphone array?

21 MS. SAHLSTEN: Objection, scope.

22 THE WITNESS: I don't have those
23 references in front of me and I did this around
24 a year ago. I cannot recall from memory which
25 ones disclosed which configurations.

1 Q. (By Mr. Lambrianakos) Well, assuming that
2 you thoroughly reviewed this reference and the
3 references that are cited within it and one or more
4 of them discloses a microphone array, then would you
5 agree that the Hussain reference discloses not only
6 noise cancellation scheme, but also the existence of
7 microphone arrays with two or more closely spaced
8 microphones?

9 MS. SAHLSTEN: Objection, form.

10 THE WITNESS: I do know that some of those
11 refer to processing schemes. If you can provide
12 me with references, I can answer your question.

13 Q. (By Mr. Lambrianakos) How do you know
14 that some of those refer to processing schemes?

15 A. Because I recall it. I recall it
16 primarily because Hussain and Campbell, for example,
17 describe a similar one in one of the references that
18 they cited. I don't recall from memory what's in the
19 others.

20 Q. Do you recall from memory whether any of
21 the references numbered 4, 5, 6 or 11 disclose a
22 microphone array?

23 A. I don't recall, but it didn't seem
24 relevant.

25 Q. In one of these references discloses a

1 microphone array, then is there any need to combine
2 Hussain with Andrea to obtain a microphone array?

3 A. Absolutely.

4 Q. How can you answer that without recalling
5 the content of any of these articles?

6 A. I know the literature in general. There
7 are many different array setups. If you have a
8 system that you want, for example, wearable or
9 holdable in your hand as Andrea discloses, Andrea has
10 disclosed a very appropriate microphone array. Other
11 microphone arrays could be something that would be in
12 a car attached to the car itself or a room or maybe
13 just a large array in a lab.

14 In order to make a useful system, it helps
15 to start with something, an array that's designed for
16 that particular purpose. Andrea discloses a very
17 effective system for wearable or handheld
18 communication device with a microphone array and
19 provides all the signals that would be needed to use
20 the algorithm which is what is disclosed in Hussain.
21 So combining them would be a very obvious choice.

22 Q. So the choice is obvious because your goal
23 would be to design a wearable or handheld
24 communication device; is that right?

25 MS. SAHLSTEN: Objection, misstates

1 testimony.

2 THE WITNESS: The choice is obvious
3 because Andrea discloses an effective handheld
4 wearable device with a microphone array that has
5 been designed complete with circuits,
6 configurations and so forth to provide signals
7 that can be used in reducing background noise.

8 Hussain describes a method of removing
9 background noise using such signals, and he
10 discloses a method that is improved relative to
11 wide band processing.

12 Q. (By Mr. Lambrianakos) When you say
13 Hussain describes a method of removing background
14 noise using such signals, are you talking about
15 signals from a handheld or wearable device?

16 A. I'm talking about two or more closely --
17 relatively closely spaced microphones.

18 Q. So Hussain does disclose noise
19 cancellation in a device that has two closely spaced
20 microphones, doesn't he?

21 A. Yes. Well, he discloses the algorithm for
22 doing the noise cancellation when you have two or
23 more relatively closely spaced microphones. He does
24 not discloses the device.

25 Q. But doesn't he cite two devices in

1 footnotes 4, 5, 6 and 11?

2 A. We've already discussed that. If you'll
3 provide those references, I'll tell you what they
4 cite to.

5 Q. So you don't know sitting here today what
6 is disclosed in references 4, 5, 6 and 11 in Hussain?

7 MS. SAHLSTEN: Objection, asked and
8 answered.

9 THE WITNESS: I believe I've already
10 answered that.

11 Q. (By Mr. Lambrianakos) So you don't know,
12 correct?

13 A. I have said that I do not recall and I'm
14 not going to guess or test my memory from over a year
15 ago as to what is in what references.

16 Q. So if one of those references discloses a
17 microphone array with two closely spaced microphones,
18 then what does Andrea add to Hussain's disclosure?

19 A. That's not the question asked when I
20 looked at this. The question is Andrea discloses a
21 very nice headset or handheld system with two
22 microphones configured very nicely, but the
23 processing is relatively simple.

24 Hussain discloses how to use that system
25 and do more effective processing. So adding Hussain

1 to Andrea makes a lot of sense. Hussain does not
2 disclose any physical characteristics of the
3 microphone array except that the microphone should be
4 closely spaced. If he cited to -- he cited to one,
5 two, three, four there, and if they were all
6 different microphone arrays, it's just an example,
7 it's not limiting.

8 It does show in column -- the first column
9 at the bottom, it says studies on noise in
10 automobiles and it uses reference 11. So that
11 implies at least reference 11 is looking at
12 automobile situations and not handheld or handset
13 operations; although, I can't be certain without
14 looking at the reference again.

15 MR. LAMBRIANAKOS: I object to that answer
16 as not responsive.

17 Q. (By Mr. Lambrianakos) Dr. Anderson,
18 you're here to answer my questions, not the questions
19 that you decided that you want to answer. So here's
20 my question again and this is what I want you to
21 answer. If one of the references that we've referred
22 to that is cited in Hussain in notes 4, 5, 6 or 11
23 disclose a microphone array with two closely spaced
24 microphones, then what does Andrea add to Hussain's
25 disclosure?

1 A. Andrea adds a very nice headset or handset
2 system with two closely spaced microphones that can
3 operate with Hussain.

4 Q. And why do we care that Andrea discloses a
5 handset system?

6 A. I don't know why you care. I'm just
7 suggesting that Andrea discloses two systems with
8 closely spaced microphones both of which could be
9 easily combined with Hussain to provide improved
10 output.

11 Q. Why did you decide to cite to Andrea for
12 these two systems?

13 A. It was a long time ago, I don't recall,
14 but I will speculate at least partially that Andrea
15 was well-known for providing noise cancellation
16 systems for improving speech and noise. They had a
17 commercial track record. They designed systems that
18 were widely used and effective, and it would be a
19 good place for somebody who wanted to design an
20 improved system for picking up speech in the presence
21 of noise while minimizing distortion or background
22 noise. Andrea provided a good system, but Andrea's
23 system could be improved and Hussain taught a very
24 effective way that could be used to improve that
25 system.

1 Q. So you're saying that Andrea provided a
2 good system, but in your combination except for the
3 microphones and perhaps some preprocessing, you would
4 scrap the entirety of the rest of Andrea's noise
5 suppression apparatus and replace it with Hussain's,
6 correct?

7 MS. SAHLSTEN: Objection, form, misstates
8 testimony.

9 THE WITNESS: Andrea describes microphones
10 and their configuration and in a system that's
11 very effective. The acoustics are hard to
12 design. Andrea's liked that.

13 What I'm scrapping is the differentiating
14 amplifier. What I'm replacing it with is
15 improved processing. So I'm scrapping the wide
16 band differencing operation with a sub-band
17 operation that can do both estimation and
18 differencing and other methods.

19 Q. (By Mr. Lambrianakos) Now, the Hussain
20 system works well even if the reference channel mic 2
21 picks up some speech in that microphone, right?

22 A. The Hussain system assumes that you will
23 have some speech or may have some speech in the
24 reference channel. It will work better. One of
25 ordinary skill in the art readily understands that it

1 will work better to the degree that you have less
2 corruption or noise corruption on either of the
3 signals.

4 Q. Do the simulation results in Hussain
5 assume that the reference channel includes some
6 speech?

7 A. Yes, it assumes the more difficult case.

8 Q. So Hussain would work well even if it
9 didn't use the precise microphone arrangement of
10 Andrea; is that right?

11 A. Hussain operates with or without the
12 precise situation of Andrea. With the situation of
13 Andrea, it will work better.

14 Q. The Andrea system, that's a purely analog
15 system, isn't it?

16 A. Yes.

17 Q. And the Hussain system is a digital
18 system, right?

19 A. Yes.

20 Q. You recall the Holzrichter reference that
21 you used?

22 A. Yes.

23 Q. What is a feature vector in Holzrichter?

24 A. Holzrichter describes feature vector that
25 contains relevant information from a sensor and

1 control information.

2 Q. What is a feature vector? What's the
3 definition?

4 A. Vector we can get. A vector is a
5 collection generally of numbers that are grouped
6 together. And feature describes whatever you decide
7 to describe as a feature. Holzrichter describes it
8 as containing information from the sensors and the
9 processing and control signals.

10 Q. Does Holzrichter use the term control
11 signals?

12 A. I'm sorry, what's the context?

13 Q. When I say Holzrichter, I'm referring to
14 the reference in Exhibit 1007. Are we on the same
15 page with that?

16 A. Yes. What I'm wondering about is your
17 question following right after. I stated that
18 Holzrichter discloses putting controls, control
19 signals control data into the feature vectors.

20 Q. Right. So does Holzrichter use the term
21 control signals?

22 A. I don't have the benefit of a search
23 engine, and I don't think you want me to read all 50
24 pages of this right now. But I do know that
25 Holzrichter talks about control information that is

1 passed to other -- other components. So control
2 information that is sent would be a signal, a control
3 signal.

4 Q. You said that Holzrichter describes
5 feature vectors as containing control signals, right?

6 A. Yes.

7 Q. But you're not sure that Holzrichter ever
8 uses the term control signals; is that right?

9 MS. SAHLSTEN: Objection, asked and
10 answered.

11 THE WITNESS: Can you refer me to the page
12 you're looking at in my declaration on this?

13 Q. (By Mr. Lambrianakos) I was referring to
14 your testimony sir.

15 A. Okay. I'll look it up in my declaration.
16 Okay. Can you re-ask your question?

17 Q. What's the basis of your testimony that
18 Holzrichter describes feature vectors as containing
19 control signals?

20 A. Holzrichter states, for example, in
21 column 9 that control -- or system control
22 information can be added as additional coefficients
23 to any feature vector to identify trained feature
24 vectors with acoustic speech units, to optimize
25 search speeds, to keep track of pauses and memory

1 locations and similar housekeeping activities.

2 That's one.

3 He also describes elsewhere that his
4 algorithms can produce onset of speech time, end of
5 speech time, presence of voice speech and other
6 outputs. And this is looking in column 31. These
7 signals -- these -- this control information and the
8 outputs of these are packed into a feature vector and
9 sent to other portions to control the operation of
10 his system. It's control information and it is sent,
11 therefore, it is a control signal. We refer to the
12 feature vectors. The feature vectors contain
13 additional information about voicing that are sent
14 and used to control the rest of the system.

15 Q. Let's go back to column 9. What portion
16 of column 9 were you referring to in your testimony?

17 A. I'm referring to the paragraph that begins
18 with the number 4.

19 Q. Where is the system control information
20 referred to in column 9 that you testified about?

21 A. Around line 50.

22 Q. In that sentence beginning at line 49,
23 column 9 says: Finally system control information
24 can be added as additional coefficients to any
25 feature vector to identify trained feature vectors

1 with acoustic speech units, for example, PLUs,
2 et cetera, to optimize the search speeds, to keep
3 track of pauses and memory locations and similar
4 housekeeping activities. Do you see that?

5 A. Yes.

6 Q. What search speeds are referred to here?

7 A. Holzrichter describes various things that
8 his system can be used for, one of them is speech
9 recognition. I assume that's referring to an aspect
10 of that.

11 Q. So the system control information he's
12 referring to here is used in connection with the
13 speech recognition system?

14 A. It can be.

15 Q. And then you also refer to column 31?

16 A. Yes.

17 Q. What particular lines in column 31 were
18 you referring to?

19 A. I was discussing Table 1 where around line
20 26 it says examples of single organ FM sensor
21 algorithms. I believe that should be EM. That's a
22 typo. The single organ means you're referring to a
23 single sensor. He has multiple EM sensors that he
24 discloses, and he's saying single organ sensor
25 algorithms can produce the onset of speech time, the

1 end of speech and the presence of voice speech among
2 other things.

3 Q. And how in your opinion does that disclose
4 control signals?

5 A. Well, a control signal really depends on
6 how it's used. Any signal could be informational or
7 control depending on whether it's used for control.
8 In the case of Holzrichter, he uses those signals to
9 control how, for example, his speech recognition
10 algorithm works.

11 In the case of Hussain, those same signals
12 about the speech activity or speech presence, onset
13 time, offset time and so on are disclosed as being
14 used to control the noise cancellation algorithm.

15 Q. Where does Hussain disclose that?

16 A. On page 11 of my exhibit. It's Hussain's
17 page 2612, first column under item number 2.
18 Actually before that it states that an effective
19 voice activity detector is available. And then he
20 goes on to describe under number 2 that his system
21 has adaptive filter can be used in noise cancellation
22 format during the speech plus noise period to process
23 the noisy signal. He goes on -- I don't want to read
24 all of this.

25 Oh, I started at the wrong spot. He says:

1 If the noise power is significant and the noise
2 between the two channels is significantly correlated
3 in the sub-band, then perform adaptive intermittent
4 noise cancellation wherein an adaptive filter maybe
5 determined which models the differential acoustic
6 path transfer function between the microphones during
7 the noise alone period.

8 So a signal from the voice activity
9 detector that he discloses indicates when there's
10 speech and when it's noise alone, and when it's noise
11 alone, the adaptive filter operates or adapts. It
12 doesn't adapt when it's not in the noise -- a noise
13 alone; therefore, the signal that contains
14 information about whether or not there's speech or
15 noise only is a control for that algorithm.

16 Q. You agree that Holzrichter uses
17 non-acoustic sensors to sense the positions and
18 movement of certain physical features of the speaker?

19 A. Holzrichter does use non-acoustic sensors
20 in his operation.

21 Q. The EM sensors are not acoustic sensors,
22 right?

23 A. They are not acoustic sensors.

24 Q. They're electromagnetic sensors?

25 A. That is what EM stands for.

1 Q. And he discloses and you cite to three of
2 those sensors, right?

3 A. Where is the citation you're looking at?
4 I assume you're looking at paragraph 89 of my
5 declaration.

6 Q. That's one place, yes.

7 A. Yes. Did you have other places in mind
8 that you'd like me to refer to?

9 Q. You also mention it in paragraph 69.
10 Going into page 30 as well, do you see you refer to
11 Figure 3 which refers to the vocal folds sensor, the
12 tongue jaw sensor and the lips sensor? You see that?

13 A. Yes.

14 Q. Each of these sensors outputs a feature
15 vector, right?

16 A. No. The sensors output signals.

17 Q. So on page 30 of your declaration where
18 you see box 2 EM/vocal fold sensor, and then there's
19 an arrow that goes to form vocal fold feature vector,
20 do you see that?

21 A. So the feature vector would be formed in
22 block 7, not in block 2.

23 Q. Right. I didn't ask you about blocks. I
24 just said each of these sensors outputs a feature
25 vector, right, and you said no.

1 A. That's correct. Two is the sensor.

2 Q. I see. So the sensors output a signal and
3 then the Holzrichter system forms feature vectors
4 from those systems?

5 A. Yes.

6 Q. And then according to Holzrichter, those
7 feature vectors are then combined to form more
8 feature vectors?

9 A. Yes. The feature vectors are
10 Holzrichter's way of describing a packet of
11 information.

12 Q. Then the feature vectors that Holzrichter
13 creates are compared to a library of known stored
14 feature vectors?

15 A. That's one option in figure 3. It's
16 showing the speech recognition configuration.

17 Q. Do the stored feature vectors in
18 Holzrichter correspond to particular sounds?

19 A. Stored feature vectors are referring to --
20 yeah, they correspond to particular sounds or types
21 of sounds or auditory conditions.

22 Q. So comparing the feature vectors that are
23 output by the system to the stored feature vectors is
24 a way for Holzrichter to identify sounds that are
25 being made by the speaker, correct?

1 A. Yes.

2 Q. And then those sounds are assembled in
3 Holzrichter to recognize words and sentences, right?

4 A. The embodiment disclosed in Figure 3 does
5 that.

6 Q. Does Holzrichter disclose an embodiment
7 where his feature vectors are used for de-noising a
8 speech signal?

9 A. We're relying on Holzrichter to provide an
10 accurate speech activity detector which he does.

11 Q. Not my question, sir. My question is does
12 Holzrichter disclose an embodiment where his feature
13 vectors are used for de-noising a speech signal?

14 A. Yes.

15 Q. Where is that?

16 A. Holzrichter describes that in order for
17 speech recognition system to perform accurately, you
18 must be able to ignore parts where it's only noise,
19 and by so doing you can improve the accuracy of your
20 system. So he does in that sense a form of noise
21 cancellation or noise suppression called noise gating
22 where he determines when there's speech and when
23 there's noise. And when there's noise, he ignores
24 that signal to remove the effect of the noise.

25 Q. So it's your testimony that Holzrichter

1 discloses an embodiment where feature vectors are
2 used for de-noising a speech signal?

3 A. I just stated that a little bit
4 differently than what you said. I can state it
5 again.

6 Q. Or you can just answer the question.

7 A. Holzrichter describes a system that can
8 detect when there's speech and when there isn't and
9 he discloses using that to discard noise only
10 periods. I then, relying on Holzrichter, only for
11 its ability to detect when there's speech and when
12 there isn't.

13 Q. So does Holzrichter disclose an embodiment
14 where feature vectors are used to de-noise a speech
15 signal?

16 A. I've answered that. The short answer is
17 he does, he uses a noise gate effectively as the
18 input to his speech recognition system.

19 Q. Does he use feature vectors to remove
20 noise from a speech signal?

21 MS. SAHLSTEN: Objection, asked and
22 answered.

23 THE WITNESS: Holzrichter discloses a way
24 of detecting when there's noise. He discloses
25 lots of things you can do with it. One of them

1 is take your noisy speech signal and eliminate
2 noise when speech isn't present. He also
3 describes other things such as when it's really
4 noisy using switching modes to using just the EM
5 signals for its speech recognition, but that
6 wasn't relevant. That was an embodiment I
7 didn't care about because he uses -- well, as
8 I've said, he detects when there's speech and
9 when there's noise and he does use those -- he
10 puts that into feature vectors and he uses those
11 feature vectors to determine when to ignore the
12 signal as being only noise and when to use it in
13 the speech recognition system.

14 Q. (By Mr. Lambrianakos) Does he use feature
15 vectors to remove noise from a speech signal?

16 A. So you've asked that before.

17 Q. You haven't answered it yet.

18 A. So maybe I'm misunderstanding your
19 question. If you mean it's a speech signal only,
20 then you're assuming there's no noise and he does not
21 do that. If you mean a speech plus noise signal,
22 he's removing noise from the speech plus noise
23 signal.

24 Q. How is he removing noise from a speech
25 plus noise signal?

1 A. A speech plus noise signal have pauses
2 during which only the noise is present. During those
3 times, Holzrichter instructs his recognition system
4 to ignore or discard the signal, the noise at that
5 period.

6 Q. Does Holzrichter disclose removing noise
7 from a speech plus noise signal when speech is
8 present?

9 A. I also described an embodiment where he
10 removes the effects of noise during speech when noise
11 is very high by relying only on the EM sensors.

12 Q. Does Holzrichter describe a system that
13 removes noise from a speech plus noise signal such
14 that the output is the speech with reduced noise?

15 A. As I've described, he discusses a
16 method -- describes a method such that brings in the
17 speech plus noise signal and can remove the noise
18 only periods so that the speech plus noise signal now
19 has less noise. The noise between syllables or words
20 has been removed.

21 Q. Does he describe a system that removes
22 noise from the speech plus noise periods?

23 MS. SAHLSTEN: Objection, asked and
24 answered.

25 THE WITNESS: Yeah. I've answered that

1 very question. Is there something else you're
2 looking for?

3 Q. (By Mr. Lambrianakos) An answer to the
4 question.

5 MS. SAHLSTEN: Objection.

6 Q. (By Mr. Lambrianakos) Does he
7 describe -- does he describe a system that removes
8 noise from the speech plus noise periods?

9 MS. SAHLSTEN: Objection, asked and
10 answered, argumentative.

11 THE WITNESS: I've answered that question.
12 We have -- can you read it back from the
13 transcript?

14 Q. (By Mr. Lambrianakos) No. You can answer
15 the question now. I'm not interested in your
16 commentary about whether you think you answered the
17 question.

18 MS. SAHLSTEN: Objection. Your questions
19 are argumentative. It's badgering.
20 Dr. Anderson has been answering all of your
21 questions. So I would appreciate if you stop
22 harassing the witness.

23 MR. LAMBRIANAKOS: What you're saying is a
24 complete misrepresentation of Dr. Anderson.
25 He's not answering my question. He is providing

1 information which is not responsive to the
2 question. I need a responsive answer to the
3 simple question does Holzrichter describe a
4 system that removes noise from the speech plus
5 noise periods.

6 MS. SAHLSTEN: Counsel, you've asked it
7 several times. I'll allow him to answer it
8 again. Go ahead, Dr. Anderson.

9 THE WITNESS: You've asked the question
10 multiple different ways. I've tried to be
11 accurate to every way you've asked it. You ask
12 now -- let me make sure I understand. If
13 Holzrichter describes removing noise from a
14 speech plus noise signal during speech plus
15 noise only periods. So are you meaning --

16 Q. (By Mr. Lambrianakos) That's not the
17 question. Incorrect.

18 A. Then ask it again.

19 Q. Yes.

20 Does Holzrichter disclose removing speech
21 from a speech plus noise signal during the time that
22 there is speech present?

23 A. He does not disclose removing speech from
24 a speech plus noise signal.

25 Q. Does Holzrichter disclose removing noise

1 from a speech plus noise signal during the time that
2 there is speech present, yes or no?

3 MS. SAHLSTEN: Objection, asked and
4 answered.

5 THE WITNESS: I've already answered that
6 he does.

7 Q. (By Mr. Lambrianakos) Where does he
8 disclose that in his -- in the reference?

9 A. Column 33 background noise suppression
10 algorithm. There are two issues in background noise
11 suppression. A noise that occurs when the speaker is
12 not speaking but which a CASR confuses with speech
13 onset and noise that occurs during the speaker's
14 ongoing speech period. In the first case, noise
15 occurring while the speaker is not speaking is
16 eliminated as valid speech input by an onset of
17 speech algorithm.

18 The second case, the elimination of
19 acoustic noise, from background, that enters the
20 microphone during speech, is made possible by use of
21 non-acoustic data. If a constant high background
22 acoustic level is such that it is comparable to the
23 acoustic input by the speaker into his own
24 microphone, then it is known by experts that CASRs
25 will not work. However, the multi-organ NASR systems

1 will work, because they can provide sufficient
2 information to determine a missing speech unit
3 information, they will continue to function by
4 automatically defining speech frames and they will
5 provide best estimates of the speech sounds as if
6 they were operating in a whispering or nonsounded
7 speech mode of operation.

8 MS. SAHLSTEN: We've been going for over
9 an hour and it's getting kind of close to
10 lunchtime. Would it be a good time for a break?

11 MR. LAMBRIANAKOS: Sure, we can take a
12 break.

13 MS. SAHLSTEN: Okay.

14 (A luncheon recess was taken.)

15 Q. (By Mr. Lambrianakos) Dr. Anderson, do
16 you take the position in your declaration that
17 Holzrichter discloses a noise cancellation system?

18 A. The only position I take relative to
19 Holzrichter is that he discloses a voice activity
20 detector such as could be used in such a system.

21 Q. So you take the position that Holzrichter
22 discloses a voice activity detector and it's your
23 opinion that that voice activity detector could be
24 used in a noise cancellation system; is that right?

25 A. Yes.

1 Q. Do you take the position in your
2 declaration that Holzrichter uses feature vectors in
3 a noise cancellation system?

4 A. The opinions laid out in my declaration
5 are that in combination with Hussain, Holzrichter
6 discloses voice activity detection signals to control
7 a noise suppression algorithm.

8 Q. But you don't take the position in your
9 declaration that Holzrichter by itself discloses
10 feature vectors in a noise cancellation system,
11 right?

12 MS. SAHLSTEN: Objection, form.

13 THE WITNESS: Can you repeat the question?

14 Q. (By Mr. Lambrianakos) Do you take the
15 position in your declaration that Holzrichter by
16 itself discloses feature vectors used in a noise
17 cancellation system?

18 A. I take the position that Holzrichter
19 discloses feature vectors that are control
20 information for a noise cancellation system. I cite
21 to Holzrichter generally and it is clear that
22 Holzrichter does use that, does use his feature
23 vectors in background noise suppression, but I'm
24 relying for purposes of obviousness and invalidity on
25 the combination of Holzrichter and Andrea and

1 Hussain.

2 Q. Do you take the position in your
3 declaration that Holzrichter by itself discloses
4 feature vectors used in a noise cancellation system?

5 A. I disclose that Holzrichter uses his
6 feature vectors in his noise -- or his speech
7 recognition algorithm which operates noisy
8 conditions. I do not rely on Holzrichter for the
9 noise cancellation part even though he does disclose
10 that.

11 Q. He doesn't disclose a noise cancellation
12 system though, does he?

13 A. He does.

14 Q. Well, you say -- where do you say in your
15 declaration that Holzrichter discloses a noise
16 cancellation system?

17 A. I already explained that my declaration is
18 using Holzrichter in combination with Hussain for the
19 noise cancellation system, but you asked does he
20 disclose a noise cancellation system and he does.

21 Q. Where in your declaration do you say that
22 Holzrichter discloses a noise cancellation system?

23 A. For example, paragraph 90 Holzrichter
24 explains that its EM sensor measurements of organ
25 location and motion provide the information required

1 for accurate speech recognition and provide explicit
2 evidence of specific articulator activities which are
3 very difficult to reliably extract from the acoustic
4 signal, which in turn provides a significantly better
5 and more accurate representation of feature vector
6 coefficients.

7 I could have cited to others, but I quoted
8 that part. And in result of your questioning, I've
9 shown you other places where Holzrichter does indeed
10 disclose specifically background noise suppression
11 algorithm that uses his EM sensors.

12 Q. So you're saying that paragraph 90
13 contains a statement by you that Holzrichter
14 discloses a noise cancellation system?

15 A. We should back up. My opinions as in my
16 declaration are that Holzrichter in combination with
17 Hussain is a noise cancellation system and Andrea.
18 One of the reasons why this would be an obvious thing
19 to do is because Holzrichter is aimed at the same
20 area, processing speech and noisy situations and
21 detecting speech from the noise.

22 90, paragraph 90, is a summary of some of
23 the implications of that. In my declaration, I am
24 not relying on Holzrichter's noise suppression
25 algorithm, even though, as I have pointed out on the

1 record, he does discloses an algorithm and it's
2 hinted at in 90.

3 Q. Now, my question was to a noise
4 cancellation system, not an algorithm. Do you
5 understand the difference?

6 A. So a system --

7 Q. Yes or no, sir, do you understand the
8 difference?

9 A. I understand the difference.

10 Q. Okay. So is it your testimony today
11 that -- strike that.

12 I asked you where in your declaration you
13 say that Holzrichter discloses a noise cancellation
14 system. You pointed to paragraph 90. I just want to
15 make sure I understand. Your testimony is that in
16 paragraph 90 somewhere in here you say that
17 Holzrichter discloses a noise cancellation system; is
18 that right?

19 MS. SAHLSTEN: Objection, misstates
20 testimony.

21 THE WITNESS: That's not what I said.
22 Holzrichter is a complete system.

23 Q. (By Mr. Lambrianakos) I asked --

24 A. It has --

25 Q. Go ahead.

1 A. It has hardware, sensors. It has
2 processing algorithms. The algorithms are the part
3 that in cooperation with the hardware implement a
4 system and this describes mitigating the effects of
5 noise and speech by producing representations that
6 are better representation of the speech unaffected by
7 the noise. That is a system. It's a system, and
8 it's a system that does noise mitigation or noise
9 suppression.

10 Q. So it's your testimony that in paragraph
11 90 you provide the opinion that Holzrichter discloses
12 a noise cancellation system; is that right?

13 A. Are you just asking me the same thing?

14 Q. I'm waiting for an answer. You keep
15 telling me things that aren't relevant to my
16 question. I just wanted you to tell me what -- where
17 in paragraph 90 -- why I cited paragraph 90 in
18 response to my question about where you say in your
19 declaration that Holzrichter discloses a noise
20 cancellation system?

21 MS. SAHLSTEN: Objection, asked and
22 answered argumentative.

23 THE WITNESS: Holzrichter makes it very
24 clear that it is a system for processing speech
25 in noisy situations. In paragraph 90 I allude

1 to and quote that Holzrichter uses his EM sensor
2 measurements of organ location and motion to
3 provide the information required for accurate
4 speech recognition. Holzrichter also explains
5 that accurate speech recognition cannot occur
6 with noisy inputs. That it fails. He goes -- I
7 go on to say: And provide explicit evidence of
8 specific articulator activities which are very
9 difficult to reliably extract from the acoustic
10 signal, which in turn provides a significantly
11 better and more accurate representation of the
12 feature vector coefficients. That, any person
13 of ordinary skill in the art would understand as
14 a noise suppression system.

15 Q. (By Mr. Lambrianakos) And where do you
16 say in your declaration that Holzrichter discloses a
17 noise suppression system?

18 A. Are you asking for those words?

19 Q. I mean, it's -- yes.

20 A. Do you want me to quote those words?

21 Q. Where do you say it? Yeah, show them to
22 me.

23 A. Those words as you've stated them aren't
24 written in that way, in that order in my declaration.

25 Q. You do have the opinion in your

1 declaration that Andrea discloses a noise suppression
2 system -- strike that.

3 You say in your declaration that Andrea
4 discloses a noise cancellation apparatus?

5 A. So we're on the same page, can you tell me
6 where you're at?

7 Q. Well, you say it in paragraph 81.

8 A. Yes.

9 Q. You say it in paragraph 76, right? So
10 we're clear then that you have stated repeatedly that
11 Andrea discloses a noise cancellation apparatus,
12 right?

13 A. Yes.

14 Q. What about Hussain, does it disclose an
15 adaptive noise cancellation scheme like you say in
16 paragraph 66?

17 A. Yes.

18 Q. But you don't say anywhere that Andrea
19 discloses -- strike that.

20 You don't say anywhere in your declaration
21 that Holzrichter discloses a noise cancellation
22 apparatus, do you?

23 A. I describe his operations as a noise
24 cancellation system, but since I'm not relying on it
25 to meet that claim, I don't state that in the same

1 way.

2 Q. So it's your testimony here under oath
3 today that Holzrichter discloses a noise cancellation
4 system?

5 MS. SAHLSTEN: Objection, asked and
6 answered.

7 THE WITNESS: It's a little bit irrelevant
8 because, as I said, I'm not relying on that, but
9 since you asked and I pointed out in Holzrichter
10 that it has a system, it has a background noise
11 suppression algorithm as part of that system;
12 therefore, it does contain a noise
13 suppression -- it is a noise suppression system.

14 Q. (By Mr. Lambrianakos) Why aren't you
15 relying on Holzrichter's noise suppression system in
16 your analysis if it discloses it?

17 A. I didn't feel I needed to. There are
18 actually thousands of noise suppression systems. We
19 chose a noise suppression system to focus on and that
20 was Holzrichter. To include all the possible
21 arguments against the validity I could have made
22 would have made the declaration too cumbersome.

23 Q. Does Holzrichter disclose using an
24 adaptive filter for noise suppression?

25 A. I don't have -- offer an opinion on

1 whether or not Holzrichter discloses an adaptive
2 filter for noise suppression.

3 Q. Turning to page 40 of your declaration, at
4 the end of the paragraph that ends on page 40, you
5 write: A POSITA would have understood that
6 automatically generating or forming the feature
7 vector corresponding to the vocal folds signal is
8 automatically generating control signals using the
9 voice activity signals. Do you see that?

10 A. Yes.

11 Q. Is that your opinion?

12 A. That's what I wrote.

13 Q. So it's still your opinion today?

14 A. It hasn't changed.

15 Q. And do you provide any reasoning as to how
16 a feature vector is a control signal?

17 A. The feature vector controls the operation
18 of the Hussain system with the voice activity. That
19 makes it a control signal. That would be relatively
20 understood.

21 Q. So where in your paragraph 89 do you
22 explain how or why a person of ordinary skill in the
23 art would have understood that generating or forming
24 the feature vector corresponding to the vocal folds
25 signals is automatically generating control signals?

1 A. It goes on to explain it more in paragraph
2 90. In my opinion, a person of ordinary skill in the
3 art would have found it obvious to use Holzrichter EM
4 sensor as Hussain's voice activity detector and to
5 automatically generate control signals using the
6 voice activity signals. We've already read that
7 before, but I conclude by saying a person of ordinary
8 skill in the art would therefore have looked at
9 Holzrichter's EM sensor which automatically generates
10 control signals using the voice activity signals to
11 ensure effective voice activity detection.

12 Q. But in paragraph 90 you don't explain why
13 the feature vector corresponding to the vocal folds
14 signal is a control signal, right?

15 A. We've discussed this many times. The
16 motion of the vocal folds tells you when there's
17 voicing; Holzrichter makes that clear. That signal
18 contains that information. Holzrichter later further
19 explains that that feature vector can be packed with
20 all that explicit evidence that you need.
21 Holzrichter -- a person of ordinary skill in the art
22 seeing this would have no doubt the Holzrichter's EM
23 sensor provides the voice activity detection control
24 signals necessary to operate the system.

25 Q. But I'm really asking you though is see

1 you drew this red box around two elements of Figure 3
2 of Holzrichter on page 40. Do you see that?

3 A. Yes.

4 Q. And you say that's the voice detection
5 subsystem, right?

6 A. Yes.

7 Q. And you say that the feature vector that's
8 formed in block 7 is a control signal, right?

9 A. Yes.

10 Q. But this figure doesn't show that
11 particular feature vector being used for control,
12 does it?

13 A. The operation of the blocks in that figure
14 are described throughout the patent. I summarized
15 what that feature vector contains, and I've also at
16 your request shown you many other places in the
17 patent where it describes that that feature vector
18 contains control signals including speech onset, end
19 of speech and presence of voice speech signals.

20 Q. Right. But none of that's in this
21 paragraph or in your declaration, is it, sir? Isn't
22 it true that this particular figure shows that the
23 feature vector for vocal fold sensor is combined with
24 other feature vectors in block 11? Doesn't it show
25 that, sir?

1 A. It does.

2 Q. And doesn't it show that that combined
3 feature vector or joint feature vector is what is
4 used in the pattern matching block 12?

5 A. Yes, it does.

6 Q. So it's the feature vectors in block 11
7 that generate control signals for Holzrichter's voice
8 recognition or speech recognition system, right?

9 A. I -- 11 would as well as 7, 6, 9 and 8.

10 Q. But you'd agree that Holzrichter is not
11 showing here that the feature vectors from 6, 7, 8, 9
12 and 10 are used directly for pattern matching, right?

13 A. If all we needed was Figure 3, I wouldn't
14 have put all the text around it. I explained what is
15 going on in the text. I've explained it to you.
16 I've shown many different references and there are
17 other references in my written text. That's to
18 illustrate where it happens.

19 Figure -- or block 11 is combining
20 features, signals, control signals from each of these
21 blocks. That doesn't mean that those blocks don't
22 have them. Holzrichter makes it very clear that
23 voicing, for example, is detected using sensor number
24 two as circled in the red block.

25 Q. So that's interesting but that doesn't

1 answer my question. Is Holzrichter showing here that
2 any of the speech -- strike that.

3 Does Holzrichter disclose in Figure 3 that
4 any of the feature vectors generated in block 6, 7,
5 8, 9 or 10 are used individually to perform pattern
6 matching?

7 A. First off, I haven't offered opinions
8 about pattern matching. That's speech recognition.
9 Second, he says that it's a joint feature vector
10 formation, which any person of ordinary skill in the
11 art would understand includes combining features from
12 the inputs feature vectors. But all of that's
13 irrelevant. What we're concerned with is that the
14 feature vector describing the voice detect -- the EM
15 vocal fold sensor contains a voicing information. It
16 tells when there's speech and when there isn't.

17 Holzrichter describes that that's its
18 functionality. He also describes that you can
19 combine information in that vector. He describes
20 that it comes from that particular sensor. I don't
21 see that there's any ambiguity here from one of
22 ordinary skill in the art who has even cursorily
23 glanced at the Holzrichter patent.

24 Q. But where do you say in paragraph 89 that
25 it is the vocal fold sensor alone that determines

1 whether or not there's speech?

2 A. I don't say that it's a vocal fold sensor
3 alone. I say a person of ordinary skill in the art
4 would have understood the automatically generating or
5 forming the feature vector corresponding to the vocal
6 folds signal is automatically generating control
7 signals using the voice activity signals.

8 Q. But just agreed that Figure 3 doesn't show
9 the vocal fold feature vector being used as a control
10 signal except in combination with other feature
11 vectors; isn't that right?

12 A. I don't know what you're talking about.

13 Q. Well --

14 A. What are you saying?

15 Q. You put Figure 3 in your declaration,
16 didn't you?

17 A. Yes.

18 Q. So you understand what it says, right?

19 A. I do.

20 Q. And you drew a red box around just two
21 blocks at that figure, didn't you?

22 A. Yes.

23 Q. And you came to the conclusion that a
24 person of ordinary skill in the art would have
25 understood that automatically generating or forming

1 the feature vector corresponding to the vocal fold
2 signal is automatically generating control signals
3 using the voice activity signals, right?

4 A. Exactly.

5 Q. Right. But you also agreed that Figure 3
6 doesn't use the vocal fold feature vector alone as a
7 control signal in the -- in Holzrichter's speech
8 recognition system, right?

9 A. That's irrelevant to whether or not it
10 outputs control signals.

11 Q. Sir, I didn't ask you what you think is
12 relevant. I only asked you the question that where
13 you agreed that Figure 3 doesn't use vocal fold
14 feature vectors alone as a control signal in
15 Holzrichter's speech recognition system?

16 MS. SAHLSTEN: Objection, misstates
17 testimony.

18 THE WITNESS: I have not offered an
19 opinion as to everything about the speech
20 recognition system. I have offered the opinion
21 that it provides control signals and I provided
22 ample support to you. I've described it in the
23 declaration and I've pointed to additional
24 support within this Holzrichter reference.

25 It supplies control signals. Those are

1 used in the pattern recognition, but that
2 doesn't matter because what matters is that they
3 are used to control -- the output of that
4 controls Hussain's noise suppression algorithm,
5 and in that respect, those signals become
6 control signals for the Hussain system.

7 Q. (By Mr. Lambrianakos) Now, you don't take
8 the position in your declaration that Holzrichter
9 ever discloses that you should use only one EM sensor
10 for vocal folds to determine whether the user is
11 speaking, right?

12 A. I do take the position that he should use
13 the vocal fold sensor to determine whether someone is
14 speaking.

15 Q. That wasn't my question, was it, sir?
16 You don't take the position in your
17 declaration that Holzrichter discloses that you
18 should use only one EM sensor to determine whether a
19 user is speaking; is that right?

20 A. I do.

21 Q. Where do you say that, sir?

22 A. Right in paragraph 89, I say: Holzrichter
23 further explains that this vocal fold information
24 signal provides valuable information to a speech
25 recognition system to determine if voice speech is

1 occurring, voice activity signals.

2 Q. So, in your opinion, that sentence states
3 that you should use the vocal fold signal by itself?

4 A. I'll continue reading if you've forgotten:
5 A person of ordinary skill in the art would have
6 understood that automatically generating or forming
7 the feature vector corresponding to the vocal fold
8 signal is automatically generating control signals
9 using the voice activity signals.

10 Q. Wow. So does Holzrichter ever disclose
11 that you should use only one EM sensor, particularly
12 the vocal fold sensor, to determine whether the user
13 is speaking?

14 A. Yes.

15 Q. Where does it say that?

16 A. I refer you first to Table 1 in column 31,
17 examples of single organ EM sensor algorithms, onset
18 of speech time, presence of voice speech, end of
19 speech. That's a summary of what he does, but he
20 talks about it further in his voluminous text leaving
21 no doubt that the EM sensor at the throat is used to
22 detect voicing.

23 Q. Does he ever disclose that you should use
24 the EM sensor for vocal folds as the only sensor for
25 determining whether speech is present?

1 MS. SAHLSTEN: Objection, asked and
2 answered.

3 THE WITNESS: I just said single organ EM
4 sensor algorithms. Each one of his sensors is
5 for a different organ. A single organ algorithm
6 is for a single sensor.

7 Q. (By Mr. Lambrianakos) And so, in your
8 view, that table discloses that Holzrichter uses only
9 one sensor in his speech recognition system to
10 determine whether the user is speaking?

11 MS. SAHLSTEN: Objection, form.

12 THE WITNESS: I already explained that the
13 table summarizes a lot of text, so I'm not
14 relying on the table alone but the specification
15 as a whole. That table states that a single
16 sensor is used, for example, to detect the
17 presence of voiced speech. That is described in
18 references that I've done and many other places
19 in this patent to correspond to vocal fold
20 motion. That is the sensor that I have
21 identified in Figure 3.

22 Q. (By Mr. Lambrianakos) And is there an
23 embodiment that Holzrichter discloses that uses only
24 that one sensor to determine whether a user is
25 speaking?

1 A. I just said so.

2 Q. So you're saying yes, there is an -- there
3 is an embodiment in Holzrichter that says let's just
4 use the vocal fold sensor?

5 A. For the detection of the presence of
6 speech, he uses the vocal fold sensor.

7 Q. So you're saying that the tongue jaw
8 sensor and the lip sensor have nothing to do with
9 determining whether the user is speaking?

10 MS. SAHLSTEN: Objection, misstates
11 testimony.

12 THE WITNESS: He also uses those, but this
13 in Table 1 is a single EM sensor algorithm, the
14 vocal fold sensor for detecting the presence of
15 speech, voiced speech. He uses all the sensors
16 in various ways. They're described throughout
17 there, but what matters is that he has provided
18 a very effective voice activity detected
19 algorithm based on the motion of the vocal folds
20 using EM sensor. That's what I rely on.

21 Q. (By Mr. Lambrianakos) Is it your
22 testimony that you understand the claims of the '543
23 patent to require that the VAD be used to detect only
24 voiced speech?

25 A. The '543 patent throughout its entire

1 specification talks about voice detection, voicing
2 activity, claim 1, voice detection subsystem, voice
3 activity signals, voice detection subsystem. I'm
4 still on claim 1. Everything is about voicing.
5 Everything in that patent is about voicing. That
6 voice -- that patent is doing essentially what is
7 done in the prior art which detects voice activity
8 signals.

9 Q. So it's your view then that the VAD in the
10 claims is not also used for detecting unvoiced
11 speech?

12 MS. SAHLSTEN: Objection, scope.

13 THE WITNESS: I don't know if -- and I
14 haven't formed an opinion that it is limited to
15 only voiced speech and might not apply to
16 unvoiced speech, but in the context of the
17 specification certainly and even in the context
18 of the plain language of the claims, they only
19 require a voice activity detector, not an
20 unvoiced activity detector.

21 Q. (By Mr. Lambrianakos) You'd agree that in
22 the embodiment in Figure 3, Holzrichter does not
23 disclose using the feature vector from the vocal fold
24 sensor for pattern matching without combining it with
25 other feature vectors?

1 A. I don't offer any opinions about his
2 pattern matching.

3 Q. So you don't have any opinion about what
4 type of feature vector is input into the pattern
5 matching block 12 in order to perform pattern
6 matching?

7 A. I have expressed opinions about what comes
8 out of block 7. I could speculate and talk, but
9 apparently -- well, that's not relevant to what we
10 are using Holzrichter for or for my declaration other
11 than to provide context. However, looking at it, the
12 vocal fold feature vector which is input into there
13 to form a joint feature vector and in the disclosure
14 of Holzrichter, it would be clear that the output of
15 that signal would also have to contain voicing
16 information because he describes that as being used
17 in the speech recognition system.

18 Q. What type of algorithm does Holzrichter
19 use in block 11?

20 MS. SAHLSTEN: Objection, scope.

21 THE WITNESS: I would have to go back and
22 review Holzrichter again. It's long, but I
23 could do so if you like it.

24 Q. (By Mr. Lambrianakos) Well, you don't
25 express any opinion in your declaration about the

1 processing that's necessary in block 11, do you?

2 A. I've quoted a lot of things. I don't
3 recall them all off the top of my head, but I can go
4 through my cites and let you know what I find.

5 Q. I thought you said earlier that the output
6 for pattern matching is irrelevant to your
7 declaration. Didn't you say that?

8 A. That was part of what I said other than to
9 provide context.

10 Q. So you think you might have somewhere in
11 your declaration an opinion regarding the processing
12 which is done in block 11 of Holzrichter to yield the
13 combined feature vector that's used for pattern
14 matching?

15 MS. SAHLSTEN: Objection, scope,
16 argumentative.

17 THE WITNESS: Can you repeat your
18 question?

19 Q. (By Mr. Lambrianakos) Do you think you
20 have somewhere in your declaration an opinion
21 regarding the processing which is done in block 11 of
22 Holzrichter to yield the combined feature vector
23 that's used for pattern matching?

24 MS. SAHLSTEN: Same objections.

25 THE WITNESS: So I am not offering an

1 opinion about the pattern matching use in
2 Holzrichter. I've offered an opinion consistent
3 with Holzrichter and his descriptions that seven
4 outputs control information about that is
5 essentially the voice activity or voicing
6 activity of the user of the system.

7 Q. (By Mr. Lambrianakos) Was it your
8 understanding of a control signal?

9 A. A signal that can be used to control,
10 activate, change, dictate, influence or potentially
11 influence the behavior of another part of a system or
12 another system.

13 Q. And you agree that Holzrichter doesn't
14 disclose using the vocal fold sensor feature vector
15 alone in his speech recognition system, right?

16 MS. SAHLSTEN: Objection, asked and
17 answered.

18 THE WITNESS: Yeah, we've gone over this
19 question a lot. What is it that you don't
20 understand about my previous answer?

21 Q. (By Mr. Lambrianakos) Sir, answer my
22 questions. I don't answer your questions. Your
23 question are irrelevant. You understand?

24 A. You asked me --

25 Q. You --

1 A. You asked me to say -- ask you if I need
2 clarification. I need clarification because
3 apparently I don't understand what you've been asking
4 if you want an answer different from what I've
5 already given.

6 Q. So you think you don't understand the
7 following question: Do you agree that Holzrichter
8 doesn't disclose using the vocal fold sensor feature
9 vector alone in his speech recognition system?

10 MS. SAHLSTEN: Objection, asked and
11 answered, argumentative.

12 Q. (By Mr. Lambrianakos) Are you saying you
13 don't understand that question?

14 A. I have answered that question. What I
15 don't understand is what you don't understand about
16 my answer because I have answered it. If you want to
17 know something else, you either need to rephrase the
18 answer -- the question in a different way or tell me
19 what it is that you're looking for that I did not
20 already address.

21 Q. Do you take the position in paragraph 89
22 that Holzrichter ever discloses that the feature
23 vector which is formed from the vocal fold sensor is
24 used individually for pattern matching?

25 A. I do not offer an opinion about how it is

1 used in block 12, the pattern matching block. I
2 offer an opinion that it discloses control signals
3 that are reflective of voicing activity.

4 Q. Do you see in Figure 3 there's an acoustic
5 microphone?

6 A. Yes.

7 Q. What does Holzrichter disclose that
8 microphone is used for?

9 A. I haven't offered an opinion on his
10 acoustic microphone. It is part of his speech
11 recognition system.

12 Q. Does Holzrichter disclose that a feature
13 vector is generated from the activity picked up in an
14 acoustic microphone?

15 A. Yes.

16 Q. Is it your opinion that -- that those
17 feature vectors are control signals?

18 A. I haven't offered an opinion on those
19 feature vectors.

20 Q. Sitting here today, do you believe that
21 the feature vectors generated from the acoustic
22 microphone are control signals?

23 MS. SAHLSTEN: Objection, scope.

24 THE WITNESS: I'm not going to form an
25 opinion sitting here today.

1 Q. (By Mr. Lambrianakos) So at the time that
2 you came up with your opinion that the feature
3 vectors generated from the vocal fold sensor were
4 control signals, did you consider whether the feature
5 vectors from the acoustic microphone are control
6 signals?

7 MS. SAHLSTEN: Objection, scope.

8 THE WITNESS: I wasn't concerned with the
9 acoustic microphone.

10 Q. (By Mr. Lambrianakos) Why weren't you
11 concerned with the acoustic microphone?

12 A. Cause I was concerned with the voice
13 activity detector which is disclosed as being a
14 function of the EM signal.

15 Q. Well, doesn't Holzrichter disclose
16 combining the outputs from three EM sensors and the
17 acoustic microphone to determine whether voice
18 activity is present?

19 A. He discloses combining all of those to do
20 speech recognition.

21 Q. But doesn't he disclose combining all of
22 those in order to output to his speech recognition
23 system that voicing activity is present?

24 A. It's irrelevant because he has disclosed
25 that he uses a single sensor to detect voicing and

1 that single sensor is the vocal fold sensor. And so
2 whether or not that information is passed through in
3 one way or another doesn't matter because what we
4 care about is not his speech recognition algorithm
5 but his highly accurate voice detection system.

6 Q. Sir, perhaps you misunderstood my
7 question. I didn't ask you if something was relevant
8 or if you cared about it. I simply asked you, didn't
9 Holzrichter disclose that all of the sensors are used
10 to determine whether or not voice activity is
11 present?

12 A. He used -- no. Holzrichter disclosed
13 voicing activity is determined using a single EM
14 sensor algorithm.

15 Q. Where does he disclose that?

16 A. I've already pointed you to Table 1 and
17 the text around it. Can we take a break --

18 Q. So would you disagree --

19 A. -- so I can refill?

20 Q. I'm in the middle of a question.

21 So would you disagree that Holzrichter
22 discloses that one should use information from three
23 EM sensors as well as an acoustic microphone to
24 determine whether a user is speaking?

25 A. Where are you referring in Holzrichter?

1 Q. Nowhere in particular. I'm asking you for
2 your understanding of Holzrichter.

3 A. Holzrichter describes extracting a
4 significant amount of information. Some of it uses
5 multiple sensors, some of it uses single sensors.
6 What uses multiple sensors isn't of interest to me
7 and it's not what I've offered an opinion on. He
8 also importantly discloses using a single sensor, the
9 vocal fold sensor, in determining voicing.

10 May we take a break?

11 MR. LAMBRIANAKOS: Yes.

12 (A recess was taken.)

13 Q. (By Mr. Lambrianakos) Dr. Anderson, do
14 you see pages 41 through 43 of your declaration you
15 describe the motivation to combine an expectation of
16 success in combining Andrea and Hussain with
17 Holzrichter's VAD?

18 A. Yes.

19 Q. Now, in the second sentence -- strike
20 that.

21 In the last sentence of paragraph 91 you
22 say that a POSITA would have been motivated to use
23 Holzrichter's EM sensor as the VAD to generate
24 control signals to improve overall noise cancellation
25 performance by improving the accuracy of the voice

1 activity detection. Do you see that?

2 A. Yes.

3 Q. When you say Holzrichter's EM sensor
4 there, are you referring to only the vocal fold
5 sensor or all the EM sensors combined?

6 A. The vocal fold sensor.

7 Q. I see. Does Holzrichter use the tongue
8 jaw sensor to help determine whether the user is
9 speaking?

10 A. Holzrichter uses the tongue sensor jaw
11 sensor for extracting various bits of information for
12 his speech recognition system, but I haven't offered
13 an opinion on those.

14 Q. Does he use the tongue sensor jaw sensor
15 as you said to help determine whether the user is
16 speaking?

17 A. He uses those for determining various
18 things relative to the speech recognition system, but
19 I have not expressed an opinion as to whether or not
20 they can also provide information about whether a
21 person is speaking.

22 Q. Right, but putting aside whether you've
23 expressed an opinion, do you know one way or the
24 other whether Holzrichter uses the tongue jaw sensor
25 to help determine whether the user is speaking?

1 MS. SAHLSTEN: Objection, scope.

2 THE WITNESS: And as I've expressed, he
3 uses the EM single sensor on the vocal folds for
4 detecting voicing. He uses the others for other
5 aspects of speech. I did not express an opinion
6 on those and I'm not prepared to at this time.

7 Q. (By Mr. Lambrianakos) So sitting here
8 today, you would say you're not prepared to answer
9 the question of whether Holzrichter uses the tongue
10 jaw sensor for helping determine whether the user is
11 speaking?

12 A. I am prepared to answer that part or at
13 least part of it. He uses -- he discloses using a
14 single sensor for -- and that would be the vocal fold
15 sensor for determining whether or not a person is
16 vocalizing. He also uses the other sensors to
17 provide additional information, but that's not what
18 we're relying on and I have not expressed opinions
19 there and I'm not prepared to form them right now.

20 Q. Right. So if you could just answer my
21 question instead of telling me other information
22 which is not responsive, I'd appreciate it.

23 Does Holzrichter use the tongue jaw sensor
24 to help determine whether the user is speaking?

25 A. Holzrichter uses a single sensor to

1 determine voicing. He uses the others for detecting
2 other information. I have not expressed an opinion
3 on that and I'm not going to do so now.

4 Q. I didn't ask you about voicing. I asked
5 you about whether the user is speaking. Do you know
6 the difference?

7 A. I know the difference.

8 Q. Good. So answering my question and not
9 the one you wish I had asked, does Holzrichter
10 disclose using the tongue jaw sensor to help
11 determine whether the user is speaking?

12 MS. SAHLSTEN: Objection, scope.

13 THE WITNESS: Holzrichter discloses
14 multiple embodiments, one of them at least uses
15 only a single sensor. I have not formed an
16 opinion, but I can continue reading if you would
17 like me to read to you what's in here about the
18 role of the other sensors.

19 Q. (By Mr. Lambrianakos) So you don't know
20 without reading the patent more fully whether
21 Holzrichter discloses using the tongue jaw sensor to
22 help determine whether a user is speaking?

23 A. What I know is that Holzrichter discloses
24 determining whether or not a person is speaking using
25 a single sensor. He discloses an embodiment that has

1 only that one sensor. He also describes many other
2 things over the 50 plus columns to describe other
3 embodiments to provide additional information used in
4 his speech recognition system.

5 Q. So which one sensor does Holzrichter
6 disclose using?

7 A. Holzrichter discloses at least one
8 embodiment that uses the vocal fold sensor.

9 Q. That wasn't my question. Where does
10 Holzrichter disclose using just one sensor?

11 A. So do you want where? He discloses it,
12 for example, in column 23 around line 34, down at
13 least for the next several paragraphs is one place he
14 talks about using for a simpler low cost speech
15 recognition enhancement, one or two organ interface
16 measurements may suffice.

17 Q. Does he ever disclose that one can use
18 just the vocal fold sensor by itself?

19 A. So you asked wherein Holzrichter he
20 discloses using a single voicing sensor?

21 Q. I asked you does Holzrichter ever disclose
22 that one can use just the vocal fold sensor by
23 itself?

24 A. Yes.

25 Q. Where?

1 A. First he states in column 17, line 8, the
2 vocal cord sensor output signal is related to the
3 true excitation signal, the vocal tract, for which
4 realtime signals have never been available before.
5 Okay. That's just to establish that that signal is
6 important.

7 Then he goes on in column 28 to say: The
8 actions of single speech organ, such as vocal folds,
9 can guide important decisions made by traditional
10 acoustic speech recognition systems; however, it is
11 not normally possible to use the non-acoustic, radar,
12 from a single speech organ motion to uniquely
13 identify a word-sound.

14 So he says that that can be used for
15 traditional acoustic speech recognition systems. He
16 goes on to give a system with more that has described
17 previously, and he goes on for several pages to
18 describe some of these algorithms. Single sensor
19 algorithms can provide exactly the information that
20 we're looking for in Hussain, which is something that
21 can give the presence of voice speech, onset of
22 speech time or the end of speech using these -- this
23 highly accurate sensor providing information that has
24 never before been available.

25 Q. Where do you cite for him -- for your

1 testimony that you goes on to give a system,
2 et cetera?

3 MS. SAHLSTEN: Objection, form.

4 THE WITNESS: Can you give context of what
5 you're saying?

6 Q. (By Mr. Lambrianakos) Well, you just
7 testified a couple seconds on ago he goes on to give
8 a system with more -- that describe -- more that has
9 described previously and he goes on for several pages
10 to describe some of these algorithms, single sensor
11 algorithms that can provide exactly the information
12 that can give the presence of voice speech, onset of
13 speech time or the end of speech using this highly
14 accurate sensor providing information that has never
15 before been available.

16 So where does he say that you would use
17 just the vocal fold sensor by itself to make the
18 system that you were describing?

19 A. As I said before, in column 23 he says:
20 For simple or low cost speech recognition
21 enhancement, one or two organ interface measurements
22 may suffice. Then he elsewhere, as I quoted, talks
23 about the revolutionary impact of his voicing
24 detection, his EM vocal fold sensor. And then he
25 goes on to describe in 28 that single speech organ

1 such as -- specifically he calls out vocal folds can
2 be used. Then he describes various algorithms.
3 That's in 28, 29, 30 to 31 and he summarizes those
4 results in 31 saying that example of single organ EM
5 sensor algorithms include the presence of voice
6 speech, the onset of speech time and the end of
7 speech, those could be obtained from a single organ.

8 He's furthermore made it clear that voice
9 speech is determined using the voicing sensor, and he
10 said that you can have a single sensor system but
11 that it doesn't work as well. While it may work to
12 help traditional things, his system that uses all of
13 them is assuming that you have more but that it can
14 be dumbed down, if you will, to have just a single
15 one. And, once again, he pulls out and cites
16 specifically the voicing sensor which provides
17 exactly the information that is needed to do in
18 Hussain.

19 Q. You don't express an opinion in your
20 declaration that Holzrichter teaches that you can
21 have a dumbed down system that uses just the vocal
22 fold sensor, correct?

23 MS. SAHLSTEN: Objection.

24 THE WITNESS: I'm not --

25 MS. SAHLSTEN: Form.

1 THE WITNESS: -- concerned with his speech
2 recognition system. I'm concerned with the fact
3 that he teaches very clearly that you can use
4 his vocal sensor, vocal fold sensor, to
5 determine when someone is uttering voice speech
6 or not. That's what matters.

7 Q. (By Mr. Lambrianakos) You can't use vocal
8 cord sensors to determine when someone is uttering
9 unvoiced speech, can you?

10 A. You use it to detect voicing.

11 Q. Are you saying that you do not use it to
12 determine unvoiced speech?

13 A. I'm saying that if you want to
14 detect voice activity, you use a voicing sensor. I'm
15 not offering opinions on unvoiced speech right there.

16 Q. Well, doesn't Hussain have a speech/noise
17 only detector?

18 A. Yes.

19 Q. Speech in that context includes voiced
20 speech and unvoiced speech, doesn't it?

21 A. It may.

22 Q. Sir, you provide some quotations in
23 paragraph 92 that you say support your opinion that a
24 person of ordinary skill in the art would have
25 recognized that Holzrichter's EM sensor is highly

1 accurate and efficient at detecting speech. Do you
2 see that?

3 A. Yes.

4 Q. And when you say Holzrichter's EM sensor,
5 once again, that refers only to the EM sensor for
6 vocal cords -- vocal folds, excuse me?

7 A. The one we're relying on is the vocal --
8 vocal cords fold sensor.

9 Q. And is it your understanding that all of
10 the evidence that you cite in paragraph 92 is
11 specific to the vocal folds sensor?

12 A. That quote from column 24, 5 through 7, is
13 talking about the EM sensors in general.

14 Q. What about your citation at column 10,
15 lines 35 to 37?

16 A. That column 10 quote applies to all of the
17 sensors, including it applies to the vocal fold
18 sensors, and it also provides or applies to the
19 others, which is why we continued to provide -- I
20 provided additional quotes talking about the
21 importance of the vocal folds and highlighted the
22 vocal fold sensor.

23 Q. Which are those additional quotes that
24 you're referring to?

25 A. For example, in paragraph 90 it's

1 referring to 17, column 17, starting at line 3.
2 Actually, let's skip down to line 8. The vocal cord
3 sensor output signal is related to the true
4 excitation of the vocal tract for which realtime
5 signals have never before been available -- or never
6 been available before. The speech processing model
7 derived from knowing the action of the excitation
8 source and so on.

9 Q. And your -- and your citation there goes
10 through line 23, right?

11 A. Yes.

12 Q. What does it say beginning at line 18?

13 A. Similar measurements of the other
14 position -- of the positions of other organs which
15 participate in the definition of the vocal tract
16 during a given speech time frame are associated with
17 the PLU being spoken and provide a significantly
18 better and more accurate representation of the
19 feature coefficient -- vector coefficients.

20 Q. Do you know what articulatory phonetics
21 is?

22 MS. SAHLSTEN: Objection, scope, form.

23 THE WITNESS: Generally, yes.

24 Q. (By Mr. Lambrianakos) You don't contend
25 that a person of ordinary skill in the art in this

1 matter would have any knowledge of articulatory
2 phonetics, right?

3 MS. SAHLSTEN: Objection, scope.

4 THE WITNESS: I have not contended that.
5 What I have contended is that a person of
6 ordinary skill in the art would understand that
7 Holzrichter discloses something that has never
8 been seen before, something that can detect a
9 vocal tract motion non-acoustically in a
10 non-invasive way for detecting whether or not
11 there is voicing better, he says, than ever
12 before. That's what matters when somebody is
13 looking for a voice activity detector.

14 MR. LAMBRIANAKOS: I object to the
15 entirety of the answer following the responsive
16 portion "I have not contended that."

17 Q. (By Mr. Lambrianakos) In your search for
18 prior art to assert against the '543 patent, did you
19 come across a reference which used a voice activity
20 detector in connection with a noise cancellation
21 system?

22 A. A voice activity detector in connection
23 with a voice -- a noise cancellation system?

24 Q. That's right.

25 A. Many.

1 Q. Is Hussain one of them?

2 A. Yes.

3 Q. Which other references did you come across
4 that disclose a voice activity detector used in
5 connection with a noise cancellation system?

6 A. That was over a year ago. I couldn't
7 recite them from memory.

8 Q. But you're sure there were many?

9 A. Yes.

10 Q. You think there were more than ten?

11 A. I'm not going to put a number on it.

12 Q. How do you know there were many if you
13 can't think of another one?

14 A. I'm not going to try to recall a number
15 while I'm under oath and I can't exactly recall. I
16 do know there were many.

17 Q. But you chose not to use any of them in
18 your combination in this particular matter?

19 A. I chose to use Hussain. Hussain describes
20 sub-band processing system using two microphones as
21 an input that would fit beautifully with the
22 disclosed system of Andrea.

23 Q. But you relied on Holzrichter to supply
24 the VAD that's mentioned in Hussain, didn't you?

25 A. Yes.

1 Q. Because Hussain didn't describe any
2 particular VAD, right?

3 A. Hussain just said -- I should add, VADs
4 are a common thing. You choose one according to your
5 particular implementation and if you want an
6 effective one, you go find an effective one.
7 Holzrichter disclosed an effective one.

8 Q. Who said that VADs are a common thing?

9 A. Me.

10 Q. Okay. Hussain just says that an effective
11 VAD should be chosen?

12 MS. SAHLSTEN: Objection, form.

13 THE WITNESS: He says it is assumed, dot
14 dot dot, that an effective voice activity
15 detector, VAD, is available.

16 Q. (By Mr. Lambrianakos) So Hussain doesn't
17 say that an effective voice activity detector is
18 available, does he?

19 A. I just said he says, quote, it is assumed
20 in this work that an effective voice activity
21 detector is available.

22 Q. But that's just an assumption, right?
23 He's not saying that he knows that an effective voice
24 activity detector is available, right?

25 A. He is describing a system that assumes

1 that a voice activity detector is available. One of
2 ordinary skill in the art, and this is not a
3 difficult thing, would know to go find a voice
4 activity detector.

5 Q. Hussain doesn't even provide a citation to
6 any literature that identifies an effective voice
7 activity detector, correct?

8 A. Exactly, in support of what I just said.
9 These are well-known and common and it was assumed
10 that anyone practicing this field could go grab an
11 effective voice activity detector from someplace and
12 use it.

13 Q. You determined all of that by reading this
14 paragraph here?

15 A. No. I determined all that because I've
16 been working in this field for 30 years.

17 Q. And you're a person of ordinary skill in
18 the art, right?

19 A. We've already established that.

20 Q. So do you think it was commonly known at
21 the time of Hussain that you could have a microphone
22 array with two or more relatively closely spaced
23 microphones?

24 A. Hussain cites prior references to similar
25 arrays.

1 Q. I didn't ask you that, did I?

2 Do you think it was commonly known at the
3 time of Hussain that you could have a microphone
4 array with two or more relatively closely spaced
5 microphones?

6 A. Yes.

7 Q. And yet he decided to cite to authority
8 for that proposition, right?

9 A. His citations aren't necessarily
10 supporting that particular statement but rather the
11 entire problem set up in context that he is operating
12 within.

13 Q. You have no idea what those references
14 cite because you, sitting here today, couldn't answer
15 any questions about their content, right?

16 MS. SAHLSTEN: Objection, argumentative,
17 misstates testimony.

18 THE WITNESS: I'm sorry, can you rephrase
19 that?

20 Q. (By Mr. Lambrianakos) Sure.

21 You don't know what the content is of any
22 of the articles which are cited for the sentence we
23 just discussed, 4, 5, 6 and 11, right?

24 A. I can tell you the titles. And I've said,
25 I've read some of them. I don't know what is

1 associated with what nor do I recall their details.
2 The first one, A Multi-Microphone Sub-Band Adaptive
3 Speech Enhancement System Employing Diverse Sub-Band
4 Processing is Reference 4.

5 Speech Recognition in Noisy Environment
6 With the Aid of Microphone Arrays, number 5.

7 Number 6, Speech Enhancement By Recursive
8 Estimation of Differential Transfer Functions.

9 Number 7, Evaluation of Adaptive Noise
10 Cancellation For Speech Recognition.

11 Number 11, Speech Enhancement Using
12 Sub-Band Intermittent Adaptation.

13 Q. So you don't know what the content of any
14 of the articles that we've just discussed is, right,
15 even though you are capable of reading the titles; is
16 that right?

17 A. Sitting here today, I cannot tell you
18 everything in those articles.

19 Q. Well, didn't you indicate in your
20 testimony that the availability of an effective voice
21 activity detector is evidenced by the fact that
22 Mr. Hussain didn't need to cite to any literature to
23 identify an effective voice activity detector?

24 A. I stated that voice activity detectors are
25 very common. He says an effective one is assumed.

1 One of ordinary skill in the art would then know how
2 to go get one. It's very similar to saying that this
3 car has certain characteristics without specifying
4 which brand of tires you're using. A person of
5 ordinary skill in that art would know to go buy
6 whatever tires worked with that car.

7 It's very similar, voice activity
8 detection was understood. Some worked well, some
9 worked poorly. And they were -- voice activity
10 detectors are dependent upon the context, the types
11 of signals encountered, the types of inputs, noise
12 levels, processing capabilities, allowable delay and
13 many other factors. So one of ordinary skill in the
14 art would then go choose from one of those known
15 systems, one that was effective, and put it in place.
16 And Holzrichter described a very effective voice
17 activity detection system.

18 Q. Move to strike all of that as not
19 responsive.

20 Didn't you indicate in your testimony that
21 the availability of an effective voice activity
22 detector is evidence by the fact that Mr. Hussain did
23 not need to cite to any literature to identify an
24 effective voice activity detector?

25 A. You're asking me if I remembered exactly

1 what I said? Are you just quoting what I said
2 earlier, and, if so, can you give me the entire
3 quote?

4 Q. I'm asking you a question and you're not
5 answering it. So I have to ask again until you
6 answer it. That's all.

7 A. You asked if I -- didn't you just say and
8 then you quoted something. I don't have it in front
9 of me. You do. If you can read the entirety of the
10 quote and ask if I said it, then I will say yes,
11 that's what I said.

12 Q. I asked you Hussain doesn't even provide a
13 citation to any literature that identifies an
14 effective voice activity detector, correct? And you
15 said exactly. In support of what I just said, these
16 are well-known and common and it was assumed that
17 anyone practicing in this field could go grab an
18 effective voice activity detector from someplace and
19 use it. Did you say that?

20 A. If that's what I -- if you just read it
21 accurately, then that's what I said.

22 Q. And that's because you believe that
23 because Hussain didn't cite to literature for an
24 effective voice activity detector, that means that it
25 was readily available to a person of ordinary skill

1 in the art?

2 A. Incorrect.

3 Q. Incorrect.

4 A. I stated that as one who has practiced in
5 the art for 30 years, I know that to be true and that
6 what Hussain said was further support of my statement
7 of personal knowledge.

8 Q. So even though these voice activity
9 detectors were readily available, based on your 30
10 years of experience, you couldn't cite to a single
11 reference that uses a voice activity detector in an
12 adaptive noise cancellation scheme to use in
13 combination with Hussain and Andrea; isn't that
14 right?

15 A. I don't even know what you're saying.

16 Q. You don't know what an adaptive noise
17 cancellation scheme is?

18 MS. SAHLSTEN: Objection.

19 THE WITNESS: You're asking me now --
20 you're presenting it as a statement that I
21 cannot name a single voice activity detector
22 used in an adaptive noise cancellation scheme?

23 Q. (By Mr. Lambrianakos) Incorrect. That
24 wasn't what I asked you. I'll ask you again. If you
25 don't understand my question, let me know.

1 Is it your testimony that even though
2 according to you voice activity detectors were
3 readily available based on your 30 years of
4 experience you could not cite in your declaration to
5 a single reference that uses a voice activity
6 detector in an adaptive noise cancellation scheme to
7 use in combination with Hussain and Andrea; isn't
8 that right?

9 MS. SAHLSTEN: Objection, form.

10 THE WITNESS: That is not right. I could
11 have cited to many. I cited to an effective
12 voice activity detector in Holzrichter that
13 could be used with Hussain. I could have cited
14 to others. I cited to that one because the
15 physiological detection aspect of it makes it
16 particularly reliable and effective.

17 Q. (By Mr. Lambrianakos) So, in your view, a
18 combination of Andrea and Hussain with a reference
19 that teaches a voice activity detector but not in the
20 context of an adaptive noise cancellation scheme
21 would be preferable to a combination with a reference
22 that discloses an effective voice activity detector
23 in an adaptive noise cancellation scheme?

24 MS. SAHLSTEN: Objection, form, misstates
25 testimony.

1 THE WITNESS: I have said no such thing.

2 Q. (By Mr. Lambrianakos) I didn't say you
3 said it, sir. I'm asking you for your opinion.

4 In your view, is the combination of Andrea
5 and Hussain with a reference that teaches a voice
6 activity detector but not in the context of an
7 adaptive noise cancellation scheme is preferable to a
8 combination with a reference that discloses an
9 effective voice activity detector in an adaptive
10 noise cancellation scheme?

11 A. In my mind, it's not preferable or not
12 preferable. Voice activity detection is used for
13 many different things so where you get it doesn't
14 matter so much. Holzrichter does an effective voice
15 activity detector. The fact that he is not using it
16 the same way as Hussain, one of ordinary skill in the
17 art wouldn't think twice about that. It doesn't
18 matter.

19 Q. Turning to Exhibit 1008, that is the
20 Stevens reference. Do you recognize that reference,
21 sir?

22 A. Yes.

23 Q. Have you ever read it?

24 A. Yes.

25 Q. How long has it been since you read it?

1 A. I read it in preparing my report.

2 Q. Is that the last time you read it?

3 A. In its entirety.

4 Q. You rely on Stevens because it discloses
5 an accelerometer; is that right?

6 A. Yes.

7 Q. And accelerometer is not an EM sensor,
8 right?

9 A. No.

10 Q. Turning to page 7 of 9 of the reference.

11 A. Okay.

12 Q. In the second full paragraph, do you see
13 that the author discloses that a neck attached
14 accelerometer is currently being used in a
15 computer-based system of speech training aids for
16 deaf children?

17 A. Yes.

18 Q. And do you see it's being used in a
19 similar system for the training of pronunciation of a
20 second language?

21 A. Yes.

22 Q. In your declaration you don't contend that
23 Stevens discloses using an accelerometer in a noise
24 suppression system, right?

25 A. No.

1 Q. You also rely on the Alcivar reference.
2 That's Exhibit 1009. Do you see that?

3 A. Yes.

4 Q. This discloses a tissue conduction
5 microphone?

6 A. Yes.

7 Q. That's not an EM sensor, right?

8 A. I should be careful there. It's not an
9 electromagnetic sensor in the same way that
10 Holzrichter discloses one. Electromagnetic
11 principles are used in the operation of a capacitor
12 microphone, but it is not called an EM sensor
13 generally.

14 Q. Does Holzrichter disclose the sensor
15 that's in Alcivar?

16 A. No.

17 MS. SAHLSTEN: Objection, form.

18 THE WITNESS: He does not discloses the
19 tissue conduction microphone in Alcivar.

20 Q. (By Mr. Lambrianakos) Does Alcivar
21 disclose using the tissue conduction microphone as a
22 switch?

23 A. He discloses using it to detect voice for
24 operating a switch.

25 Q. And he uses the tissue conduction

1 microphone in an underwater communication system?

2 A. In one embodiment.

3 Q. Are there other embodiments?

4 A. Yes.

5 Q. What are the other embodiments?

6 A. In column 1 he states: It is, therefore,
7 a general object of the present invention to provide
8 a voice actuated transmitter switch or VOX that is
9 substantially insensitive to non-speech generated
10 sounds.

11 It is a specific object of the present
12 invention to provide a voice activated transmit
13 switch for use in a high noise environment voice
14 communication system.

15 It is another object of the invention to
16 provide a voice actuated transmit switch which is
17 especially suited for underwater communication
18 systems.

19 Q. So you read the objects. Where is the
20 other embodiment that you refer to?

21 A. Figure 1 is for a -- it says that Figure 1
22 is a block diagram of a communication system
23 utilizing voice actuated transmit switch of the
24 present invention. And Figure 2 is a schematic
25 diagram of the VOX circuit. Then he says: Turning

1 now to the drawings, the voice activated switch or
2 VOX of the present invention will be described in
3 connection with an underwater communication system.

4 One of ordinary skill in the art looking
5 at this Figure 1 would understand that there is
6 nothing in that that is specific to an underwater
7 communication environment except the context of the
8 breathing apparatus, block 16, and a dashed line
9 around the speech microphone.

10 Q. Are you being paid for your testimony?

11 A. I'm being paid for my time.

12 Q. How much?

13 A. 450 per hour.

14 Q. So could you just answer my question. My
15 question is what embodiments other than an underwater
16 communication system does Alcivar disclose?

17 A. He discloses a system shown in Figure 1
18 that can be used in any high noise environment.

19 Q. Where is the embodiment in which he shows
20 it being used other than in an underwater
21 communication system?

22 A. Figure one is an embodiment. It can be
23 used in any high noise environment.

24 Q. I recognize your opinion is that it can be
25 used anywhere but that doesn't answer my question.

1 My question is in response to your statement that
2 there are other embodiments, what are the other
3 embodiments disclosed by Alcivar using the tissue
4 conduction microphone other than in an underwater
5 communication system?

6 A. And I just read to you from Alcivar where
7 he -- first he states that this system can be used in
8 any high noise environment voice communication
9 system, that Figure 1 and Figure 2 describe aspects
10 of that embodiment and that then he goes on to
11 describe those same figures in the context of a
12 preferred embodiment.

13 Q. So what embodiments does he describe other
14 than an underwater communication system?

15 MS. SAHLSTEN: Objection, asked and
16 answered.

17 THE WITNESS: He describes the embodiment
18 in Figure 1 and Figure 2.

19 Q. (By Mr. Lambrianakos) And Figure 1 is an
20 underwater communication system?

21 A. Figure 1 is a communication system for use
22 in high noise environments. He then describes how
23 that can be used in an underwater environment.

24 Q. So what other kinds of systems other than
25 an underwater communication system does Alcivar

1 describe?

2 A. He describes the ones shown in Figure 1.
3 He describes that that is applicable in a high noise
4 communication environment.

5 Q. So you can't name any specific embodiment
6 that he describes other than the underwater
7 communication system?

8 A. I just did.

9 Q. What is that? Is it an adaptive noise
10 cancellation system? Is it a voice recognition
11 system? What kind of system other than an underwater
12 communication system?

13 A. Figure 1 is an embodiment intended to work
14 in a high noise communication environment. It
15 describes a communication system with a voice
16 activated switch to be used in a high noise
17 communication environment.

18 Q. So it's your testimony that Figure 1 does
19 not illustrate an underwater communication system in
20 particular?

21 A. I've already explained that Figure 1 works
22 generally but with the addition of the diver thing
23 that's used later in the description of the preferred
24 embodiment for underwater. It also applies to the
25 underwater environment.

1 Q. Doesn't Alcivar say looking at Figure 1
2 which depicts the illustrative underwater
3 communication system, et cetera, doesn't he say
4 Figure 1 is the underwater communication system?

5 A. Where are you reading?

6 Q. Column 1, line 63.

7 A. That's after he goes on to talk -- he
8 switches to talk about it can be understood the
9 description of the invention in connection with the
10 underwater communications is by way of illustration
11 only and that voice activated transmit switch can be
12 used in other communication systems and it is
13 particularly suited for high noise communication
14 environments. Looking at Figure 1, which depicts the
15 illustrative underwater communication system, as I
16 explained, he shows first Figure 1 is a communication
17 system utilizing a voice activated transmit switch of
18 the present invention.

19 Then, that it can be used in multiple
20 environments including high noise environment
21 communication system. And then he goes on to
22 describe the particular application of that or
23 embodiment that uses that circuit in the context of a
24 speech -- speech cavity which surrounds at least a
25 diver's mouth and uses -- is used in a diving

1 environment.

2 Q. And in Figure 2 that shows a schematic of
3 the box circuit itself, right?

4 A. Yes.

5 Q. And there are no other figures and no
6 other description of any particular embodiment which
7 incorporates the particular tissue conduction
8 microphone of Alcivar, correct?

9 A. I disagree.

10 Q. So what are the other figures other than
11 Figures 1 and 2?

12 A. There are figures just -- there are only
13 Figures 1 and 2.

14 Q. Okay. And what other part of the
15 description describes an embodiment that uses
16 Alcivar's tissue conduction microphone other than the
17 embodiment of an underwater communication system?

18 MS. SAHLSTEN: Objection, asked and
19 answered.

20 THE WITNESS: I have answered that very
21 question multiple times.

22 Q. (By Mr. Lambrianakos) Well, you've said
23 that he says it can be used in high noise environment
24 communication systems, but you haven't identified an
25 embodiment which is described in the specification

1 that is an example of that other than the underwater
2 communication system; isn't that right?

3 A. No, that is not right.

4 Q. So what other embodiments are there that
5 are specifically described in the specification?

6 A. Figure 1 without the breathing apparatus
7 and Figure 2 describe his invention that work, as he
8 said, in a high noise environment communication
9 system.

10 Q. So you imagine a Figure 1, which is
11 expressly described by Alcivar, as the embodiment of
12 an underwater communication system in which the
13 breathing apparatus part is deleted and then, in your
14 view, that means that this is -- this figure also
15 describes other embodiments?

16 MS. SAHLSTEN: Objection, form.

17 Q. (By Mr. Lambrianakos) Is that your
18 testimony?

19 A. I'm going to re-read what Alcivar says
20 because he's the final word on this. Turning now to
21 the drawings, the voice actuated switch or VOX of the
22 present invention will be described in connection
23 with an underwater communication system.

24 He doesn't want to describe the whole
25 thing twice. Shown in block diagram form in Figure 1

1 and indicated generally by reference numeral 10. It
2 should be understood that the description of the
3 invention in connection with the underwater
4 communication system is by way of illustration only
5 and that the voice activated transmit switch can be
6 used in other communication systems and it is
7 particularly suited for high noise environment
8 communication systems.

9 That's very clear to me as one of ordinary
10 skill in the art that the system he's going to
11 describe, and he does it in the context of a diver
12 system, works in non-diver situations, in high noise
13 environments communication systems, and that it is
14 the same system as described. It's the same circuit.
15 It's Figure 1 and it's Figure 2. And he describes in
16 detail such that anyone of ordinary skill in the art
17 could apply that in many different ways.

18 Q. All I'm asking you to do, which you have
19 clearly refused to do, is to identify for me what
20 other specific systems Alcivar discloses in his
21 patent with which his tissue conduction microphone
22 could be used? What other embodiments are there?

23 MS. SAHLSTEN: Objection, asked and
24 answered.

25 THE WITNESS: Here's another embodiment.

1 This voice activated transmit switch can be used
2 in other communication systems and can is
3 particularly suited for high noise environment
4 communication systems. The embodiment is the
5 very same switch used in other contexts as he
6 describes.

7 Q. (By Mr. Lambrianakos) So you think that
8 that statement discloses other embodiments, is that
9 your testimony?

10 A. Yes. I should add, because we've read it
11 so many times that --

12 Q. Speeches are improper in a deposition.

13 A. I'm going to qualify my answer. I've read
14 the entire paragraph. In that last answer, I just
15 read part of a sentence. We should be taking the
16 whole paragraph as indicating another embodiment. I
17 ask for a break.

18 Q. You want a break?

19 A. Yeah.

20 MR. LAMBRIANAKOS: Go ahead.

21 (A recess was taken.)

22 Q. (By Mr. Lambrianakos) Dr. Anderson, would
23 you please turn to page 99 of your declaration, which
24 is your discussion of claim 2.

25 A. Okay.

1 Q. Do you see that for element 2A, you rely
2 on the EM sensor module 23 as the glottal
3 electromagnetic microwave power sensor of the claim?

4 A. Yes.

5 Q. Is that the same sensor module that is
6 used to obtain the vocal fold information that you
7 relied on for claim 1?

8 A. Yes.

9 Q. You don't refer to EM sensor module 23 in
10 your discussion of claim 1, right? I withdraw the
11 question.

12 MR. LAMBRIANAKOS: Pass the witness.

13 MS. SAHLSTEN: Just a moment while I check
14 my notes.

15 (Discussion off the record.)

16 MS. SAHLSTEN: Okay. I have no questions
17 for Dr. Anderson.

18 MR. LAMBRIANAKOS: Great. That means
19 we're done.

20 (Discussion off the record.)

21 (After being asked, off the record, if
22 counsel would like a copy of the transcript,
23 counsel replied with the following:)

24 MR. LAMBRIANAKOS: We'll take a rough and
25 turn around in the week of the final.

1 (After being asked, off the record, if
2 counsel would like an expedited copy of the
3 final transcript, counsel replied with the
4 following:)

5 MS. SAHLSTEN: No, we don't need it;
6 normal is fine.

7 (Deposition concluded at 3:38 p.m.)
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E R R A T A S H E E T

Pursuant to Rule 30(e) of the Federal Rules of Civil Procedure and/or Official Code of Georgia Annotated 9-11-30(e), any changes in form or substance which you desire to make to your deposition testimony shall be entered upon the deposition with a statement of the reasons given for making them.

To assist you in making any such corrections, please use the form below. If supplemental or additional pages are necessary, please furnish same and attach them to this errata sheet.

* * *

I, the undersigned, DAVID V. ANDERSON, Ph.D., do hereby certify that I have read the foregoing deposition, and that to the best of my knowledge, said deposition is true and accurate (with the exception of the following corrections listed below).

Page___Line___should read:_____

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Page___Line___should read:_____

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Page___Line___should read:_____

Reason for change:_____

1 Page____Line____should read:_____

2 Reason for change:_____

3 Page____Line____should read:_____

4 Reason for change:_____

5 Page____Line____should read:_____

6 Reason for change:_____

7 Page____Line____should read:_____

8 Reason for change:_____

9 Page____Line____should read:_____

10 Reason for change:_____

11 Page____Line____should read:_____

12 Reason for change:_____

13 Page____Line____should read:_____

14 Reason for change:_____

15

16

17 _____

Signature

18

19

20 _____, Notary Public.
 This, the_____day of_____, 2023.
 My Commission Expires:_____.

21

22

23

24

25

D I S C L O S U R E

STATE OF GEORGIA) DEPOSITION OF
HENRY COUNTY) DAVID V. ANDERSON, Ph.D.

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Georgia CCR-B-2289

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I, F. Renee Finkley, a Certified Court
Reporter in and for the State of Georgia, do hereby
Certify:

That prior to being examined, the witness
named in the foregoing deposition was by me duly
sworn to testify to the truth, the whole truth, and
nothing but the truth.

That said deposition was taken before me
at the time and place set forth and was taken down by
me in shorthand and thereafter reduced to
computerized transcription under my direction and
supervision, and I hereby certify the foregoing
deposition is a full, true and correct transcript of
my shorthand notes so taken.

I further certify that I am not of kin or
counsel to the parties in the case, and I am not in
the regular employ of counsel for any of the said
parties, nor am I in any way financially interested
in the result of said case.

IN WITNESS WHEREOF, I have hereunto
subscribed my name this 1st day of March, 2023.

F. Renee Finkley, RPR, RMR, CRR, CLR
Georgia CCR-B-2289

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