

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN TUOZHU TECHNOLOGY CO., LTD.,
Petitioner,

v.

STRATASYS, INC.,
Patent Owner.

IPR2025-00531 (Patent 9,168,698)
IPR2025-00532 (Patent 10,556,381)

Oral Hearing Held: July 14, 2026

Before HYUN J. JUNG, CHRISTOPHER L. OGDEN, and
LILAN REN, *Administrative Patent Judges*.

IPR2025-00531 (Patent 9,168,698)
IPR2025-00532 (Patent 10,556,381)

APPEARANCES:

ON BEHALF OF THE PETITIONER:

JOSHUA A. GRISWOLD, ESQ.
RISHI GUPTA, ESQ.
Fish & Richardson P.C.
1717 Main Street - Suite 5000
Dallas, TX 75201
(214) 292-4034 - Joshua A. Griswold
(214) 292-4056 - Rishi Gupta
griswold@fr.com
rgupta@fr.com

ON BEHALF OF THE PATENT OWNER:

BRIAN W. OAKS, ESQ.
AASHISH KAPADIA, ESQ.
McDermott Will & Schulte LLP
300 Colorado Street - Suite 2200
Austin, TX 78701
(512) 726-2574 - Brian W. Oaks
(512) 298-6499 - Aashish Kapadia
boaks@mcdermottlaw.com
akapadia@mcdermottlaw.com

The above-entitled matter came on for hearing on July 14, 2026,
commencing at 12:00 p.m., via video teleconference.

P R O C E E D I N G S

- - - - -

JUDGE JUNG: This is an oral hearing for IPR 2025-00531 and 00532. In these proceedings, Petitioner, Shenzhen TuoZhu Technology, challenges all claims of U.S. patent numbers 9,168,698 and 10,556,381. Both patents are owned by Stratasys. I am Judge Jung, and with me are Judge Ogden and Judge Ren. Beginning with the Petitioner's Counsel and followed by Patent Owner's Counsel, please state your names for the record.

MR. GRISWOLD: Thank you, Your Honor. My name is Josh Griswold, and I have with me my colleague, Rishi Gupta.

JUDGE OGDEN: Excuse me, I can't hear you. Do you mind coming to the podium, please?

MR. GRISWOLD: Yeah. All right. Is the audio better here? Yes. I'm Josh Griswold.

JUDGE OGDEN: It's a little quiet. Can somebody test the podium microphone?

MR. GRISWOLD: Can you hear me now?

JUDGE OGDEN: I can, but it's very faint. Can we take a minute and see if we can fix that? Sorry about that.

USHER: Your room volume up, sir? Stand by, please. I bumped your room up some. Thank you. Hello, counsel. Come up to the mic, please. Let's get an audio check for you.

MR. GRISWOLD: How about now? Can you hear me?

JUDGE OGDEN: Yeah, that's better. Thank you.

1 MR. GRISWOLD: Okay. As I was saying, I am Joshua Griswold,
2 and I have here my colleague, LEAP practitioner, Rishi Gupta.

3 JUDGE JUNG: Thank you.

4 MR. OAKS: Good afternoon, Your Honors. I'm Brian Oaks,
5 representing lead Counsel for Stratasys, Inc., the Patent Owner. And with
6 me today is backup Counsel, Aashish Kapadia.

7 JUDGE JUNG: Thank you, Mr. Oaks. Petitioner has 105 minutes
8 of total argument time because its LEAP request was granted, and Patent
9 Owner has 90 minutes of total argument time. Each party may reserve time
10 for rebuttal, and we will likely take a break before we listen to rebuttal
11 arguments. Please refer to demonstratives, papers, or exhibits by slide or
12 page number. And once again, the public can listen to and view these
13 proceedings. With that said, Mr. Griswold, you may start when you're
14 ready.

15 MR. GRISWOLD: Thank you, Your Honors. Again, I'm Josh
16 Griswold, and I'm here with my colleague, LEAP practitioner, Rishi Gupta,
17 on behalf of Shenzhen TuoZhu Technology Co., Ltd. They're known more
18 widely as Bambu Lab printers or Bambu. That's how --

19 JUDGE OGDEN: Sorry to interrupt, again. It's still fairly faint. I
20 don't know if maybe you could just get closer to the microphone. Maybe
21 that would fix it. I'd appreciate it.

22 MR. GRISWOLD: Is this any better, Judge Ogden?

23 JUDGE OGDEN: Yeah, it's a little bit better. Yeah, it's good
24 enough. Thank you.

25 MR. GRISWOLD: I'll speak up. I'll be sure to be loud. Anyway,

1 as I was saying, I may mistakenly refer to them as Bambu or Bambu Lab,
2 and I hope that you understand who I'm speaking about. Today, I'll discuss
3 the Calderon Grounds and my colleague, Rishi Gupta, will discuss the
4 Warren Grounds.

5 JUDGE OGDEN: Okay.

6 MR. GRISWOLD: Because I'm already up here, I'm going to start
7 with the Calderon Grounds.

8 JUDGE OGDEN: Okay.

9 MR. GRISWOLD: So, and while I'm talking, feel free to interrupt
10 me with questions, anything I can help you understand. So, I'm going to
11 jump directly to Slide 122, and we're going to start off first by discussing
12 how RepRap is a printed publication. And also, how we got to this
13 particular point. As you likely recall, the Patent Owner had challenged
14 RepRap as a printed publication in its Preliminary Response before
15 institution. The Petition had explained that RepRap -- it's an online forum,
16 it's well known to developers and users of 3D printers, and the threads were
17 accessible from the front page of reprap.org, and ordered by subject matter
18 and keyword searchable.

19 Among the arguments the Patent Owner presented before
20 institution was that there's no evidence of which subject matter keywords
21 could be used to find the RepRap thread that we're citing to. And at
22 institution, the panel found Patent Owner's challenge unconvincing and
23 found the position the Petition presented a reasonable likelihood that it
24 would prevail in proving RepRap was a printed publication, but the issue
25 was left open for the final written decision, and the Board invited the parties

1 to develop the record further.

2 Patent Owner didn't further challenge RepRap's status as a printed
3 publication in its Response. The Petitioner, however, complied with the
4 invitation and developed the record further. So, thus all the arguments that
5 you heard from Patent Owner today appear in its Sur-reply. And so, we're
6 going to talk about those Sur-reply arguments. I'd also like to note as an
7 initial matter, the Patent Office has in a related matter between the parties,
8 addressed whether a RepRap article was a printed publication. That's IPR
9 2025-00321.

10 I think it's important to appreciate here that we have a different
11 record and different arguments. And most notably, as I'll discuss in a bit, we
12 have testimony of Dr. Bowyer. Dr. Bowyer is the creator and the founder of
13 RepRap and RepRap.org. He's also the administrator of that website. And
14 so, this difference is significant.

15 JUDGE JUNG: Mr. Griswold, before you continue, do you agree
16 that the dispute between the parties now has just devolved down into
17 whether or not this thread was reasonably able to be found by one of
18 ordinary skill in the art?

19 MR. GRISWOLD: I agree, yes.

20 JUDGE JUNG: Okay.

21 MR. GRISWOLD: Yes, there is a lot that is not disputed.

22 JUDGE JUNG: So, there's no dispute that the RepRap was
23 publicly available.

24 MR. GRISWOLD: Correct.

25 JUDGE JUNG: People interested in the subject matter could

1 access it. And Dr. Bowyer does testify that he accessed this thread. Do you
2 know how he accessed this thread? Did he use a keyword search, or did you
3 just give him the internet address to find the thread?

4 MR. GRISWOLD: I don't know how he accessed the thread. I can
5 tell you how we accessed the thread, and that was by keyword search. That's
6 how we found it.

7 JUDGE JUNG: Okay. And then Dr. Wolfe, your other declarant,
8 also gives some testimony about RepRap. Was he also just given the thread,
9 or did he also -- was he able to search and find the thread on his own?

10 MR. GRISWOLD: Dr. Wolfe was given the thread.

11 JUDGE JUNG: Okay.

12 MR. GRISWOLD: Yes.

13 JUDGE JUNG: So, there's really not any direct evidence that this
14 thread was able to be found by keyword search by one of ordinary skill in
15 the art, such as Dr. Wolfe, right? We just have Dr. -- actually, Mr. Bowyer's
16 opinion, that it could have been found by one of ordinary skill in the art.

17 MR. GRISWOLD: I disagree with that. So, Mr. Bowyer explains
18 that the forum posts are contemporaneously indexed by his search engine
19 and that they are searchable by the content of the post --

20 JUDGE JUNG: Um-hum.

21 MR. GRISWOLD: -- and we provided example keywords that
22 show up in the post that also show up in the Calderon reference and, for that
23 matter, the '681, '398 patent.

24 JUDGE JUNG: Do you remember, what were the keywords you
25 used? Was it strain gauge or extruder head, or both?

1 MR. GRISWOLD: It was force and sensor, and collision
2 detection, and there's a long list of them in the --

3 JUDGE JUNG: Okay.

4 MR. GRISWOLD: -- let me get to that. Collision, collision
5 detection, calibration, sensor, force, and measurement.

6 JUDGE JUNG: Okay. Where's that in the record? I missed it. Is
7 that in the declaration, one of the declarations?

8 MR. GRISWOLD: That's in the Reply.

9 JUDGE JUNG: The Reply, okay.

10 MR. GRISWOLD: And Your Honors, beyond keyword --

11 JUDGE JUNG: Um-hum.

12 MR. GRISWOLD: -- searching -- I don't mean to interrupt your
13 thinking if you are building another question.

14 JUDGE JUNG: I'm just looking at the Reply, but are you looking
15 at page 26? There's a list of words.

16 MR. GRISWOLD: Yes.

17 JUDGE JUNG: All it says, these are the keywords.

18 MR. GRISWOLD: Correct.

19 JUDGE JUNG: But were they actually used to find this thread?

20 MR. GRISWOLD: They're keywords that we use to find the
21 thread, but I don't have --

22 JUDGE JUNG: That's not --

23 MR. GRISWOLD: -- any evidence that --

24 JUDGE JUNG: That's not what --

25 MR. GRISWOLD: -- it was back in --

1 JUDGE JUNG: -- what the sentence really says.

2 MR. GRISWOLD: -- the day, correct. But I don't believe that's
3 the standard.

4 JUDGE JUNG: Okay, but I just need to -- if we decide to go in
5 your favor, I need some evidence that yes, it was keyword searchable. Dr.
6 Bowyer gives me that. A search was done using these keywords and we
7 found this thread. That seems to be lacking a little bit.

8 MR. GRISWOLD: I disagree that is the standard, Judge Jung.

9 JUDGE JUNG: Not that it has to be the standard, but if I have
10 these findings, then it would be beyond doubt that we should decide in your
11 favor.

12 MR. GRISWOLD: So, it's not Dr. Bowyer's opinion that the posts
13 are keyword searchable. He runs the site. He is the administrator. He has
14 firsthand knowledge that these keywords -- that the posts
15 contemporaneously were searchable. These are words from the posts, these
16 are words from the patents, and so there is, I think, very little dispute that
17 you would have been able to search with those keywords.

18 But I think beyond that, we don't even have to get to the issue of
19 keywords because it's an internet forum. There were nine posters discussing
20 the Z-axis calibration and force sensors, and collision detection, so there
21 were nine participants in that conversation, and then the entire thread was
22 visited and contributed to by another handful of posters, and Dr. Bowyer
23 testifies that these people are professionals and hobbyists in 3D printers.
24 And RepRap is about a community project to develop a home-built 3D
25 printer that can print itself. He says it's visited by 1,000 users a month, back

1 in the day. So, it's well known. There's evidence of people who have
2 actually visited the site. It was keyword searchable.

3 JUDGE JUNG: Oh yeah, I don't dispute any of that.

4 MR. GRISWOLD: Yeah.

5 JUDGE JUNG: That is a public forum visited by people that are
6 interested in the subject matter. But I would like, for the sake of the
7 decision, whether or not there's some evidence that, yes, we did do a search
8 and we found this thread.

9 MR. GRISWOLD: I can only tell you --

10 JUDGE JUNG: You pointed me to some good parts of the record,
11 but I wish there was a sentence that said, I, so-and-so, put in this keyword
12 and I found this thread on this date.

13 MR. GRISWOLD: Yeah, I can --

14 JUDGE JUNG: But I don't have that, but that's okay.

15 MR. GRISWOLD: I can only testify -- I cannot testify. I'm the
16 attorney. I know that we found it with those keywords.

17 JUDGE JUNG: Okay.

18 MR. GRISWOLD: But again, I don't think you need to have
19 keywords, and it doesn't have to be searchable 10 or 20 years after the
20 posting. Contemporaneously with the posting, there were professionals in
21 the 3D printing space, hobbyists in the 3D printing space that found and
22 contributed to the thread. It's also, as Dr. Bowyer testifies, 1,000 users a
23 month. RepRap was a known website. People visited the website, the
24 thread title, genetic algorithms. Regardless of whether you know what
25 genetic is, the algorithms on a site dedicated to building a 3D printer is about

1 algorithms for 3D printers.

2 JUDGE JUNG: And one last thing, this hasn't been addressed by
3 the parties, but as you both realize, both sides must realize by now, if there's
4 any inconsistencies between decisions by the Board, there needs to be some
5 sort of explanation. So, what is Petitioner's explanation, if we come out
6 differently here than we did in IPR 2025-00321?

7 MR. GRISWOLD: I think in that instance, there were no
8 keywords given. I think in that instance, the title was not descriptive. I
9 think in that instance, the keyword searching -- the argument about keyword
10 searching, was searching YouTube, and the panel at least did not identify
11 any evidence that shows that a user would have gone to YouTube to search
12 for videos or articles about 3D printing construction, which is very different
13 from our circumstance here.

14 JUDGE JUNG: Okay. Evidence here is that RepRap is a publicly
15 available forum for interested people interested in 3D printing, and you had
16 more than a reasonable likelihood of being able to find this thread.

17 MR. GRISWOLD: Agreed, agreed. And people did find the
18 thread.

19 JUDGE JUNG: Okay.

20 MR. GRISWOLD: So, how they found it, I can't tell you, but they
21 found it.

22 JUDGE JUNG: Okay.

23 MR. GRISWOLD: You've used an internet forum, I'm sure,
24 before, right?

25 JUDGE JUNG: Um-hum.

1 MR. GRISWOLD: So, you can read the titles, and people do read
2 the titles, and so the title is also descriptive, yet another way you could get to
3 this particular forum or this particular thread.

4 JUDGE JUNG: Okay, that's all I have for this issue. I'd like to
5 move on to your combination of Calderon with RepRap.

6 MR. GRISWOLD: Certainly.

7 JUDGE JUNG: Do you have a copy of your Petition available?

8 MR. GRISWOLD: I do. Yes, '698, Your Honor?

9 JUDGE JUNG: Okay, yeah, that's fine. Around page 53 to 54 of
10 your Petition. No, sorry, I take that back. That's page 55. Okay.

11 MR. GRISWOLD: Okay.

12 JUDGE JUNG: That last full paragraph on page 55 of the Petition,
13 it starts with the word 'sixth', and dropping down to the last sentence.
14 Actually, let me see. Dropping down four lines.

15 MR. GRISWOLD: I'm on the '698 petition and the last full
16 paragraph is, RepRap is a community project.

17 JUDGE JUNG: Oh.

18 MR. GRISWOLD: Should I open the '381, perhaps?

19 JUDGE JUNG: Maybe, maybe I'm on the wrong page.

20 MR. GRISWOLD: Oh, I'm sorry. I was on page 55 of the PDF.
21 Sixth, yes, strain gauges were commonly used for force measurements.

22 JUDGE JUNG: Yes, that's it.

23 MR. GRISWOLD: Correct?

24 JUDGE JUNG: Okay.

25 MR. GRISWOLD: Yeah.

1 JUDGE JUNG: I think it's the third sentence, four lines down. It
2 says, the predictable inclusion of a strain gauge follows the familiar pattern
3 of merely substituting one element for another known in the field to obtain
4 predictable results. And then the very next sentence says, supplementing
5 Calderon with a strain gauge on the extrusion head mount would not have
6 disturbed the other aspects of the system.

7 So, substituting and supplementing are kind of contrary words. By
8 supplementing in that last sentence, do you mean you're referring back to the
9 substitution? You're going to add that strain gauge in place of monitoring
10 servo drive currents, not actually adding the strain gauge on top of the servo
11 drive motor current monitoring?

12 MR. GRISWOLD: I think in the context of our combination, the
13 system is supplemented by use of a strain gauge to enable additional
14 functionality.

15 JUDGE JUNG: So, you're really substituting or just adding on?

16 MR. GRISWOLD: The combination is not based in, solely, the
17 servo drive motor embodiment. If that answers your question.

18 JUDGE JUNG: Okay.

19 MR. GRISWOLD: And I can point --

20 JUDGE JUNG: Wait a minute. So, in your combination of the
21 servo drive motor monitoring, is that still in place or has that been pulled out
22 and substituted with a strain gauge?

23 MR. GRISWOLD: So, if you look at Calderon's description of
24 that embodiment --

25 JUDGE JUNG: Um-hum.

1 MR. GRISWOLD: -- there are two examples of how you could
2 determine the touchdown. It's on Slide 129 of my slide deck.

3 JUDGE JUNG: Okay.

4 MR. GRISWOLD: You can go there, or if you have Calderon, it's
5 at the top of column 10. And it describes contact between the tip of the
6 nozzle and the substrate is monitored by a sensing means, and the controller
7 electronically records the Z-axis position of the platform as the time contact
8 is detected. In an apparatus that uses servo drive motors, so this is a special
9 subset --

10 JUDGE JUNG: Um-hum.

11 MR. GRISWOLD: -- contact of the substrate can be detected by
12 simply monitoring for change in the servo drive. So, I think that those are
13 two separate descriptions. They're related, they do the same thing, but
14 Calderon contemplates you could use a sensing means or you could use
15 monitoring the servo drive. And if you look at our obviousness
16 combination, particularly the thing that describes what the combination is,
17 we advocated replacing or using a strain gauge as the sensing means in this
18 configuration.

19 JUDGE JUNG: So, you're no longer using the servo drive motor
20 monitoring, correct?

21 MR. GRISWOLD: Oh, it --

22 JUDGE JUNG: It could still be there, but it's not being used for --

23 MR. GRISWOLD: If that is your question, you do not need to use
24 the servo drive current. I don't know whether there's another reason in
25 Calderon that it may use the servo drive current. The Z calibration would

1 use the strain gauge as a force sensor, and the collision detection after
2 initialization, and more just generally collision detection, would use the
3 strain gauge as a force sensor.

4 JUDGE JUNG: Okay. So, why would that be better than using
5 the servo drive motor current monitoring, that's already there? Calderon
6 doesn't make it clear, but it seems like that is what's being used for collision
7 monitoring. If a collision occurs, that contact between the tip and the
8 surface being extruded is -- I assume it exceeds some kind of set point,
9 collision is determined to have occurred, and it stops Calderon. Is that a
10 reasonable understanding of Calderon before your proposed modification?

11 MR. GRISWOLD: So, Calderon has two descriptions in it. First,
12 it uses the nozzle touchdown --

13 JUDGE JUNG: Um-hum.

14 MR. GRISWOLD: -- to determine the relationship between the
15 nozzle and the substrate, so that it knows -- the nozzle is fixed in the Z-axis
16 and it moves the substrate up to touch it, right?

17 JUDGE JUNG: Right.

18 MR. GRISWOLD: And it also then uses the nozzle and the strain
19 -- or excuse me, the servo drive or sensing means to determine whether there
20 is a print left over on a bed as part of the initialization step. And so, if it
21 finds a print on the bed, it alarms the user, the user removes the remaining
22 print, and then it completes the remainder of the initialization. And so, our
23 combination is instead of using the servo drive current to measure when you
24 have tip contact, you would use the strain gauge on the extruder mount, and
25 there's some advantages that I can describe.

1 JUDGE JUNG: Do you know what happened -- like, before you
2 go on -- what happened in Calderon when the tip did actually collide with an
3 object that was being made?

4 MR. GRISWOLD: Calderon doesn't say. The only discussion of
5 collision detection in Calderon -- there's two examples -- one is during the
6 initialization stage to make sure that there isn't a print already on the bed that
7 just didn't get removed. And there's another example where there's a very
8 brief mention of if you have a power outage to re-find the part, but I don't
9 think that that's collision detection. I think that that's akin to initialization.

10 It doesn't teach what might happen, for example, if you get a
11 spaghetti failure. I don't know how familiar you are with 3D printers, but
12 sometimes the thermoplastic doesn't bond to the material it's supposed to
13 bond to, and then you just get a big pile of spaghetti. Wade actually
14 mentions that in his post in RepRap. It doesn't explain what happens when
15 that occurs.

16 JUDGE JUNG: Okay. All right. Let's look at your reasons for
17 adding a strain gauge to Calderon.

18 MR. GRISWOLD: And the reproduced Slide 134, if looking at the
19 slide deck is helpful -- 134 is the '698 and 135 is Calderon. And then I
20 would start talking at 136, if you want to hear me talk and ask questions, or
21 I'd be glad to field questions.

22 JUDGE JUNG: Oh yeah. Please go ahead with your presentation.

23 MR. GRISWOLD: Okay. I do also want to discuss what it means
24 to detect contact force, and we can get to that --

25 JUDGE JUNG: Oh, yeah.

1 MR. GRISWOLD: -- at some point. I'm sure you also would like
2 to know.

3 JUDGE JUNG: Yes. All right. I would like a little bit of help
4 with that.

5 MR. GRISWOLD: Okay. So, I don't have slides and conversation
6 prepared for all nine of the motivations to combine that we advanced, and I
7 would point out that -- well, actually '381 has a few. It's a subset of the
8 motivations to combine, when you're talking about using the strain gauge at
9 the extruder mount, as opposed to the additional obviousness in '381 of
10 calculating contact force. But you only need to find one motivation to
11 combine to find that the combination is legitimate and that Calderon can
12 render the claims unpatentable -- Calderon, RepRap.

13 The one on Slide 136 is the Petitioner's explanation of real-time
14 collision detection after system initialization. And so, it's important to
15 appreciate the Calderon patent is about a system initialization process, where
16 it finds the z-axis position, and the majority of the patent is about that. And
17 the collision detection that Patent Owner cites to are both in -- one, in an
18 initialization. It says it's an initialization because it then finishes the
19 initialization operation. And the other is a special case where if you lose
20 power, for example, in the middle of a process, it's re-finding the location of
21 the part. As I said, I don't know that it's collision detection.

22 So, the Patent Owner's argument that there's no need to add
23 RepRap for the purpose of collision detection, is either ignoring our
24 statement that the collision detection would occur after system initialization,
25 or it's misreading Calderon. And Calderon's example four is what I have

1 reproduced on page 136. And it's informative if you just read the first
2 sentence of it. In the embodiments of any of the above examples, the auto-
3 initialization method of the present invention can further be used to detect
4 whether the build envelope is cleared before building a model begins.

5 And then the very last sentence says, if a model is detected, the
6 machine stops the build, alerts the user, and, to clear the envelope, and the
7 machine continues with the Z-axis initialization when the envelope is
8 cleared. So, that, I think, makes it clear. It's part of the initialization.

9 And the problem that the RepRap folks were talking about is
10 collision detection is also needed during the print. And so, by using the
11 strain gauge, you can enable collision detection during the print. As you can
12 imagine, the Z-axis servo drive only measures the force when the substrate is
13 moving up, but there's a lot of other movement in there that a strain gauge
14 wouldn't enable measuring. 137 just mentions more or less what I said, that
15 it allows you to have constant measurement of force that improves your
16 collision detection.

17 JUDGE JUNG: There is a slight difference between collision
18 detection and force measurement, right? Like, RepRap is pretty clear. I
19 want to use strain gauges to avoid -- to measure collisions so I can avoid a
20 misprint, like it happened to me before overnight. But then the Petitioner
21 argues that that's enough to go on to measure -- to derive a constant
22 measurement of force. So, can you help me a little bit with that little gap in
23 between collision detection and continuous force measurement?

24 MR. GRISWOLD: Well, in the RepRap forum, the different
25 professionals, hobbyists that were debating what sensing mechanism to use,

1 and they talked about a bunch of different things.

2 JUDGE JUNG: Um-hum.

3 MR. GRISWOLD: They talked about a bunch of different sensors.

4 When they were talking strain gauge, they were talking about how to use it,
5 and Wade, who seemed to be the champion of the strain gauge, said that he
6 had in mind that he would measure -- continuously measure -- the forces
7 acting on the head, including its weight. And so, that's where the teaching
8 that we've adopted in the Calderon/RepRap combination comes from.

9 JUDGE JUNG: But your original reason to combine with RepRap
10 was for collision detection, correct?

11 MR. GRISWOLD: Both Z-axis and collision detection.

12 JUDGE JUNG: Okay. Then can you still help me fill in that gap?
13 Why would you go on and then have a constant measurement of force
14 starting with -- you're starting with the collision detection and Z-axis
15 calibration, And then from there, you jumped over to a continuous force
16 measurement. What's the bridge?

17 MR. GRISWOLD: Well, the continuous force measurement I
18 think is necessary for collision detection. You've got to be listening for a
19 collision the whole time, if you're going to do collision detection. But
20 there's other advantages, and this relates to the disadvantages of measuring
21 servo drive current as a proxy for force, and I've got a few slides on that. Do
22 you care for me to discuss the slop and backlash was an issue?

23 JUDGE JUNG: I actually do, because it does -- as Patent Owner
24 points out, that discussion doesn't seem to be directly related to, servo drive
25 motor current monitoring. So, I'd like you to fill in that gap as well.

1 MR. GRISWOLD: So, where should we go first? What makes
2 sense? I --

3 JUDGE JUNG: Yeah, let's jump to the backlash --

4 MR. GRISWOLD: Okay.

5 JUDGE JUNG: -- for a moment.

6 MR. GRISWOLD: Yeah, so --

7 JUDGE JUNG: Maybe that'll help with the original.

8 MR. GRISWOLD: Certainly. If you look at Slide 138 --

9 JUDGE JUNG: Um-hum.

10 MR. GRISWOLD: -- 138 talks about how slop and backlash was a
11 known problem, and it in and of itself is a motivation to combine. So --

12 JUDGE JUNG: But are you saying this was a known problem in
13 particular for servo motor current detection or --

14 MR. GRISWOLD: I think it's a known problem in general for any
15 kind of force measurement.

16 JUDGE JUNG: Yeah, I agree.

17 MR. GRISWOLD: So --

18 JUDGE JUNG: Even strain gauges would have a backlash
19 problem, correct?

20 MR. GRISWOLD: No, I don't think a strain gauge would have a
21 backlash problem. So, think about the servo drive. You've got a motor and
22 it's got some sort of --

23 JUDGE JUNG: Are you saying that there's no backlash problem
24 with strain gauges at all?

25 MR. GRISWOLD: Okay, maybe it's orders of magnitude

1 different. If you think --

2 JUDGE JUNG: Okay.

3 MR. GRISWOLD: -- of a strain gauge --

4 JUDGE JUNG: It is different.

5 MR. GRISWOLD: Yeah.

6 JUDGE JUNG: I agree.

7 MR. GRISWOLD: Yeah.

8 JUDGE JUNG: Do you have testimony that says the backlash
9 problem in a strain gauge is smaller than the backlash problem in Calderon?

10 MR. GRISWOLD: I do, yes. And the testimony, though, goes to
11 the manner of mounting and the location of the strain gauge, as opposed to a
12 strain gauge sensor versus current sensor and the differences between the
13 two.

14 JUDGE JUNG: Was it Dr. Wolfe that provided that testimony?

15 MR. GRISWOLD: Dr. Wolfe provides that testimony.

16 JUDGE JUNG: I hate to ask Counsel this, but do you remember
17 the exact paragraph? Because it always takes a little bit of time. And I hate
18 putting you on the spot like that.

19 MR. GRISWOLD: Well, it's going out of order, is what makes me
20 slow, but I have all of this committed in my head and memory, and it's on
21 slides. So, we've just got to find the right slide.

22 JUDGE JUNG: Okay.

23 MR. GRISWOLD: So, on Slide 138, he explains that the whole
24 assembly, the arm that the extrusion head is on, the XY-axis translator,
25 which is the mechanism --

1 JUDGE JUNG: Um-hum.

2 MR. GRISWOLD: -- that moves the arm left to right in Calderon,
3 the Z-axis translator, and the servo drive motors were all known to have slop
4 and backlash. And that would make it difficult to accurately and precisely
5 identify when the nozzle has contacted the substrate in Calderon's find Z
6 program, right?

7 JUDGE JUNG: Okay, yes.

8 MR. GRISWOLD: And he also observes that using the servo drive
9 as a sensing means would have a damping effect on the force signal due to
10 this slop and backlash. And we don't know what the servo drives in
11 Calderon look like, but there's some mechanism that the -- Wolfe talks
12 about, and that mechanism -- you're an aerospace engineer -- mechanisms
13 have slop.

14 JUDGE JUNG: Um-hum. Right.

15 MR. GRISWOLD: So, that's the slop and backlash that we solve
16 by using a strain gauge on the extruder head mount.

17 JUDGE JUNG: So, you're telling me that that testimony implicitly
18 is telling me that the slop and backlash of a strain gauge is smaller than the
19 slop and backlash of servo drive current monitoring?

20 MR. GRISWOLD: There is more testimony on that. So, on Slide
21 140, on the left-hand side, there's paragraph 168 of Dr. Wolfe's testimony
22 where he explains that using strain gauges on the exterior mount would not
23 suffer the same degree of slop and backlash, in part because the strain gauge
24 would measure force from a location closer to the nozzle at the extrusion
25 head mounting.

1 JUDGE JUNG: Okay.

2 MR. GRISWOLD: So, you don't have the arm, you don't have the
3 XY translator, you don't have the mechanism. You're measuring it at the
4 point that you'd experience the force.

5 JUDGE JUNG: Yeah, thank you for that citation. But, all right, so
6 this kind of brings up a new problem. So, we don't know exactly what's
7 happening in Calderon with its servo current monitoring, so how do I really
8 know that the strain gauge would be better? Because I don't know what's
9 happening in Calderon. How can I compare what the strain gauge provides
10 me with what I don't know about Calderon?

11 MR. GRISWOLD: What you do know is that the strain gauge is at
12 the extruder head, at the end of the arm. And so, all of the arm slop -- the
13 arm has an elbow in it, as you can see in Figure 1. All of the XY translation
14 mechanism, and all of the Z translation mechanism is excluded from the
15 force chain that that sensor measures.

16 JUDGE JUNG: Okay.

17 MR. GRISWOLD: And then measuring with a constant force
18 -- constantly measuring the force on the extruder head, including its weight,
19 Dr. Wolfe testifies, is basically looking for a change in the force. And so,
20 when the print bed comes up and touches the extruder head, it's reducing the
21 weight of the extruder head. So, it's an immediate reaction at the extruder
22 head, whereas measuring the force using the servo drives, you've got to
23 absorb all of the slop and backlash in that arm before they start exhibiting a
24 significant force on the substrate.

25 JUDGE JUNG: Okay. And just so I'm clear, each arm has its own

1 servo motor, right? So, you can adjust the arm either in the X direction, the
2 Y direction, or the Z direction, and you're saying one of the motors for one
3 of the directions still has enough slop that a strain gauge would be a better
4 replacement, a better --

5 MR. GRISWOLD: So, I think Calderon doesn't look like the
6 modern 3D printers that you've seen.

7 JUDGE JUNG: Um-hum.

8 MR. GRISWOLD: So, Calderon has an arm that only moves in
9 the XY plane.

10 JUDGE JUNG: Okay.

11 MR. GRISWOLD: And then the Z-axis is, if you look at Figure 1,
12 on my Slide 141, there's a Z-axis translator that's down at the bottom of the
13 machine.

14 JUDGE JUNG: Um-hum.

15 MR. GRISWOLD: It doesn't show a picture of what exactly it is,
16 but it's far from the point of contact of the nozzle.

17 JUDGE JUNG: Okay. And so, the strain gauge would just be
18 better because of that distance. It's the closer to the point of where the force
19 occurs versus the servo motor?

20 MR. GRISWOLD: Closer to where the point -- yeah, to where the
21 force occurs than the servo motor. Two reasons, as I said. You have force
22 that acts on the nozzle here and you measure it right there. But also, if
23 you're measuring from the servo drive, you have this slop right here and this
24 slop right here and the slop in the mechanism that moves this way.

25 JUDGE JUNG: Okay.

1 MR. GRISWOLD: And whatever flexure and slop you have in the
2 thing that holds it up in the air and the substrate, the mechanism that moves
3 the substrate, that you have to consume before this thing really starts
4 pressing down, but immediately, you start lifting it up, it reduces the weight.

5 JUDGE JUNG: Okay, thank you.

6 MR. GRISWOLD: So, let's talk about what else we should talk
7 about. Another motivation that's also relevant to this, right, is the servo
8 drive current is inaccurate and inconsistent, and it's solved by using a strain
9 gauge. And that's because the servo drive, because it's a moving
10 mechanism, it's subject to wear, it's subject to damage, it's subject to getting
11 dirty. And that's actually a big issue with 3D printers. And with a strain
12 gauge, you're not measuring this mechanism.

13 And so, measuring the servo drive current over time, it's going to
14 collect dirt, it's going to build friction, it's going to wear, it may become
15 damaged. And so, you're not only measuring the contact force, but you're
16 also measuring this additional force that changes over time. And so, the
17 strain gauge is not subject to that same inaccuracy and the inconsistency, I'd
18 argue, is yet more difficult to deal with.

19 JUDGE JUNG: Just a minor technical point, but a strain gauge is
20 also subject to drift, like its measured force would kind of change over time
21 as well. But I take it, Petitioner's position, even considering that drift, the
22 strain gauge would be better than the servo drive motor current.

23 MR. GRISWOLD: Well, so Dr. Wolfe testifies that strain gauges
24 are well understood, and Dr. Oswald, I've got some testimony from him who
25 testifies that -- and I know this from experience -- that as a sophomore, I

1 learned about strain gauges and how to use them and the error, and I had
2 labs on it. Oswald testifies that's a thing of sophomore mechanical
3 engineers. And so, you can account for drift and temperature issues on a
4 strain gauge. You have no control and no way to measure how dirty or how
5 worn or how damaged the servo drive is.

6 JUDGE JUNG: But presumably, the operator would, every now
7 and then, periodically check to make sure.

8 MR. GRISWOLD: That's a guess.

9 JUDGE JUNG: That's still within tolerance.

10 MR. GRISWOLD: Yeah.

11 JUDGE JUNG: Same with the strain gauge. You have to also
12 periodically check to make sure its measured force still is within calibration
13 windows.

14 MR. GRISWOLD: I think this goes off record, but my experience
15 with strain gauges is that temperature is the concern and actually -- well,
16 they mentioned temperature in the discussion -- but that's something you
17 -- that's part of the specification of a strain gauge.

18 JUDGE JUNG: Okay, thank you.

19 MR. GRISWOLD: So, let me make sure that I discussed all of the
20 things I want to discuss in slop and backlash. We've discussed that slop and
21 backlash is also system-wide, and this relates, again, to the fact that it's not
22 just in the servo drive, it's in the entire arm. And we discussed that it's a
23 general problem to all of any kind of contact measurement where you need
24 precision.

25 And Wade's post where he talks about when you're talking in terms

1 of millimeters, just a little bit of give, is going to be an issue. I think that
2 that communicates that it's not just -- they were definitely talking about a
3 particular sensor, but Wade was not saying that sensor is bad because it has
4 slop and backlash. He's saying slop and backlash is bad and that sensor has
5 it.

6 JUDGE JUNG: Okay. One last thing. The mention about in
7 Calderon that it can do the Z-axis calibration without the need of a special-
8 purpose sensor. So, how does that affect your motivations to combine? It
9 seems to me that Calderon already teaches a pretty good way to do it without
10 a special purpose sensor. Why would one of ordinary skill in the art then go
11 on to add that special purpose sensor?

12 MR. GRISWOLD: Well, I think all of those motivations that we
13 just discussed outweigh using a special purpose sensor. As Dr. Wolfe
14 testifies, strain gauges are well understood. They're very commonplace.
15 Oswald agrees, you learn about them as a sophomore mechanical engineer.
16 I graduated in '95. I think, long ago, and I learned about them way back
17 then. And Calderon doesn't limit its example to just servo drive current.

18 If you go back to Slide 129, there are two examples. You can use
19 a sensing means and you can use a servo drive motor. Those are two ways
20 to determine whether you have contact of the tip. And I think it's probably
21 worthwhile also pointing out on my Slide 131, where we show that we're
22 talking about the sensing means embodiment, the reference to rather than
23 servo drive current is just to communicate that even if you had a servo drive,
24 it would still make sense to use the strain gauge either as the sensing means,
25 or instead of the servo drive current, it's the best solution.

1 JUDGE JUNG: Okay.

2 MR. GRISWOLD: And by the way, if you get into Calderon, and
3 it's in the Petition, and I think it may also be in the Reply -- I could find you
4 a citation for it -- but there's a broad statement in Calderon where it broadly
5 defines the type of sensors that can be sensing means. So, Calderon was
6 intended to be sensor-specific. I'd also posit that a strain gauge isn't a -- isn't
7 the special type of sensing means that Calderon may have had in mind.

8 JUDGE JUNG: And I do think that's -- in Calderon, about the
9 special purpose sensor to be explaining an advantage -- maybe it's not a
10 teaching away, but it is an advantage. And if I had to -- if I viewed them
11 that way, it seems I need a little extra from the motivation to combine to get
12 over any disadvantages that the addition of a strain gauge would add in view
13 of that advantage of Calderon.

14 MR. GRISWOLD: So --

15 JUDGE JUNG: But you've explained that.

16 MR. GRISWOLD: I agree. We're on the same page about it not
17 being a teaching away. It doesn't say absolutely don't do this. It says you
18 could do it without having to have a special-purpose sensing means. So, it's
19 an advantage of that combination. And as we've explained, there's reasons
20 to use a strain gauge. But to need an additional motivation to combine to
21 overcome that teaching, I think, is inconsistent with the disclosure of
22 Calderon that advances both using a sensing means or using the current on
23 the servo drive.

24 So, we don't have to prove that it's the better alternative of the two,
25 although I think, as we've discussed, we think it's the better alternative of the

1 two, and we think Dr. Wolfe has explained why it's the better alternative of
2 the two. But Calderon teaches using a sensing means to sense contact of the
3 tip. And so, whether you take account of that sentence, that additional
4 sentence or not, the motivation, the level of motivation should be the same.

5 JUDGE JUNG: Thank you.

6 MR. GRISWOLD: I think that is what I wanted to say on
7 motivation to combine with respect to using the strain gauge on the extruder
8 mount. I'm going to jump around on two slides really quickly because I
9 think the remaining discussion benefits from an understanding of what the
10 claims mean. So, I think if we go to Slide 117, let me find my notes on that.

11 And the difference between the '698 and '381 claims is significant,
12 and you've observed this. One is detecting the current contact force, and the
13 other is a controller configured to calculate the contact force. I don't think
14 there's any dispute on what it means to calculate the contact force. I haven't
15 seen any discussion in the record on that. But I do think the Patent Owner is
16 applying some special meaning that they haven't articulated to the phrase
17 detecting the current contact force.

18 And why I think this is, in the Calderon Grounds, I think there's no
19 dispute that the strain gauge in the combination -- once you assume there's a
20 combination made -- detects force. And the dispute is really over whether
21 that force that it's detecting is the contact force. In Warren, as my colleague,
22 Mr. Gupta, will talk about a little bit more, the dispute is whether sensing
23 contact by a system that senses a change in amplitude that's proportional to
24 force is detecting the contact force.

25 And then, given that a strain gauge and this change in amplitude

1 are both proxies for force, I'm not really sure why one is and one isn't
2 detecting contact force. And I want to make some observations about the
3 plain language of the claim. And this, I hope, will help you understand our
4 position, which has been consistent from the Petition.

5 So, by the plain language of the claim, the sensor doesn't have to
6 be a sensor that you can calculate contact force from. And this is with
7 respect to the '698 claims. There's nothing in the claim that talks about
8 calculating contact force. The claim just doesn't say that. The sensor need
9 only be configured to detect a contact force.

10 And sometimes, I feel like an example or an analogy is a little bit
11 easier to understand, at least get my point across. I think of like a push-
12 button switch, for example. When you press on the switch, the switch closes
13 and it transmits power, and you take your finger off the switch and it opens
14 and it breaks the circuit. The push-button switch can detect a current contact
15 force because it's able to detect when there is force applied to the push
16 button, and when the push button is released, there's no contact force and it's
17 not detecting the contact force.

18 And so, I think that the sensor need only be able to make this
19 binary determination -- have I detected a contact force or have I not detected
20 a contact force. It doesn't need to measure the magnitude. We don't see the
21 word magnitude of the contact force in the claim. I think maybe some of the
22 interpretation that the Patent Owner is advancing on this term maybe
23 suggests that the sensor detects only the contact force, and we'll discuss that
24 in a little bit. Only doesn't appear in the claim either. The claim simply
25 requires detecting the contact force, where the contact force is the force that

1 the sensor in the previous limitation is configured to detect. That's all --

2 JUDGE REN: Can we pause here?

3 MR. GRISWOLD: Yes.

4 JUDGE REN: Can we pause here? Because I think we lost Judge
5 Ogden.

6 USHER: Stand by.

7 JUDGE REN: Okay.

8 MR. GRISWOLD: He's just frozen.

9 JUDGE REN: I actually don't see you on my screen. Okay, here
10 we go.

11 MR. GRISWOLD: Judge Ogden, did you catch all that? Should I
12 back up a bit?

13 JUDGE OGDEN: I'm not sure how far you proceeded after I got
14 disconnected, but I believe you were discussing the construction of detecting
15 a current contact force.

16 MR. GRISWOLD: I'll tell you the punchline and you can ask me
17 to back up. The punchline is that detecting the current contact force, it
18 doesn't require detecting the magnitude of the force. It doesn't require
19 detecting force in a manner that you can calculate force. It doesn't require
20 detecting only the current contact force. The language of the claim requires
21 only detecting the contact force, where the contact force is the force that the
22 sensor in the previous limitation is configured to detect.

23 JUDGE OGDEN: Okay, that's good. I'll look at the record and
24 make sure that I've got everything that was discussed. Thank you.

25 MR. GRISWOLD: Okay. We've gone through a lot of my slides.

1 I want to make sure that I give my colleague, Mr. Gupta, the time to argue.
2 Quickly, to Slide 157. So, Dr. Wolfe testifies about this testimony, or about
3 this post in the RepRap forum that a POSITA would understand Wade's
4 suggestion of constantly measuring force, acting on the extrusion head,
5 including its weight, to be detecting contact, by sensing when the weight of
6 the extrusion head, carried by the extrusion head mounting, is reduced by
7 contact with the nozzle to the substrate. So, in other words, you have a force
8 that's acting on the extrusion head and that reduces the weight. So,
9 therefore, detecting that reduction in weight is detecting contact force.

10 And I'm going to move on quickly to the motivations for
11 calculating force, and this will take us back to Slide 145. I think it's pretty
12 clear that RepRap is at least suggesting calculating force by its mention of
13 measurement of the force and words like weight. And you can see that in
14 the posts on Slide 145. On Slide 146, Dr. Wolfe -- I'm not going to do 146.
15 Let's get down into the more interesting points.

16 So, Slide 149, one of the motivations relates to basically not
17 damaging the nozzle and not damaging the substrate. And to have that
18 conversation, we need to understand generally how Calderon's initialization
19 works. And we've discussed it a little bit before, but I'll hit it really quickly.
20 Again, the initialization involves moving the substrate up to contact the
21 nozzle tip, and that determines the relationship between the substrate and the
22 nozzle tip, and that's a calibration step that's used subsequently.

23 And so, Dr. Wolfe explains in this passage here on the left that
24 control of the contact force between the nozzle and substrate during
25 initialization to prevent damaging the substrate, you would control the

1 contact to prevent damaging the substrate, especially with low compression
2 strength foam substrates, and to prevent damaging the nozzle.

3 So, there's two reasons to do it. And I think it's also important to
4 appreciate that he says, especially with low compression strength substrates,
5 not only with. So, you wouldn't want to damage a hard substrate, as well.
6 That's relevant because Patent Owner, I think, says, well, that's inconsistent
7 with Calderon's teaching that sometimes you do want to damage the
8 substrate, but that was a special case that in certain types of foam, you would
9 sink the nozzle beneath the top surface of the foam.

10 So, Dr. Wolfe says that the controller would be programmed with a
11 maximum contact pressure either coded into the software or input by user
12 that was related to the compression strength of the substrate and the nozzle,
13 right? Because you're moving the substrate up, you have to stop it at some
14 point, and you want to stop it before you damage either the substrate or the
15 nozzle.

16 So, in Slide 150, Dr. Wolfe testifies that calculating the force is
17 obvious because it would facilitate programming the controller or a user
18 setting a set point because of the setting a set point to a maximum contact
19 pressure. Because that contact pressure and compression strength are both
20 in units of force per area, and so you would have the units in the same
21 number. Otherwise, you'd have to do some calculation and work way back
22 to, for example, a strain gauge or a servo drive current, and that correlation,
23 which is certainly doable when you're writing software, but a user wouldn't
24 be able to do that. And as you may appreciate, Calderon discusses different
25 substrates, so you need to put in different compression strengths. Right,

1 depending on the substrate that you're using.

2 JUDGE JUNG: Do you really need to calculate the force per unit
3 area? Can't you just look for a specific reading from the strain gauge? Like,
4 if I reach this particular output from the strain gauge, I could stop the
5 substrate from moving up?

6 MR. GRISWOLD: I don't think that you would know whether
7 you're about to damage the -- you'd have to know -- the person programming
8 it or inputting that number would have to know the correlation between the
9 strength of the substrate. So, for example, the foam substrate that has the
10 instance of wanting to press the nozzle through the top surface of it.
11 Ignoring that aspect of it, I would have to know that correlation between the
12 sensor strain and when I'm going to pierce the top surface of that very soft
13 substrate. And then I'd have to know it for steel when I'm using steel, or I
14 have to use -- when I use plastic, right? And so, while I can look up in the
15 back of a textbook the compression strength of my material, I can't look up
16 that strain gauge value because it requires a calculation.

17 JUDGE JUNG: Or it could already be pre-programmed, right?
18 Instead of programming in an algorithm to calculate the force, you just
19 program in various set points from the strain gauge for various materials.

20 MR. GRISWOLD: Somebody would have to do that when they
21 wrote the software. And so, it's an additional step. A little bit more
22 difficult. Also, in another motivation that's discussed here, is simply
23 expressing the units to a user and user-friendly units. Everybody thinks in
24 force. That's why the discussion with Wade was talking in force. I don't
25 think in terms of displacement when I'm really interested to know whether

1 my part is going to fail.

2 There is a mathematical relationship, but I don't want to have to do
3 that math. I know what the strength -- the compression strength is per unit
4 area, and I just want to control to that. And that compression strength, of
5 course, is very simple math to get to the force.

6 JUDGE JUNG: Still kind of stuck on it. It still seems just as easy
7 to just look for a particular strain gauge reading, and then display that as
8 force. I'd actually have to go through the extra step of calculating the force
9 and then displaying the calculated force value.

10 MR. GRISWOLD: You just said it though, look at a strain gauge
11 reading and express it as force, right?

12 JUDGE JUNG: Yeah, but that's not a calculation. It's just --

13 MR. GRISWOLD: It --

14 JUDGE JUNG: -- I'm looking for a particular deflection and that
15 corresponds to -- this is just off the top of my head --

16 MR. GRISWOLD: Yeah.

17 JUDGE JUNG: -- but let's say --

18 MR. GRISWOLD: But that corresponds, so you --

19 JUDGE JUNG: One millimeter of deflection on a strain gauge is
20 equal to 10 newtons, let's say.

21 MR. GRISWOLD: But that's not always the case. It depends on
22 the --

23 JUDGE JUNG: Right.

24 MR. GRISWOLD: -- material that you're contacting, right?

25 JUDGE JUNG: Yeah. Right. But let's just say, in the most

1 simplest example, one millimeter equals 10 newtons of force. I didn't have
2 to calculate it. I just looked for 1 millimeter deflection on the strain gauge,
3 and then I display that as 10 newtons of force. It might not be true, but that's
4 all the user needs is 10 newtons.

5 MR. GRISWOLD: Wouldn't it be easier to have that calibration
6 table already built into your software and the user says, I have steel and the
7 compression strength of steel is so many KSI. They input it in and then no
8 one has to do the math, or the guy who's programming it, he's told, here is
9 the correlation, code this into the software to calculate contact force. There
10 are advantages, I think. If you're ready to move on --

11 JUDGE JUNG: Yes.

12 MR. GRISWOLD: -- I just want to discuss a couple of the
13 individual limitations really quick, and then I want to cede my time to my
14 colleague. I planned to use 45 minutes, and we're well past it. '698,
15 limitation 1A, is whether the Petition shows that Calderon teaches build
16 instructions -- identifying build instructions. And I think if you trace
17 through that, there's a file that has the volume elements and it explains that
18 those volume elements correspond to shapes that can be extruded.

19 This is Slide 153. There's another portion that I think Patent
20 Owner -- of the Calderon that Patent Owner ignores that's also cited in that
21 explanation in the Petition. And that's the passage at the left that describes,
22 you have design data that's provided from a CAD, which is a mathematical
23 description of a physical part to be created. It's split into layers. Those
24 layers are individually shaped and applied to produce the final part.

25 So, that's describing the correlation from the CAD file, the slicer,

1 all the way to the printed part. And then immediately following the
2 paragraph the parties have been discussing -- well, let me also say there's
3 little doubt that Calderon identifies build instructions because it builds a
4 three-dimensional part. But immediately after the paragraph the parties are
5 discussing, there is a -- the very next sentence after mentioning the volume
6 elements, it says an electronic controller 116 in response to receiving three-
7 dimensional shape data from the processor 108 over line 114 -- if you'd like
8 to follow along, I can give you the location of the Petition it is -- I can give
9 you the cite in Calderon. This is 434, column 4, line 34.

10 JUDGE JUNG: Thank you.

11 MR. GRISWOLD: So, the controller, in response to receiving the
12 three-dimensional shape data from the processor 108 over line 114, controls
13 the extrusion of modeling materials so that beads of modeling material are
14 extruded layer by layer in a pattern defined by the volume elements. So, I
15 think perhaps Patent Owner is looking for G-code. I'm not sure that
16 Calderon uses G-code. These volume elements are the thing that defined the
17 print. Those are print instructions. And just to finish out the independent
18 claims, this is '698, element 1D, Slide 158.

19 The control signal that they say is not disclosed is part and parcel
20 of the implementation of the collision detection, where Wade says it would
21 shut the printer down when you detected a collision. I mean, it also makes
22 no sense to have a system that has a sensor that senses force and then does
23 nothing with it. So, with that, I'm going to give my time to my colleague,
24 Mr. Gupta, unless you have other questions.

25 JUDGE JUNG: I have no questions.

1 MR. GRISWOLD: Thank you.

2 MR. GUPTA: Good afternoon, Your Honors.

3 JUDGE JUNG: Hello, Mr. Gupta.

4 MR. GUPTA: My name is Rishi Gupta. I'm going to go over the
5 Warren Grounds with you. Judge Ogden, can you hear me if I talk like this?

6 JUDGE OGDEN: Yes, I can hear you. Thank you.

7 MR. GUPTA: Okay. I think I have just about 30 minutes, so I'm
8 going to try to go fast.

9 JUDGE JUNG: Oh, just one clarification.

10 MR. GUPTA: Oh.

11 JUDGE JUNG: This clock is counting down from 90 minutes, so
12 you have --

13 MR. GUPTA: Yes.

14 JUDGE JUNG: -- 32, plus 15.

15 MR. GUPTA: Plus 15. We were going to reserve some of that for
16 rebuttal, so --

17 JUDGE JUNG: I assumed 15 minutes would have been rebuttal.

18 MR. GUPTA: So, I'll try to go fast, though. So, we can start at
19 Slide Number 12, and I'm going to give you a quick background of Warren.
20 So, Warren is prior art publication, directed to a 3D printer that includes a
21 fabrication tool that can have one or more dispensers for depositing material
22 onto a substrate. Warren describes different types of dispensers, and we'll
23 get into that after this introduction.

24 The sections of Warren that we're really interested in here, it's
25 about 35 paragraphs out of a several hundred paragraph long disclosure,

1 starts at paragraph 0283, and it's a section titled, 'System and Method for
2 Controlling the Position of One or More Elements of a Dispensing System
3 Using Force feedback.' That's just for your reference. That's the portion of
4 Warren that we're going to be basically living in for this talk.

5 So, looking at Slide 12, this is the intro portions of Warren.
6 Warren starts off this section by first recognizing that for proper deposition,
7 and this is a paraphrase, but it's something of a quote: Some knowledge is
8 required of the intensity of the contact force between the dispenser and the
9 substrate. Warren goes on to say in that same paragraph -- excuse me, it's
10 paragraph 285 -- that improper prediction of the intensity of this force may
11 result in the destruction of the dispenser and the substrate. Later on in
12 Warren's introduction, Warren directs its disclosure to a system that
13 accurately determines the intensity of the contact force so the system can
14 maintain a desired contact force.

15 So, that's the context that starts off this discussion of this force
16 feedback section by expressing this desire for the intensity of the contact
17 force so that it can control dispenser, maintain a desired contact force for
18 proper deposition, and then also safeguard the dispenser and the substrate
19 from destruction. So, with that quick introduction to Warren, I think we can
20 turn to Slide 13.

21 Just very briefly, we can see on Slide 13, Figure 18 on the left-
22 hand side of the slide gives you a generic representation of the structure that
23 Warren is using to implement its force feedback system. Figure 18, we have
24 a Dispenser 3700 that has the vibro-sensing sensor in it. I'm going to call it
25 a vibro-sensor, if that's okay. That's kind of what Warren uses. And in Slide

1 14, there's a discussion of what Warren is doing from a procedural
2 standpoint, and a little bit of an explanation of why it's doing it.

3 Essentially, what Warren is going to do with its sensor is it's going
4 to detect a change in the amplitude of the vibration that the transducer is
5 imparting onto the system. And that change in amplitude is proportional to
6 the contact force. So, what Warren explains is, in previous systems, you
7 may use the resonant frequency shift in order to detect a contact force, but
8 often you may not actually see a resonant frequency shift when contact
9 occurs.

10 JUDGE JUNG: Um-hum.

11 MR. GUPTA: So, a better mechanism is to use the change in
12 amplitude. And what it says is that amplitude is invariably altered when
13 contact occurs. So, essentially, it's saying, look, if you see a change in
14 amplitude, you know that there's contact. Or if you have contact, you see a
15 change in amplitude, there's more contact, or maybe you've lost contact. So,
16 this change in amplitude is directly related to this idea of detecting or
17 sensing the contact force. I was going to jump around a little bit to Slide 40,
18 just to continue the introduction, but -- actually we can go to Slide 40.

19 JUDGE JUNG: That's fine. Do you have a slide for your
20 proposed modification of Warren with the through-nozzle design? Because
21 I'd like to ask a question about that.

22 MR. GUPTA: Sure. Yeah, we can do that. I do. Slide 26 is
23 where I begin that discussion.

24 JUDGE JUNG: Okay. So, just to confirm my understanding of
25 your argument, you don't really need this modification for Claim 1 of either

1 patent, the '698 or '381, because --

2 MR. GUPTA: That's right.

3 JUDGE JUNG: -- you have an extruder and you have a sensor. It
4 meets all the claim limitations. But once you get down to the dependent
5 claim, that's when you need this modification of the two nozzle design with
6 the vibro-sensor. Is that correct?

7 MR. GUPTA: That's partially correct. For Claims 1 of '698 and
8 '381, the capillary vibro-sensor meets the limitation. In fact, in my truncated
9 spiel, I was just going to bypass this particular embodiment, or this
10 particular combination.

11 JUDGE JUNG: Um-hum.

12 MR. GUPTA: It's true that for the Warren solo ground for the
13 dependent claim, there's a desire to have a linear actuator, which is part of
14 the through-nozzle design. And so, to the extent that we want to have a
15 discussion of that specific claim, Claim 9, then yes, we would need to also
16 discuss the through-nozzle design and its combination with the sensor. But
17 there's also a combination with another reference Eshed that also captures
18 the same claim, Claim 9. And so, to the extent that we're only relying on the
19 capillary sensor, the combination would work for the dependent claims. So,
20 it's a yes and no. Yeah, it depends on which ground that you're going to rely
21 on, and --

22 JUDGE JUNG: And theoretically, Patent Owner could prevail on
23 this issue and you would still prevail on claim 1 of both patents.

24 MR. GUPTA: Correct.

25 JUDGE JUNG: Okay. Now, this question is specific to the 532 or

1 the '381 patent. It's about calculating --

2 MR. GUPTA: Uh-huh.

3 JUDGE JUNG: -- contact force. All right. So, I read this portion
4 of Warren where you cited, where you gave us an introduction, and it seems
5 like it repeatedly, throughout the paragraphs, it talks about looking at just
6 specifically at vibration, the change in vibration amplitude, to adjust the
7 position of the dispenser to reach the desired force. There's no mention of
8 calculating the contact force itself. It just uses that change in the vibration
9 amplitude as a proxy or a substitute, or something in place of actually
10 calculating the contact force. So, I know your argument is split up into two
11 parts, like it would have been understood that there is a calculation of
12 contact force, but I think there's some issues with that.

13 MR. GUPTA: Sure.

14 JUDGE JUNG: Because of the repetition throughout Warren
15 about this reference to the change in the vibration amplitude. So, I'd like
16 you to concentrate on the obvious, your alternative obviousness theory. It
17 would have been obvious to calculate the contact force given what Warren
18 gives you. With all that in mind, why do you actually need to calculate
19 contact force when Warren itself teaches repeatedly throughout paragraphs
20 200 to 300 something, that you can use the change in vibration amplitude as
21 a proxy for the contact force?

22 MR. GUPTA: So, first of all, we hearken back to what Warren
23 says originally, which is that the improper prediction of the contact force is
24 -- it could lead to disasters. So, already there's a motivation to move away
25 from things that are proxies, that are essentially predictions, to actually

1 having the values that you want to use. The other thing that we focus on in
2 our argument is because you're controlling to a specific desired force, it
3 makes more sense to convert whatever that proxy value is, whether it's
4 frequency or amplitude, into the actual force number so that you can make a
5 real-world comparison. This is the argument we talk about with the
6 domains.

7 JUDGE JUNG: Um-hum.

8 MR. GUPTA: You're desiring a specific force for the operation of
9 your system. You're not working towards a specific amplitude, you're
10 working for a specific force. And so, it makes more sense to take the values
11 that you get from the sensor, convert it into a force, and now you can make a
12 comparison that's practical and easier to handle when you're doing your
13 computations.

14 JUDGE JUNG: It's easier for the user, but for Warren itself
15 -- Warren's device itself -- it doesn't need to do that extra step. All it is, it's
16 looking for a particular change in the amplitude of the vibration, and that's it.
17 It works off of just that. It's --

18 MR. GUPTA: Well, I think that's what it's sensing. I don't know
19 if it's true that it just works off of that. I think the reason you see the words
20 delta, Delta A, a lot, is because it's trying to distinguish between use of Delta
21 A and use of frequency. There's a section in Warren that talks about why
22 you would not use frequency. And I suspect that what Warren was trying to
23 do is differentiate itself from other systems that used frequency.

24 So, by repeatedly saying Delta A and change in amplitude, I think
25 they were trying to present themselves as something that was distinguishable

1 from other systems. And part of the reason that they do that is because
2 they're trying to say that the frequency is just not as good. Using frequency
3 is not as good, so let's use Delta A. It's based on Delta A. There's other
4 portions of Warren that we discuss in our slides where, like, for example, in
5 the claims -- the claims actually talk about obtaining a contact force to a
6 specific micronewton level.

7 So, there's other portions that take it a step further than you're
8 suggesting. It's not just Delta A. And I think we can piggyback off of
9 something that you discussed with Mr. Griswold, which is that for any given
10 system -- so we recognize that Warren teaches lots of different
11 implementations of its system and lots of different uses of its system,
12 whether it be biologic or mechanical, or even electrical. Just using Delta A
13 doesn't give you enough information to know whether or not you're going to
14 be able to preserve the integrity of your dispenser or your system. So,
15 getting the force is a better value.

16 JUDGE JUNG: I would take issue with that because Warren itself
17 seems to teach that it is enough. It's enough to just measure the change in
18 amplitude, find whether or not you've actually reached the desired force or
19 not. You don't have to actually calculate the force. You just need to look at
20 a particular change in the amplitude of vibration. And then if it drops too
21 far, you've gone past your desired force.

22 MR. GUPTA: Yeah.

23 JUDGE JUNG: If it's still less than a specific value, then you're
24 still within a good window for contact force.

25 MR. GUPTA: Yeah, I don't know how that would work if you

1 have lots of different types of dispensers and different types of substrates
2 and different types of systems. But what Warren does say is that it's
3 interested in the accurate determination of the intensity of the contact force.
4 And intensity is more than just some proxy value. It's a magnitude of the
5 force. So, while it does use --

6 JUDGE JUNG: I agree, it does say that.

7 MR. GUPTA: -- Delta A, it --

8 JUDGE JUNG: -- but it uses amplitude instead.

9 MR. GUPTA: Yeah.

10 JUDGE JUNG: It looks specifically at the change --

11 MR. GUPTA: Sure.

12 JUDGE JUNG: -- in amplitude.

13 MR. GUPTA: It is sensing the change in amplitude, as opposed to
14 frequency. Yes, that's true.

15 JUDGE JUNG: To see if it's at or exceeded the desired force.

16 MR. GUPTA: Sure. Okay.

17 JUDGE JUNG: So, I still don't see a need to actually calculate the
18 contact force. If you're specifically looking for a specific value of the
19 change in the amplitude of the vibration, why go the extra step of actually
20 calculating the force?

21 MR. GUPTA: Well, I mean, I think that that's what we articulated
22 in our obviousness combination is all we've said. The domain change is
23 important. The accuracy of your calculations are important. The setpoint
24 values to ease of computations are important. And those are reasons why
25 you would do it. And I think the accuracy is really the best reason.

1 The other reason is that Warren talks about micronewtons of force.
2 I don't really know how you would go from Delta A to having any
3 knowledge of micronewtons without having done a conversion. At least
4 somewhere, there needs to be some -- and it's not that they know it's
5 micronewtons of force. It's precision of micronewtons of force. So, they're
6 able to know to that level of precision the force of their system.

7 JUDGE JUNG: Is it because Warren itself says -- the two are
8 proportional -- the change in amplitude is proportional to the force. So, if
9 you have a micronewton force, if that's what you're looking for. You're
10 looking for a small change in the change in amplitude, in the vibration.

11 MR. GUPTA: Well, precision is a measure of how accurate you
12 are, right? So, they're talking about 10 to the minus sixth, one millionth of a
13 newton of precision. I mean, that sounds to me like they're at least
14 suggesting a calculation, or at least some correlation between the Delta A
15 and the --

16 JUDGE JUNG: Why exactly does that suggest a calculation?

17 MR. GUPTA: Because it's in units of force. They're in units of
18 force. How else would you know that you're that precise without having at
19 least done a correlation?

20 JUDGE JUNG: Because the two are proportional?

21 MR. GUPTA: Yes. Proportional is a mathematical relationship,
22 right? A equals -- Y equals AX plus B.

23 JUDGE JUNG: If those two components are proportional, we
24 don't have to calculate the second component, right? You can just look at
25 the first part. In this case, it would be the change in amplitude. You don't

1 have to calculate through a proportionality factor to figure out the exact
2 force. You can just look at how much has my vibration amplitude changed,
3 and then that's it.

4 MR. GUPTA: I think at some point, you would have had to do it.
5 So, for example, when you're comparing your values to your desired force, I
6 think at some point, there has to have been at least a correlative step where
7 the change in amplitude for your system has been correlated to a change -- to
8 a force.

9 So, then you can go back and say, okay, well, now I've detected
10 this change in amplitude, I know that it's representative of this force because
11 I've at least done this before, and that's actually what Dr. Oswald says. He
12 says, hey, you can go -- you can measure these things experimentally and
13 you can calibrate your system. You don't need to know anything about
14 Young's modulus, you don't need to know that, you can just go do it
15 experimentally. But once you've done that, there needs to be some kind of
16 catalog of those values so that when you are operating your system, you can
17 go back and say, okay, hey, if this is the Delta A you get, then it's fine. But
18 at some point, that force was calculated.

19 JUDGE JUNG: Okay.

20 MR. GUPTA: Yeah.

21 JUDGE JUNG: Actually, I want to move on.

22 MR. GUPTA: Sure, yeah.

23 JUDGE JUNG: This is an interesting discussion, but yes, for
24 -- let's see, the '698 patent, the 531 IPR, Claims 10 and 11, those dependent
25 claims require determining planarity, in so many words. And according to

1 your expert, planarity is the flatness of the substrate on the build platform,
2 but I looked at the portions you've cited in Warren, and it seems like all it's
3 really doing is just measuring Z heights. There is no additional -- for
4 example, let's say two Z heights are taken and then compared to see whether
5 there is a flatness of the substrate on the build platform. If there's no -- your
6 citations to the record only seems to show that Z height is measured, not
7 planarity is measured or determined.

8 MR. GUPTA: So, I think that goes to what does it mean to
9 measure the planarity in -- because I think your characterization of Warren is
10 correct. What it's doing is it's going to continuously measure the Z height, as
11 it's moving along in its deposition. And for every measurement it takes, it
12 knows whether or not it's on the same plane or on a different plane, or it has
13 to move. There's another portion of Warren that's not in our briefing, but I
14 can refer to it.

15 I think it is -- let me see. Maybe it's Slide 100. Yeah, Slide 100.
16 Another claim. Another claim of Warren, which says that the system
17 controls the position of at least one element of the dispensing system for
18 mapping the surface of at least one substrate prior to dispensing. So, again,
19 maybe not planarity, but it's definitely getting values across the surface.
20 And if we think about whether or not it's getting this Z height measurement,
21 it also talks about the conformal surfaces.

22 JUDGE JUNG: Um-hum.

23 MR. GUPTA: So, the mapping of the surface with the conformal
24 surfaces -- I mean, we would say that that's at least a disclosure that it's
25 determining the planarity.

1 JUDGE OGDEN: Counsel, is there a difference between making a
2 detection or determination from which you could infer a planarity and
3 actually detecting the planarity itself?

4 MR. GUPTA: I'm sorry. Could you ask that question one more
5 time?

6 JUDGE OGDEN: Yeah, let me rephrase it. Claim 10 in the '698
7 patent says detecting a planarity. So, is there a difference between detecting
8 a planarity and detecting something from which the planarity could be
9 derived, such as you know, some combination of multiple Z distances?

10 MR. GUPTA: I'm not sure I've considered that.

11 JUDGE OGDEN: Because, I mean, it seems like Claim 10
12 requires a detection of something which is called planarity, and that sounds
13 like some sort of a two-dimensional concept, and I don't think we have any
14 proposed construction -- explicit construction -- for that word, but it seems
15 like a two-dimensional idea, planarity.

16 MR. GUPTA: Yes.

17 JUDGE OGDEN: Whereas Warren seems to just detect a bunch of
18 one-dimensional measurements, and perhaps, it's fair to say that someone
19 could go in and infer from those measurements whether or not the surface is
20 planar or not, but that may not be actually part of the method. That may be
21 something that somebody else could do, but I'm not sure that Warren
22 discloses necessarily that that is done in Warren, unless you can direct me to
23 a particular disclosure there.

24 MR. GUPTA: I think that that might go to the disclosure that I
25 was just mentioning. On Slide 100, where it talks about mapping the surface

1 before you start printing. So, that -- so if we think about what the procedure
2 of Warren is, before you start printing anything -- I'm sorry, not printing, but
3 dispensing -- prior to dispensing, you can use this system that controls the
4 position of the element of the dispensing system, which includes the force
5 feedback, to map the substrate, map the surface of at least one substrate.

6 And so that, to me, that claim sounds like the disclosure that you're
7 looking for as far as using this force feedback system on the dispenser,
8 getting these Z heights that you're talking about, but then doing it for a
9 specific reason of mapping the substrate. So, that would be that two-
10 dimensional aspect that you're asking --

11 JUDGE OGDEN: I'm sorry. You're pointing to your Slide 100?

12 MR. GUPTA: Yeah, there's two claims on that slide.

13 JUDGE OGDEN: Okay, I see. You're referring to Claim 63?

14 MR. GUPTA: Yes, I'm sorry. Yes, 63 and 74, which depend from
15 Claims 54, and then whatever the other one is.

16 JUDGE OGDEN: Okay. And so, your position is that that would
17 refer to a two-dimensional mapping of the surface --

18 MR. GUPTA: That's right.

19 JUDGE OGDEN: -- which would indicate whether or not it's
20 planar or non-planar.

21 MR. GUPTA: Right. At least this would link the usage of the
22 dispenser to a two-dimensional construction, right? Because mapping the
23 surface wouldn't just involve -- well, I guess it could just involve a one-
24 dimensional line, but it's talking about the entire surface there.

25 JUDGE OGDEN: Okay. Thank you.

1 MR. GUPTA: Yes, sir.

2 JUDGE JUNG: Okay. Thank you. Moving on to Claim 12 of the
3 '698 patent.

4 MR. GUPTA: So, I'll preview that. We may rest on the briefing
5 on Claim 12.

6 JUDGE JUNG: Okay.

7 MR. GUPTA: Because, yeah, we were going to focus on the other
8 claims.

9 JUDGE JUNG: Okay. Just one question.

10 MR. GUPTA: Okay.

11 JUDGE JUNG: Is it your position that Warren's build instruction
12 includes a specified force?

13 MR. GRISWOLD: Yes.

14 JUDGE JUNG: How does it do that?

15 MR. GUPTA: So, in Warren, paragraph 313, it talks about
16 comparing what you -- the detected force to a desired value, and then
17 maintains the force --

18 JUDGE JUNG: Where --

19 MR. GUPTA: -- to the desired values. So --

20 JUDGE JUNG: Where does that desired -- and you think that
21 desired value comes from the build instructions?

22 MR. GUPTA: Yes. Yeah, I think so, because you would have
23 -- depending on what your build is, you may have different road widths, road
24 heights. You may have different materials you're implementing, and the Z
25 height is dependent entirely on that build instruction. So, maintaining the

1 contact force is really important, and that would be built into the build
2 instruction.

3 JUDGE JUNG: Yeah, I could push back a little bit because in my
4 mind you have like a CAD/CAM file that provides the geometry that goes to
5 a slicer and cuts up the file so it can be formed on the 3D printer. And then
6 the 3D printer in Warren would look for desired contact for. So, it's not
7 coming from the build instruction. It's something that is happening while it's
8 being built. Correct?

9 MR. GUPTA: So, the way I would see it is there is a build
10 instruction that has the CAD file and the slices and all that. In the build
11 instruction, you may have to change the road width, the dimensions of your
12 build for each plane, each layer. Even within the layer, you may have to
13 change the dimensions of your build. Those parameters -- the width, the
14 height of each road that you're laying down, is dependent on the distance
15 from the Z height, as well as other parameters, like the speed that you're
16 dispensing and all these other things.

17 What you're dispensing is also dependent. So, if you have a multi-
18 material dispense, you may have to change your Z height based on that, too.
19 So, the build instruction may set those values and say, look, you need to be
20 this far away when you're doing this, or whatever. Yes. And so, when the
21 system is working, it senses the values and then controls the values to those
22 heights during the build. So, I think that's how that would work.

23 JUDGE JUNG: Is your position that Warren discloses or teaches
24 that the build instructions include the specified force, or is it your position
25 that it would have been obvious to include a specified force?

1 MR. GUPTA: Well, I'll go look at the record real quick for you.
2 We're in the '698, right?

3 JUDGE JUNG: Yes.

4 MR. GUPTA: This way I'm not lying to you about something.

5 JUDGE JUNG: I read it as a teaching, not an obviousness theory.

6 MR. GUPTA: Yeah, I think that would be what we're saying.

7 JUDGE JUNG: Okay.

8 MR. GUPTA: It's the teaching.

9 JUDGE JUNG: All right. Thank you, Mr. Gupta. I have no other
10 questions.

11 MR. GUPTA: Okay.

12 JUDGE JUNG: Is there anything else you want to address in your
13 prepared remarks?

14 MR. GUPTA: I think that the big issues for us were the
15 calculating force. I do want to talk about sensing force. '698 talks about
16 detecting and we talked about calculating, but in Warren, we talked about
17 how the Delta A is -- you used the word proxy for it -- but as soon as it -- the
18 way that Warren works, as soon as it detects a change in amplitude, it can
19 detect the presence of a contact, which is detecting the contact force. So,
20 that's one thing I wanted to talk about.

21 We also have a small module on the Eshed combination where this
22 is specifically for Claim 9, because I know you mentioned Claim 9, starting
23 on Slide 103. Eshed is a secondary reference that we are combining with
24 Warren. One of the things that we talked about with Warren is how it uses
25 its force feedback system to avoid destruction of the dispenser and all that.

1 What Warren doesn't say is what happens if there is a collision, an unwanted
2 collision? And that motivates a POSITA to seek out a solution to that
3 problem.

4 And what we argue here is that Eshed solves that problem. In
5 Eshed, when it detects a collision, it just stops production. It stops the feed
6 rate. So, that combination sort of can be combined with the capillary
7 dispenser that we talked about earlier, without having to rely on the linear
8 actuators that would be used for the through-nozzle system. All you have to
9 do is turn off your feed rate and sound an alarm. And that's what Eshed is
10 teaching you to do if you detect a collision, and those collisions can be
11 detected by Warren's force feedback system. So, yeah, I mean, I think I've
12 gotten through all the things that I wanted to say, so I'll pass the microphone
13 now, and then we'll reserve the balance of the time for the rebuttal.

14 JUDGE JUNG: Thank you, Mr. Gupta.

15 MR. GUPTA: Okay, thank you.

16 JUDGE REN: Mr. Gupta, I have a question --

17 MR. GUPTA: Oh, yes.

18 JUDGE REN: -- for the -- for what you just presented. Why
19 would a skilled artisan look to Eshed when Warren already avoids damages?

20 MR. GUPTA: Yeah, that's a good question, and that's something
21 that I was hoping to address in the slides. So, Warren avoids the collision,
22 avoids the destruction, but in the real world, sometimes you can't avoid that.
23 So, what happens with Warren if it does have a collision? It doesn't say.
24 There's a gap there. Just practically speaking, Warren doesn't say what to do
25 if there is one.

1 In a perfect world, yes, you would avoid all the collisions all the
2 time, but that's just not the reality. So, what do you do if there is a collision?
3 Well, Eshed solves that gap by saying, okay, we're going to just shut off and
4 then back away and sound the alarm. And it's really that simple for Eshed's
5 combination. The claim doesn't require any kind of linkages to the contact.
6 It's just really just about the feed rate. So, what do you do? You just turn
7 off the feed rate.

8 JUDGE REN: But that didn't come from Warren --

9 MR. GUPTA: Right.

10 JUDGE REN: -- the reference itself. It's essentially, you're
11 arguing that this avoidance to damage is not 100 percent, and therefore, you
12 need Eshed.

13 MR. GUPTA: Well, I mean, Eshed is providing the motivation
14 itself because it's talking about the collisions that occur. So, you're right,
15 Warren doesn't, but the idea that collisions occur is known in the prior art,
16 and Eshed is evidence of that knowledge.

17 JUDGE REN: And Warren itself doesn't say, oh what I teach here
18 doesn't avoid damage 100 percent of the time, be careful.

19 MR. GUPTA: I think, at best, what it's talking about is back on
20 Slide 12, where it just says improper prediction of the intensity of the
21 contact force may result in either destruction of the dispenser or the
22 substrate. So, may result in that. It doesn't say that you're going to always
23 avoid it. It doesn't say that you're always going to crash it, but I think this
24 actually goes back to the original point about calculating. The improper
25 prediction can result in more damage, so it's better to get the force so you're

1 not making that improper prediction. But to the extent that there is still
2 some problems with the system, it could certainly still crash. That's
3 paragraph 0285 where it talks about the crash. Okay.

4 JUDGE REN: Thank you.

5 MR. GUPTA: Thank you.

6 JUDGE JUNG: Now you have 18 minutes left for rebuttal. The
7 panel needs to take a short break. So, let's see. What do we have? I have,
8 1:31 on my watch. We'll start up again at 1:40, 20 minutes of.

9 MR. OAKS: Twenty or nine?

10 JUDGE JUNG: Twenty minutes before the hour.

11 MR. OAKS: So --

12 JUDGE JUNG: 1:40.

13 (Whereupon, the above-entitled matter went off the record at 1:31
14 p.m. and resumed at 1:40 p.m.)

15 JUDGE JUNG: Mr. Kapadia, how much time would you like to
16 reserve for rebuttal?

17 MR. KAPADIA: Let's reserve 10. Or actually let's do 15 of the
18 90. If we go into it a little bit, that'd be okay. And I'm going to address the
19 first ground, and my colleague, Mr. Oaks, will address the second ground.

20 JUDGE JUNG: I see. Okay. Are you ready, Mr. Kapadia?

21 MR. KAPADIA: Yes.

22 JUDGE JUNG: Okay. Please proceed.

23 MR. KAPADIA: Thank you, Your Honors. I would like to start
24 with the Warren combination, and specifically, the fact that there's no
25 motivation to combine. I'm on Slide 12. So, what we have here is an

1 excerpt of the Petition, and it says that a POSITA would have found it
2 obvious to use the vibrating force sensor concepts with Warren's through-
3 nozzle dispenser. That's the first excerpt. The second one is very similar.

4 The Petition presented four rationales. The first one is about
5 Warren's invitation to use vibrating force sensor concepts. Our Patent
6 Owner Response details this, but kind of briefly here, Warren doesn't invite
7 this. What it says is that its dispenser in Figure 18 isn't limited to the
8 specific implementations of Figures 19, 20A, and 20B. And in fact, Figure
9 18 shows a different implementation. It has a quill pen design that's
10 different than Figures 20A and 20B. The way that the sensors and the
11 dispensers are set up is different.

12 Figures 23A through 20C, those show dispenser with multiple
13 designs. I think those have three capillary dispensers, or three -- yeah, three
14 capillary on the right-hand side of Figure 20A, and then Figure 23A, and on
15 the left-hand side is a through-nozzle design. So, this is on Slide 15.

16 The second rationale is no motivation, or the rationale presented
17 was a motivation for precise control if you use a through-nozzle design.
18 There isn't such a motivation. Actually, Warren says the capillary dispenser
19 is used for more precise deposition control, and says the through-nozzle, use
20 it for essentially less -- when you want less detail, you can use the through-
21 nozzle. So, switching to the through-nozzle doesn't actually improve the
22 precision. It actually takes it a step backward relative to the capillary
23 dispenser, and that makes sense, given Warren's explanation.

24 So, Warren explains -- and this is on Slide 18 -- paragraph 279 of
25 Warren explains capillary dispensers rely on surface tension, so it's kind of

1 like a pen. If you're not touching the surface, the capillary dispenser can't
2 work properly, so it has to be precise. And that goes for the whole system
3 that's designed. So, for example, capillary dispensers have to have precision
4 linear bearings so that you can achieve constant repeatable and accurate
5 positioning. That's part of the whole construction of a capillary dispenser.

6 And so, there's really no reason to use a through-nozzle design for
7 more precision. Petitioner seems to think that we're saying the through-
8 nozzle design lacks precision. That's not the issue here. The issue is what's
9 the motivation for taking an embodiment of Warren and changing something
10 in it. Well, that embodiment of Warren has the capillary design. And so,
11 what matters is, is one more precise than the other? Is a through-nozzle
12 dispenser more precise than the capillary? It isn't. And so, that's what
13 Warren tells us, and so there isn't a motivation, at least on that basis.

14 So, the third reason is the use of a linear actuator. So, the proposal
15 is to use a linear actuator from the through-nozzle design for, I guess, the
16 dispensing system. And again, there's not a motivation here to use a linear
17 actuator. And the reason why is they point to, as support for why you would
18 do this -- they point to a teaching in Warren that you have this combination
19 tool. They never explain why this somehow meets this rationale. And when
20 you look at Warren, the combination tool is not replacing one with the other,
21 combining aspects of one with the other. It's actually one big tool that has
22 different parts to it.

23 So, we talked about Figure 23A. To me, these are similar. I think
24 these are in vitro, these examples here, but I've color-coded this on Slide 22,
25 some of these examples, and they're all separate tools. They're not

1 combining aspects of them. They're just saying, I can have one design
2 where I have a combination tool that uses all of these, and it makes sense. A
3 lot of them have very different purposes.

4 Some of them are simple in terms of conceptually material
5 dispensers, but then they have things like therapeutic emitters, stabilization
6 devices, et cetera. So, Warren isn't teaching that you combine aspects of
7 these devices. So, that leaves us with their last rationale that a POSITA
8 would have recognized the benefits of providing the through-nozzle
9 dispenser with this vibrating design, and they provide -- and this is listed on
10 Slide 23 -- three different reasons for that. Avoiding damage, controlling
11 -- control of the deposition geometry, and overcoming issues related to
12 agglomeration intersticking.

13 So, the first thing related to -- I guess this is really the first and the
14 second one, is a control over deposition geometry and avoiding damages.
15 Well, the rationale is really in the combination. This is really an aside. For
16 this rationale, it's actually backwards. It's saying you're going to start with a
17 through-nozzle dispenser and then apply the force sensor configuration. So,
18 it's a little bit different approach to the rest of how they've presented the
19 rationales.

20 But even under this one, the through-nozzle design already
21 facilitates control over the deposition geometry and avoids damage, and
22 there are descriptions in Warren about how it's precise, how it has control.
23 So, for instance, it can achieve one to two micrometers of accuracy, and
24 nanometer accuracy can be achieved -- this is on Slide 25 -- with the
25 through-nozzle design, without the vibrating sensor, nanometer accuracy

1 with linear encoders and linear stages for control.

2 So, Warren already provides that control, and there's no reason to
3 then adapt that for the vibrating sensor solution to get more accuracy. Other
4 dispensers, unlike the through-nozzle dispenser -- and we talked about
5 capillary dispensers before -- they have specific needs for vibration
6 solutions. So, the capillary design is like a pen. The quill pen is more
7 directly like a pen because the quill design has to have that precise control
8 on the positioning.

9 So, how far are you above the substrate? Warren tells you that you
10 have to be very close for the quill pen design. So, again, there's no reason
11 why you would go from the through-nozzle design and then adapt the
12 vibrating sensor solutions that are focused on these other types of designs.
13 Lastly, the issues with agglomeration and sticking -- that actually doesn't
14 have to do with through-nozzle dispensers at all. It has to do with the quill
15 pen design or an ink design. And even if it were an issue, Warren gives you
16 the solution, you vibrate it at a low frequency. So, it wouldn't be a
17 motivation to go from, say, one implementation to another, or to change one
18 implementation to another.

19 So, the Petitioner's Reply doesn't really address these issues. I
20 didn't hear them really address them in detail today. They assert two things.
21 The first thing is that, oh our Petition advanced two combinations. One is
22 the through-nozzle and the other is the capillary design. We'll talk about
23 that. And then the second one is that they point to Warren's claims for the
24 motivation to combine. We'll also talk about that one in turn.

25 So, first, with the combination, here, this is Slide 29. These are

1 excerpts from the Petition. The combinations, reason to combine, and
2 expectations of success. So, the combination that the Petitioner chose to
3 present is that a -- and I'm quoting it here -- a POSITA would have been
4 motivated to apply Warren's through-nozzle dispenser, and then it has a
5 description of those figures, for instance, as Dispenser 3700 and Warren's
6 vibrating force sensor configuration.

7 A very similar explanation occurs at the end of their section.
8 That's the second excerpt on Slide 29. Warren's vibrating force sensor
9 configuration using force feedback bolstered by the beneficial aspects of the
10 through-nozzle dispenser. That's what gives you the reasonable expectation
11 of success. That's their assertion in the Petition. So, the Petition makes it
12 very clear that we are trying to replace the aspects of the vibrating
13 configuration, such as a through-nozzle -- or such as a capillary with the
14 through-nozzle. That's the design we're seeking to have a motivation to
15 combine, a reasonable expectation of success.

16 It didn't say anywhere in here that we are asserting two
17 combinations or two separate theories. It said the combination, and this is
18 the combination for the ground. So, when they talk about we are only
19 relying on the capillary design, the capillary design might be relevant to the
20 discussion because it relates to vibrating capabilities, but with respect to the
21 combination, the combination is with the through-nozzle design. So, if
22 there's no motivation to combine, there's no combination here, and so
23 obviously they can't meet their burden for obviousness.

24 Several Federal Circuit cases mention this. I'm not going to go
25 through them. *Wasica* is one of them, but they're required in their Petition to

1 put forth both, their combination and the evidence, and point out how the
2 evidence relates to it. So, in my view, they did that for the combination, but
3 that is the combination that they chose to present.

4 Okay. So, the second issue is with respect to Warren's claims. So,
5 they point out in their Reply to Warren's claims, this was not a motivation to
6 combine in the Petition. So, I'm just level setting here. This is on Slide 34.
7 The claims were not identified in the Petition. They didn't explain how the
8 claims provide a motivation to combine. They resorted to the claims in the
9 Reply, and they said, look, these claims show you can have a motivation to
10 combine. Well, when you look at the claims, they're entirely consistent with
11 not combining one aspect of one embodiment with the other.

12 When you look at the spec of Warren and try to line up, okay, what
13 is going on with these claims, they're referring to this -- I think, this tabletop
14 dispenser in Warren. And Warren includes separate tool designs within this
15 one combination tool -- this tabletop dispenser. The vibration solution, as
16 Warren teaches you, can be used with the capillary designs. And you can
17 also have a through-nozzle design, and that would certainly work with this
18 claim because you have a vibration imparting device. This is in Claim 54,
19 and it imparts a vibration for at least one dispenser. So, it can impart that
20 vibration to the capillary design.

21 And then in the same dispenser in Claim 59, you can have a
22 through-nozzle design. That's exactly what Figure 23A is showing you. So,
23 the notion that these claims somehow support taking one piece of an
24 embodiment and replacing with another, it doesn't really match what
25 Warren's teachings are when you consider these claims are part of the

1 integrated document.

2 All right. So, then I want to talk about detecting and calculating a
3 contact force. And I know there is some discussion about, well, what is the
4 difference? I think given the way Petitioner presented their Petition with
5 respect to Warren, I don't know if there's a distinction that they've made
6 here. And the reason why is when they were talking about detecting a
7 contact force for the '698 patent -- this is for that claim element -- they start
8 talking about here's what Warren says, and then this is an excerpt on Slide
9 36. This is from their Petition.

10 It says, a POSITA would have understood or found it obvious that
11 the contact force can be readily calculated. And the hook for that is
12 important here. Their hook is that they relied on Warren's disclosure of
13 proportionality. We talked about that earlier today. So, that proportionality
14 was their hook to say, you know what, we can calculate the contact force.
15 So, they tie the detecting claim language to the calculating claim language.
16 Whether the claim requires calculating or not, at least for this Warren
17 ground, what Petitioner has decided to present is one view, if you think
18 about the two different IPR proceedings. One view of how Warren meets
19 the claim elements.

20 And so, what Warren is presenting here is -- or what Petitioner is
21 presenting here is that we think that it detects the contact force because it
22 calculates the contact force. They also explain why, by the way. It's not
23 highlighted here on the slide, but it's in the very next sentence. And that is,
24 they compare Warren's design to what's disclosed in the patent. The patent
25 does say that you can sense something, and then as long as the contact forces

1 -- and I'm paraphrasing here because the full quote from the patent is not
2 here on the slide -- as long as the contact forces may be calculated from the
3 sense physical characteristics.

4 So, they're saying, we know we're detecting a contact -- this is their
5 assertion -- we know we're detecting a contact force because we can
6 calculate one from Warren. That's what Warren's telling us. So, that's their
7 assertion here with Warren. And so, we're going to talk about what Warren
8 teaches, and we're going to look at many of the same paragraphs but with an
9 understanding, maybe some of the different paragraphs than what Petitioner
10 had discussed.

11 So, as I think was mentioned earlier, Warren repeatedly talks about
12 detecting a change in amplitude of vibration. It's not exactly clear what
13 Warren is sensing. What Warren says is you either get the amplitude or you
14 get a change in amplitude, but that itself is not the feedback signal, for
15 instance. You have to amplify that and then feed that back.

16 And so, when Warren is talking about the desired force of contact,
17 I think that's in several paragraphs of Warren, what Warren is teaching is
18 that I am looking at the change in amplitude. I'm looking for that. And he
19 tells you why. He tells you others looked at the change in frequency. The
20 change in frequency is not reliable. So, anyone else who's looking at change
21 in frequency, they have the wrong solution. The right solution is the change
22 in amplitude. And we'll talk about why he believed that to be the case.

23 So, he senses and transfers a changed vibration signal. This is on
24 Slide 37. And that feedback signal is then used to control the position of the
25 dispenser. The result is that they can maintain a desired contact force, but

1 Warren never says that I am detecting that contact force. He never says that
2 I'm calculating it. So, there might be some relationship between the two.
3 He says there's proportionality, but there's no detection or calculation of that
4 contact force. So, and this is also the --

5 JUDGE REN: Can you maintain a desired contact force without
6 detecting it?

7 MR. KAPADIA: Yeah, yeah. So, yes, you can, Judge Ren. So,
8 this is on Slide -- I'm going to jump ahead and then come back. This is on
9 Slide 49. So, Warren tells you not just how do you get to contact, Warren
10 also tells you what are you trying to achieve. And in paragraph 312 of
11 Warren, this is on Slide 49 again, Warren tells you what you're trying to
12 achieve is that the amplitude of the feedback signal is maintained at a
13 constant level. So, to me, that means there's no change in amplitude.

14 So, Warren is telling you exactly how to get contact, that is a
15 change in amplitude, and what you're trying to maintain, which is no change
16 in amplitude. And that's also why I think it's a little confusing. It took me a
17 little while to think about how Warren is disclosing this because it's a little
18 confusing because yes, the change in amplitude might be -- might
19 correspond -- what does he say -- proportional to the force. And yet here,
20 you have no change in amplitude, and I don't know what sort of force that is
21 proportionate to. He doesn't explain what that means. And I think that
22 makes sense because his solution is to look at the amplitude. It's not to
23 detect or calculate a force. And yes, he may have figured out what that force
24 might be internally, maybe his research team did or something, but that's not
25 the method that he's teaching here. The method he's teaching is the change

1 in amplitude.

2 JUDGE OGDEN: Counsel, I am sort of -- as I'm thinking about
3 this, I'm wondering if this is anything like a situation where when you
4 measure temperature, you might do so with a mercury thermometer, right?
5 And you know that the temperature is proportional to the length in a mercury
6 thermometer. And so, you're really just measuring a length, but at the same
7 time, you're also effectively measuring a temperature because of that
8 proportionality relationship. Is that analogy applicable here?

9 MR. KAPADIA: I think to a limited extent, to where you're
10 sensing one unit or measure or characteristic, and then that relates to some
11 other characteristic. So, in the case of the thermometer, the -- I think you
12 had said that the distance that the mercury moves -- I know no one uses a
13 mercury thermometer anymore, but I remember this -- a mercury
14 thermometer, the distance the mercury moves is proportionate to the change
15 in temperature. So, Warren tells you that the change in amplitude is
16 proportionate to the force, but there's a distinction here. Not just in terms of
17 what the thermometer is determining -- or sorry, detecting or calculating, but
18 there's also a distinction in terms of, if you think of a thermometer, if there's
19 no change in the distance, then you would assume, okay, well, this room is
20 room temperature. There's no change over the course of today's hearing.
21 And so, it's the same temperature. There's no temperature change.

22 Whereas with Warren, there's a change in amplitude that's
23 proportionate to force, and yet Warren's goal is to have no change in
24 amplitude. That's the steady state of his -- that's his system working the way
25 he expects it to. That gets him his solution where I'm not going to

1 accidentally run into the substrate and damage it because I am maintaining
2 that perfect -- to use the capillary design, that kind of perfect contact
3 between the capillary and the surface. So, I don't think they're exactly the
4 same, and this is probably because Warren's system is a little bit more
5 complex.

6 JUDGE OGDEN: Okay, thank you.

7 MR. KAPADIA: So --

8 JUDGE REN: So, I have a follow-up question. You were saying
9 that Warren's solution is actually to measure the change in amplitude, but I
10 don't know that I agree with that 100 percent. Isn't the goal in Warren to
11 figure out what this contact force is? And this amplitude signal is a tool
12 through which the contact force is essentially indicated. So, it seems to me
13 that it is trying to get to the question of what kind of contact force we have,
14 and the tool we use is to use the amplitude.

15 MR. KAPADIA: So, Warren doesn't describe the amplitude -- the
16 change in amplitude, as a tool, but I think it is the way that Warren is
17 teaching that you're able to get a system that achieves his intended goal. So,
18 the first goal is, how do I get -- how do I understand that I've had contact.
19 Why? Because some of these designs, like a capillary design, need it. They
20 don't work unless you're very close to contacting or essentially contacting.
21 So, that's one reason.

22 The other thing is, once I have achieved contact, how do I stay
23 there? Because I need this system to work not just once, but I need it to stay
24 in that position. Well, I need no change in amplitude. I need a constant
25 amplitude. So, that's what Warren tells us. And he does tell you that this

1 achieves contact force, my desired contact force. And he tells you that the
2 amplitude is proportionate to force. He doesn't say that I am detecting the
3 contact force. He doesn't say I'm calculating the contact force.

4 And so that is the distinction between I think Warren's teachings
5 and this analogy of Warren's goals and just a mere tool or embodiment of
6 achieving those goals. So, and this kind of dovetails reasonably well with
7 the proportionality issue. So, on Slide 41, for instance, is a plot of Warren.
8 This is Figure 21 of Warren. You won't see this on Petitioner's slides, and I
9 think I know why. When we asked Dr. Wolfe about this figure, and this
10 testimony related to this is cited in our Patent Owner Response, which is
11 -- the particular portions are cited on Slide 41. Dr. Wolfe didn't understand
12 what Figure 21 was. He was confused about what is the third signal in
13 Figure 21.

14 What this figure shows us is essentially the signals behind
15 Warren's solution. So, the first signal is -- actually, let me back up before
16 that. Let's start with the units. Arbitrary frequency units on the X-axis,
17 arbitrary vibration signal amplitude in the Y-axis. The first signal is before
18 contact, the second one is after contact, and the third one is actually a change
19 in the signal after contact. And I think Dr. Oswald explained this well. The
20 x30 means it was amplified by 30 times.

21 So, this is not what you would normally see out of the sensor. It's
22 an amplification of it. We talked about why that's necessary in Warren's
23 solution. So, you have the change in amplitude that's shown by the third
24 signal. And so, you don't know the particular units because you have
25 arbitrary units here, but this tells you why he's looking at the amplitude,

1 because the amplitude gives you the response you need, whereas with prior
2 solutions that use that frequency, the change in frequency, you wouldn't
3 necessarily see the change in frequency when you have contact. So, that's
4 what he's demonstrating here.

5 And so, there's also descriptions on Slide 42 about the different
6 plots and how they interrelate. Warren suggests that you have to select a
7 frequency to measure the change in amplitude, and it's not exactly clear what
8 frequency, but he gives you some teachings related to that. And so, I do
9 want to touch on a point here on Slide 43, which is that the evidence on how
10 to convert -- so this goes to not just does Warren teach whether you're
11 detecting a concurrent contact force, but also would it have been obvious to
12 do so even if Warren doesn't teach it directly.

13 And so, there's some suggestion from Petitioner that, well, this is
14 -- everyone's been doing this. This is really easy. That's not the case. Dr.
15 Oswald provided -- and this is cited on Slide 43 -- several paragraphs
16 explaining why it is not straightforward with Warren's design. And his
17 conclusion is essentially that the change in amplitude indicates contact, not
18 that there was some quantitative contact force that's tied to a change in
19 amplitude that someone of skill in the art would understand there to be, and
20 so he walked through -- I think this is on other slides -- he walked through
21 some of the third kind of tertiary references not part of the combination that
22 Petitioner had cited to and explained why those are different than Warren's
23 solution. One of the key things with Warren's solution is the frequency. So,
24 we talked about how it's a vibrating solution.

25 When Dr. Oswald was deposed, he was asked about measuring

1 frequency generally and how do you figure out various variables. What is
2 missing from all that testimony, and it makes sense why Petitioner wouldn't
3 want to ask him about this, is that Dr. Oswald's declaration makes it very
4 clear that when I look at Warren's system, I don't know of any standard
5 tools, so that's lookups or experiments, that work for Warren's conditions.
6 Warren has, I think, a frequency somewhere around 90 -- I don't know if it
7 was hertz or kilohertz, but this is on Slide 45.

8 So, Warren's particular solution puts it in a different category, and
9 it very well could be the case that the inventors of Warren knew what the
10 proportionality was specifically. The question though is, would someone of
11 skill in the art know what it is? That's the standard, right? We all know that
12 inventors can be much, much more skilled than someone of skill in the art,
13 and all Warren says is proportional. So, Warren doesn't say detect contact
14 force, doesn't say calculate. This isn't an enablement issue. This is, if we
15 take Petitioner's theory, does Warren teach it? And is there a reasonable
16 expectation of success? We have testimony from Dr. Oswald that it
17 wouldn't work with Warren's system.

18 Now, I do want to address the issue about precision in
19 micronewtons. There's some suggestion that the precision micronewtons
20 tells us that we are detecting a contact force or calculating a contact force.
21 That's not the case. It's very clear from Warren's disclosure that his whole
22 system achieves this high precision.

23 So, we talked about the capillary design. There are precision linear
24 motors. There are bearings that have to be precise. There are all sorts of
25 things that have to be precise. On Slide 46, there's a laundry list of things

1 from Warren that are cited that relate to precision. So, when Warren's
2 talking about precision, I think the best understanding of it is that when
3 Warren talks about proportionality, he somehow knows that it achieves this.
4 But the issue is, would you be able to detect a contact force or calculate it
5 with this sort of precision? Would someone of skill in the art be able to do
6 that based on Warren's teachings?

7 And there's nothing to tell us how to do that, and because of the
8 issues that Dr. Oswald identified, someone of skill wouldn't readily know
9 how to do this. So, what we have here is a situation where the reference tells
10 us to use a change in amplitude and tells us that gets to my desired contact
11 force, but it doesn't get Petitioner all the way to what they're trying to assert,
12 which is that I'm detecting the contact force itself, that I'm calculating the
13 contact force itself. And so, they have to resort to obviousness, and I think
14 the obviousness issue shows that the issues with a person of ordinary skill in
15 the art achieving contact force calculation shows the issues with that.

16 Now, Petitioner's Reply, this is Slide 47. They present a new
17 argument that force intensity is simply a magnitude component of the force
18 vector quantity that's measured in the micronewton precision. I think that
19 this has a flaw in it for the same reasons we've discussed, but it's also
20 something that I don't think they had discussed before with, like, force
21 intensity. Intensity is mentioned in Warren, but not magnitude components
22 in that you're using vector quantities.

23 I'm not saying that this is something that someone of skill in the art
24 wouldn't know how to do. What I'm saying is that Petitioner didn't say that
25 these things are measured in micronewton precision, and here's why

1 someone of skill in the art would be able to do it using Warren's system.
2 That's what we're missing here.

3 Petitioner also talks about necessity of detecting the -- or
4 calculating the contact force. I think our discussion about Warren looking at
5 the change in amplitude really highlights why it's not a necessity. It's also
6 the fact that Warren is trying to maintain a constant level of the amplitude
7 once you have contact. That's also why there's not a need for detecting or
8 converting to a contact force. We talked about the presumption of
9 enablement.

10 I think the last thing I want to touch on here is about -- there are
11 several assertions that Petitioner makes where the contact force can be
12 determined or can be calculated. I think *Belden*, several other Federal
13 Circuit cases, make it very clear that if we're talking about obviousness,
14 what could be done is not sufficient. There has to be a motivation for doing
15 something, and that's what's missing here. So, if there are no further
16 questions about Claim 1 with Warren, I want to turn to claims -- actually, a
17 set of claims across the two patents related to feed rate. So --

18 JUDGE REN: Do you think Warren teaches using the change in
19 amplitude to detect a change in the contact force?

20 MR. KAPADIA: I don't think Warren is detecting a change in the
21 contact force. The change in amplitude might be proportionate to a contact
22 force, as he says, but he doesn't say I'm detecting the contact force. He
23 doesn't use the contact force calculation, for instance, for anything. He
24 doesn't say, oh, I have a contact force of 15 micronewtons, that tells me I
25 have contact. He doesn't have that sort of teaching. What he says is, here's a

1 figure with the change in amplitude. The change in amplitude gives me the
2 information I need to have my solution work, and I know that change in
3 amplitude is proportional to the force.

4 So, with respect to Claims 3 and 9 of the '698 patent, and Claim 13
5 of the '381 patent, those -- they have a couple of issues. Each one of these
6 talks about feed rate in slightly different ways. But the first thing to
7 understand is that if there's no motivation to combine, because these require
8 the through-nozzle design, there cannot be obviousness finding for these
9 claims. But in addition to that, there's this assertion that there would be a
10 reason to use the linear actuator with the vibration sensing solution in
11 Warren. And so, I think it's instructive to explain why the operation of the
12 linear actuator isn't responsive to the contact force.

13 So, this is Slide 55, a brief kind of overview of what Warren is
14 teaching here. Warren has a distance invariant mode, and it has a volumetric
15 invariant mode, and then a combination approach where it's -- he switches at
16 a given point from one to another, a predetermined location. So, in the
17 distance invariant mode, the valve opens before you have motion, and then it
18 finishes opening over a set distance.

19 So, what Dr. Oswald tells us is that these are predetermined based
20 on toolpath instructions. It makes sense. You know the distance based on
21 the toolpath instructions. It's not based on contact force. The vibration
22 sensor solution conforms to the substrate. That's independent of replacing
23 Warren's teaching for valve positioning. They're not interrelated in that the
24 valve positioning isn't dependent on the contact force. In the invariant
25 mode, the valve position controls the amount of material dispensed per

1 second. That's the metric it uses. Well, that's based on distance and time, or
2 really change in distance and time expired. Again, not based on the contact
3 force. And because the combination method just switches between them at
4 predetermined locations, it's, again, not based on the contact force.

5 So, what we have here is a teaching about using the valve in a very
6 smart way. It just has nothing to do with being responsive to the contact
7 force. Now for Claim 13 of the '381, there's also not an explanation about
8 why the feed rate is responsive to the contact force. So, not only does the
9 reference not teach it, Petitioner didn't even explain it. The word contact
10 force isn't even described. And on Slide 56 -- this is an excerpt from part of
11 the Petition -- on page 35 of the Petition -- if you go to pages 36 to 38,
12 they're very similar descriptions, but those don't talk about a contact force.

13 Okay, now I'm going to move on to specified contact force or
14 expected contact force. This relates to Claims 5, 6, and 12 of the '698 and
15 Claim 11 of the '381. So, with respect to the measured contact force, I think
16 I'm -- I'll point out that based on our discussion, I think our position is very
17 clear about why Warren doesn't teach a measured contact force. But with
18 respect to Claim 12, it goes further because it has to have an instruction.

19 I read Warren several times over. I never saw an instruction in
20 Warren. I think what Petitioner is asserting is effectively hindsight here, that
21 if I look at the claims of the patent, then I know that someone with skill
22 would be able to do what the patent says, but not that the reference teaches
23 it, not that I presented a theory or rationale for having an instruction for the
24 specified contact force.

25 Okay. The other thing I want to mention with respect to the

1 specified contact force goes back to a paragraph of Warren that I mentioned
2 before. So, this is on Slide 61. So, Warren, at paragraph 312, says that I
3 want to position my Z-axis stage so that I affect the vibration of the
4 amplitude. So, it's a change in amplitude, and then the result is that the
5 amplitude of the feedback signal is maintained at a constant level. So, even
6 under this theory of calculating the contact force, doing so from the change
7 in amplitude, Warren's target is to have a constant amplitude. He wants to
8 have a steady state. So, that's the absence of a specified contact force.
9 That's saying I'm just maintaining whatever I had. And so, you have a
10 system here that just works differently, I think, than maybe what the patent
11 is describing.

12 Okay. The next two claims I want to discuss relate to planarity in
13 the '698 patent. It's Claims 10 and 11. So, Claim 10 detects planarity based
14 on a number of contact force measurements, and Warren teaches adjusting
15 the height of his dispenser at a given point. So, wherever I am right now,
16 I'm standing at the podium, if I'm Warren and I'm a capillary design, I'm
17 deciding what height should I be relative to the floor or whatever.

18 And so, he's not deciding planarity. There's two aspects here.
19 Planarity relates to a plane, and yes, planes are two-dimensional. But then
20 there's also this notion, the claim about being based on the number of contact
21 force measurements. Well, Warren is really deciding where his Z-axis is
22 based on a measurement at that point. So, he's going to measure the change
23 in amplitude, and then he knows he has contact. So, that's what he's looking
24 at. He's not doing a -- even the notion of a contact force measurement in
25 Warren is problematic because he doesn't measure a contact force.

1 But even if you look past the issue of measuring a contact force
2 versus calculating one or whatever, with respect to Claim 10, you have
3 another issue with being based on a number of contact force measurements.
4 Now, with respect to this claim, Petitioner makes two assertions. One is
5 during printing and one is before printing. So, during printing, we've
6 already discussed. Before printing, I think what Petitioner presented in their
7 Petition was Warren doesn't describe doing it before printing, but it would
8 be obvious to do so. That's what I -- this is on Slide 64. This is an excerpt
9 from the Petition. That's what they presented.

10 What they presented, though, was based on hindsight bias. They
11 didn't provide any rationale grounded in teachings of a reference of why to
12 do so. In fact, I don't even think they cited Warren. They cited to Exhibit
13 2007. Warren's Exhibit 2004. 2007 is a different exhibit, and Patent
14 Owner's Response did address that exhibit. But we had some discussion
15 today about Petitioner Slide 100, and that makes sense because what the
16 evidence that's on Petitioner Slide 100 -- I think there are some claims about
17 mapping.

18 If you look at the Petition, you won't find out any discussion of it.
19 If you look at the Reply, you won't find any discussion of it. If you look at
20 Dr. Wolfe, their expert's declaration, you won't find a discussion of it. What
21 you have here is a new argument that mapping equates to planarity being
22 presented for the first time in an oral argument hearing.

23 That's improper. There's no reason why Petitioner would -- should
24 be allowed to wait until this point in time to address what they believe to be
25 their obviousness argument for this claim. The other issue with it is, even if

1 you were to look at the mapping in that claim, there's no description in
2 Warren of what mapping means. I think we're all speculating about what
3 mapping means. We don't have expert testimony on it. We don't have any
4 proper consideration of it.

5 I did do a search of Warren in the few days before this hearing to
6 see what Warren says about mapping. He doesn't say anything else about it.
7 So, if you look at the specification, at least the search that I performed, I was
8 not able to find a discussion about what does this mapping mean. Is it
9 amount to detecting planarity, or we're talking about something two-
10 dimensional? Is it based on a number of measurements? What are we
11 talking about here? There's no discussion of it in Warren.

12 So, I think even if you were to accept that untimely argument and
13 the evidence they cited for that, the evidence itself doesn't meet the claim
14 limitation. It's insufficient. Okay. And then Slide -- I mentioned that they
15 cited to another reference, Exhibit 1007. That's Dunn. This is on Slide 65,
16 and Dunn doesn't really change the analysis either.

17 JUDGE OGDEN: Counsel, what do you think that the word
18 planarity means in the context of Claim 10?

19 MR. KAPADIA: So, I think planarity -- it may be useful to -- I
20 don't know if I have a slide on this. There is a discussion in the patent
21 related to detecting planarity. There's a separate embodiment. I think it's
22 Figure 6, if I'm not mistaken. And the way I understand planarity is that it's
23 twofold in terms of how it's discussed in the claim. One is that there is some
24 two-dimensional aspect to it because you're talking about planar.

25 So, for instance, if you -- not really in the sense of 3D printing, but

1 if you think of the earth and you have a crater that's formed by a meteorite,
2 then detecting planarity of, say, the surface proximate to the crater, would
3 indicate that it's not planar. Why? Because there's a 3,000 foot hole that
4 was developed by the meteorite. So, that's detecting planarity, for instance.
5 And then in the case of the claim, it has to be based on a number of contact
6 force measurements. So, you still have to have that detection be tied to the
7 measurements themselves.

8 So, I think that's the import of detecting planarity here. I think
9 there was some discussion in Petitioner's Reply about the degree of planarity
10 or level or something. I don't know if the claim requires a particular level.
11 It does require detecting planarity. And so, I think planarity is different in
12 the context of Warren. Planarity is different than saying, I am in one
13 position, at my given position, am I at the right height? And then Warren
14 might take a step forward and determine that at the next position, but Warren
15 isn't determining, for instance, do I have a crater? Actually, what Warren is
16 saying is, I just follow the surface. So, if there were a crater in my surface, I
17 just follow it. I'm not detecting that I have a crater. I'm not doing that. I'm
18 just following the surface. So, I think that's the distinction here.

19 JUDGE JUNG: Just to follow up. So, you agree with the
20 Petitioner's expert that planarity, for example, is flatness of the substrate
21 position on the build platform?

22 MR. KAPADIA: Flatness of the build substrate on the build
23 platform. So, I think it might depend on what flatness means. If you're
24 talking, does that require a certain level of degree. I think directionally, it
25 does describe that you have two-dimensionality to it. Assuming that that

1 opinion is tied to -- based on a number of measurements, then I think that it's
2 consistent with what the claim says.

3 But I will note that if you're talking about the flatness of a surface,
4 that's not what Warren is teaching. Warren doesn't care how flat the surface
5 is. In fact, I think Warren touts the benefits of a solution as saying, I work
6 with any surface, it's curved, it's regular, I don't care. That's the benefit of
7 my solution. So, I, again, I don't think he's detecting that the surface is flat,
8 for instance.

9 JUDGE JUNG: Oh yeah, and I just want to make clear that you
10 understand the Petitioner's position for this is that Warren detects something
11 that is not flat, therefore it detects planarity, a non-flatness.

12 MR. KAPADIA: I understand that's Petitioner's position, but at
13 the same time, Warren isn't detecting that it's not flat. He's just conforming
14 to the surface. If Warren had said, for instance, I have changed my height
15 by a certain amount, and now I know that the surface is curved with a radius
16 of X or something like that, might tell you that -- indicate that Warren is
17 teaching that he's detecting planarity, but Warren just says, I conform to it.
18 That's all he's saying.

19 JUDGE REN: Why does radius have to do with planarity?

20 MR. KAPADIA: I just --

21 JUDGE REN: Why does Warren have to -- okay.

22 MR. KAPADIA: Yeah, I just assume that if you have a surface
23 with maybe a crater with a particular radius with it, if it were a semicircular
24 crater or something like that. Again, I don't know what Dr. Wolfe meant by
25 flatness with respect to the -- say, the crater example that I'd come up with

1 today.

2 JUDGE REN: But you would agree that the lack of planarity will
3 involve some kind of height?

4 MR. KAPADIA: It might involve height. I don't know if there are
5 other ways to measure planarity.

6 JUDGE REN: Okay.

7 MR. KAPADIA: I don't know if that's your question, Judge Ren,
8 or not, of how you measure it.

9 JUDGE REN: Well, I'm just trying to figure out what your
10 position is on the fact that there's a height being measured, and therefore,
11 Petitioner's position is when you have a height, you can't be flat. Or I guess
12 when you have a difference in heights, the surface cannot be flat.

13 MR. KAPADIA: So, okay, so I see your question. So, I
14 understand your question. The first thing to understand is Warren is not
15 saying I'm teaching that I detect a difference in heights. He's not looking for
16 a difference in heights. He's looking for a change in the amplitude, and then
17 he does adjust the height of the, say, the capillary design based on that.

18 But the other piece of this is to understand, how does Warren's
19 solution work if you have a perfectly flat surface? Okay. In that scenario,
20 he still would -- Warren teaches you, you achieve contact and then you stick
21 with that surface the entire time. So, if that's what Warren is teaching, he's
22 not detecting planarity at all. In fact, in that solution, it's a surface that
23 doesn't have any irregularities, and he's operating exactly the same way. So,
24 I think in that circumstance, there's not a teaching from Warren that you're
25 detecting planarity. Okay. I see that I'm running short on time. I want to

1 give my colleague time to talk about the second ground. If there are no
2 further questions on any of the additional dependent claims, then I'll hand it
3 over to Mr. Oaks.

4 JUDGE JUNG: No questions.

5 MR. OAKS: Thank you, Your Honors. Brian Oaks for Patent
6 Owner, Stratasys. So, I'm going to take us back to where we started two and
7 a half hours ago, to the Warren -- I mean, to the Calderon Grounds, Grounds
8 -- both 2A in both of the Petitions. So, I'm on Slide 81. So, obviously the
9 first issue that we talked about all that time ago is whether this RepRap is
10 actually a printed publication that meets the requirements of public
11 accessibility.

12 So, as we talked about earlier, as you can see on Slide 81, this is a
13 printout from a forum. It's a post or a thread of posts on a forum, and it's in
14 a general forum on this RepRap website, and it's entitled Genetic
15 Algorithms. So, so far, nothing to do with collision detection, force
16 detection, anything that we've been talking about today in this patent. So,
17 the question is -- and I think Your Honor suggested this, and I would agree
18 -- that the question isn't, was RepRap Forum on the internet in 2009. That's
19 not what we're disputing. We're disputing this question, which is the *Blue*
20 *Calypso* question, which is, could a POSITA exercising reasonable
21 diligence, have located that? So, that's the question.

22 So, moving to Slide 83, let's look and see what they said in their
23 Reply about -- at least one of the theories about why a POSITA would find
24 it. I mean, if you see the highlighted portions, they're talking about
25 following a link. Well, where is that link? The link is in the patent, the two

1 patents that we're talking about invalidating. Okay, that's clearly not proper
2 to use the patent. That's not prior art as a starting point, right?

3 But even ignoring that, even if you were to get to the RepRap
4 forum as a hobbyist or user of 3D printers, there's no indication that you
5 would find that forum, that you would go to a general forum when you're
6 looking at -- if you were interested in collision detection, that you would go
7 there, or that you would look at a thread about genetic algorithms. There has
8 to be some connection. That if everything that was on the internet that has
9 been corralled and is searchable or publicly accessible, perhaps, but that's
10 not the law. There must be some reasoned approach. There must be a
11 reason that a POSITA would locate that.

12 And in fact, moving to Slide 84, Mr. Bowyer, their RepRap expert,
13 talked about there is a forum called Mechanics that talks about mechanical
14 stuff. We talked about things that you might expect, right? Perhaps if it had
15 been there, that would be a different question, but it wasn't located there. It's
16 located in another corner of the web in this genetic algorithm discussion in
17 the general forum.

18 The other question is, searchability. So, their other arguments is
19 well, there's keywords, you could find it. So, the *Blue Calypso* case also
20 tells us that just because something is technically accessible, it's possible to
21 find it using a keyword search, doesn't mean that it actually was publicly
22 accessible. What the standard is, is that you have to show why a POSITA
23 would have been using the search terms to find it and that the search would
24 actually have resulted in -- I mean, as Your Honor pointed out, they haven't
25 done that. There's no expert opinion on this. This is from the Reply on

1 Slide 86.

2 Simply, attorney hindsight provided keywords to say, hey, these
3 are keywords in the thread, you could search for those and find it. Well,
4 there's no evidence that a POSITA would have been using those keywords,
5 or that if the search engine actually works to find it. Nobody said that.
6 There's no evidence of that. Also, I'm going to move on to motivation to
7 combine. If there's any questions on public accessibility --

8 JUDGE OGDEN: I've got one question.

9 MR. OAKS: Yes.

10 JUDGE OGDEN: Going back to that issue of the link to the
11 RepRap form appearing on the face of the challenged patent, is there a
12 difference between -- I mean, obviously, we can't look to the teachings of
13 the challenged patent itself to -- in this proceeding as prior art. But is that
14 something different, though, than what's here? Whereas there's a link there
15 on the face of the patent. Maybe that's just evidence that the examiner was
16 able to find it.

17 MR. OAKS: Perhaps. Yeah. Now that you asked the question,
18 I'm not sure if that was an examiner cited reference or an applicant cited
19 reference.

20 JUDGE OGDEN: Yeah, I'm not sure either. But either way, I
21 mean, someone was able to find it for it to be listed on the face of that. So,
22 are we really prohibited from looking at that evidence in this proceeding?

23 MR. OAKS: I'm not suggesting you're prohibited from looking at
24 it. And just to be clear, I mean, that link is not to this particular genetic
25 algorithm thread that we're talking about. It's related to another relevant

1 -- whoever thought that was relevant to the art. But that isn't in the general
2 form, and it isn't titled with something, it has nothing to do about the subject
3 matter of these patents. So, that's the point, is like, yes, we're not denying
4 that that thread existed on the internet and the site, but we're saying it wasn't
5 in a place that a POSITA exercising reasonable diligence could have found
6 it.

7 JUDGE OGDEN: All right. Thank you.

8 JUDGE JUNG: One question. Does Patent Owner have any
9 dispute about this Board coming out in a different result as opposed to what
10 happened in IPR 2025-00321?

11 MR. OAKS: Well, I mean, we would have a dispute for all the
12 reasons we've argued in this case, but also as far as consistency, I agree that
13 it would be more consistent to -- it was a similar situation in which there was
14 an article on a website that was squirreled away in a corner of the internet,
15 right? Perhaps you could search for it, but they hadn't provided evidence of
16 how you would get there and why a person would be there. So, I do think it
17 would be consistent for you to find that the RepRap was not publicly
18 accessible.

19 JUDGE JUNG: But you do agree that the evidence and what we're
20 trying to find are slightly different, and that may --

21 MR. OAKS: I agree with that.

22 JUDGE JUNG: That may result in a different outcome.

23 MR. KAPADIA: It could, yeah.

24 MR. OAKS: I don't think it should, but it is different evidence.
25 It's a different website, but it's a similar situation that I think should result in

1 the same outcome.

2 JUDGE JUNG: Okay, I understand. Thank you.

3 MR. OAKS: Okay, so I'm on Slide 87, motivation to combine.

4 Okay, so what was the Petition's motivation theory? They made it quite
5 clear many, many times. This is an excerpt from the Petition, page 56. This
6 is actually the very last paragraph of the motivation to combine section, so
7 it's the conclusion. A very similar paragraph is at the very beginning. So,
8 before their enumerated rationales for combination, you'll find a similar
9 paragraph that says basically the same thing. And what that motivation,
10 what that combination is, is to go to Calderon, remove its monitoring of a
11 change in the servo drive current. And to replace that with RepRap's strain
12 gauge.

13 So, they were very clear, that's the combination. And so that's
14 what we addressed. The Petition's the name of the game. That's what
15 defines a trial. And so that's what we believe is relevant. So, with respect to
16 would you have done that, right? There was a lot of discussion about this
17 earlier. But again, as we said in our briefing, Calderon is a complete
18 solution. It says I want to determine -- when I contact the substrate or when
19 I contact a part, and here's how I'm going to do it. I'm going to monitor the
20 change in the current of the servo motor.

21 There's no reason to change that. There's nothing in Calderon that
22 says that's a bad solution. In fact, as was discussed earlier, it actually says,
23 hey, there's a benefit to this. You actually don't need to add another part.
24 You don't have to add some sort of sensing means. You can actually use the
25 servo motor and the monitoring of the drive current to do it. So, there's no

1 reason to change it unless, of course, you have hindsight and your job is to
2 try to invalidate a patent and go search the internet for things that may -- that
3 are in the claim that you've already seen. And so that's what we have to
4 guard against, or that's what Your Honors have to guard against. You're the
5 decisionmakers here.

6 On Slide 8, I think the Patent Owner discussed all these rationales,
7 so I would like to go through them. On Slide 90, this is one of their first
8 rationales is that well, the benefit of doing collision detection is that you can
9 stop the machine, stop the build if there's a problem. If you run into
10 something, you don't want to harm the machine, you stop the build. Well,
11 Calderon already says that. It says that -- here, I'm on Slide 90. It says if
12 there is a detection of contact, the machine stops the build and alerts the user
13 to clear the build envelope.

14 This particular excerpt is related to the initialization stage, as
15 Petitioner mentioned, but there's -- later, there's an excerpt. We discussed
16 this in the Patent Owner Response at page 49. There's later an excerpt in
17 Calderon, at Calderon column 10, lines 57 through 64. That excerpt says
18 you do this like when there's already a part, a partially built part on the
19 substrate. So, it's not just for initialization, it's also detecting if there's
20 contact with a part that's already in progress of being built, not a part that
21 was built in the previous job, which is what this excerpt was talking about.

22 So, the bottom line is Calderon has a solution already. It doesn't
23 need to be able to stop -- to have some modification to be able to stop when
24 it detects contact, it already talks about doing that. So, there's no motivation,
25 as Petitioners suggest, to add RepRap to do that.

1 Moving to Slide 92. This is about this slop backlash rationale that
2 the Petitioner provided. First of all, they talk about this word slop, but it's
3 not used in any reference. I think they use that as a synonym, but it's really
4 backlash that -- the RepRap reference that this Wade poster mentions, but
5 what he's talking about is with respect to these other types of sensing
6 devices, force sensors in some cases, that were mentioned in the RepRap
7 forum. They're just throwing out ideas, and he's talking about, hey, that has
8 a backlash problem. Okay, that has nothing to do with Calderon's
9 monitoring of a server drive current. There's no indication that that has any
10 backlash problems at all. So, that's kind of a hindsight created. Okay, now
11 we see Calderon, we're trying to combine these reference. Let's explain why
12 -- why would there be a problem? And there's just no indication in the
13 record or in the art at all that monitoring servo drive current has any kind of
14 backlash issue. And that's not what Wade was talking about in the RepRap
15 publication.

16 One of the reasons they say you would have this backlash problem,
17 there was some discussion of this earlier today, as they talk about there's an
18 extruder head. And you can see here on Slide 93, it's kind of a small figure,
19 but you've seen it before where the extruder head has this arm, and it's
20 actually this two or three piece arm before you actually get to the motor that
21 moves that extruder head. And that's what all the focus was. They're talking
22 about there's backlash in that.

23 Well, first of all, we don't know that that backlash affects a servo
24 drive current. It's a different kind of sensor than the force sensors in RepRap
25 that were subject to backlash. But the other point is what there's -- what it

1 talks about is there's also a Z-axis translator, which I've highlighted here in
2 this figure. And as Petitioner's counsel mentioned, in the Z-axis, it's the
3 platform itself that's moving, and so that Z-axis servo motor is right there
4 driving that platform. It also could detect the contact. When the tip hits the
5 platform, there's contact. So, it detects directly that that platform's contact
6 with the extruder, there's no backlash there. There's no arm or anything like
7 that in that chain of events. So, there's no backlash issue there either.

8 Moving to Slide 94, the Petitioners and Petitioner experts say, well
9 strain gauges would be more accurate and consistent, but they -- there's no
10 evidence provided for this. They just say that it's so. And again, there's no
11 indication in Calderon that there's any problem with using servo drive
12 current for determining contact. And it's important to understand that what
13 Calderon's trying to do is determining contact. Calderon never says it
14 measures a force, it detects a force. In fact, most of it's talking about this
15 plunger. And the plunger, all it's detecting is the plunger moves up and
16 down, it trips a sensor like an optical sensor, and it knows, okay, there's been
17 contact. But that's certainly not any kind of force sensor.

18 So, even if there were some sort of less accuracy of servo -- of a
19 servo drive motor monitoring, which there's no evidence that there is, does it
20 even matter for Calderon? Calderon is just detecting contact. It's not trying
21 to detect like in Warren some micro-Newton precision or anything like that.
22 There's no reason to change Calderon as Petitioners have suggested.

23 And finally, there's this argument on Slide 95 about damage that,
24 well, you want this more precise monitoring so that you prevent damage.
25 Well, none of the references talk about damage. Calderon doesn't talk about

1 it. RepRap doesn't talk about it. And in fact, Calderon actually talks about
2 in some instances is you do want to actually go into and in fact damage the
3 substrate. When you have a foam substrate, you're actually printing into the
4 substrate. So, there's no reason that you would be trying not to damage that
5 substrate. So, again, that's a kind of -- it's a hindsight-created reason for this
6 combination.

7 In Reply, and I'm not sure if they were going there here today, but
8 they seem to want to run away from the servo drive motor concept. But
9 that's what they talk about in their Petition over and over again. Petitioner's
10 counsel pointed out that right before that sentence, it says, well you use a
11 sensing means, and then it gives the example of what you would do. And
12 so, it's not -- they talk about that as two different ways of doing it. It says
13 generally, you could detect contact using a sensing means, and then it says in
14 the next sentence how you could do that. And it's that next sentence that
15 they, over and over, talk about is how -- what they're using in their
16 combination, what the modification is being done.

17 Okay, I'm going to skip over this. I think we've kind of covered
18 this. This was also noted in Petitioner's argument, but of course, Calderon
19 says when you use this servo drive motor current monitoring, you don't need
20 to have any other kind of special purpose sensing means. So, it's an
21 advantage that it's talking about. Maybe it's not a teaching away, but
22 certainly is discouraging a motivation to take something else out of the blue
23 and put it into Calderon's already functioning system. Okay, I think we've
24 covered all this. Are there any other questions on the motivation to
25 combine? If not, I'm going to move on to the claim elements.

1 JUDGE JUNG: I have no questions.

2 MR. OAKS: Okay, I'm on Slide 103. I first want to briefly talk
3 about claim Element 1A of the '698 patent. This one's not in the '381
4 patent. So, in that limitations, identifying build instructions for fabricating
5 an object. And the point here is what they -- what the Petitioner points to,
6 and you can see on Slide 104, for build instructions, they point to two
7 different things.

8 Well, they're both related to this model. There's a file describing
9 the geometry of part 109 to be created that includes Volume Elements 110.
10 And then on Slide 105, they also talk about that that file has a mathematical
11 description of the part and that it could be split into layers. So, you do have
12 a part and it is like defined by layers, but there's no explanation that that's a
13 build instruction. There's no instructions to the machine about how it would
14 move the extruder, with what materials, and in what position and what order
15 to actually print this part. So, they've kind of skipped that step. They
16 haven't shown actual build instructions.

17 Moving to Slide 107, I'm going to address kind of the meat of the
18 claim that we've been talking about today, which is detecting the contact
19 force and calculating a contact force in the two different patents. So, let's
20 look at -- I'm on Slide 108. So, again, RepRap is -- it's a thread of multiple
21 different people posting in this forum. And in fact, when you print it out, at
22 least in this IPR, it's 23 pages. So, it's not until you get to even like halfway
23 through, they're talking about genetic algorithms, nothing to do with
24 collision detection, force detection.

25 Finally, basically someone changes the subject, right? And they

1 first start pointing to posts, starting it on page 13 of the printout. And so,
2 this particular post is -- they point to it, but it's not really, I think, what they
3 ultimately rely upon, or maybe it's a portion of it. But this post mentions
4 that, hey, you could put a strain gauge on the extruder mount. So, this is
5 kind of the genesis of their combination, but there's no discussion here of
6 determining force using that strain gauge. Page 19, here we have a different
7 user that's saying, hey, maybe we should use a different sensor than that.
8 This is a force sensor, but it's not the strain gauge. It's this IESP-12 force
9 sensor, which is like -- I looked it up -- it's a pressure transducers. It's a
10 different way of measuring force.

11 But even that same person says, well, it doesn't look like it would
12 work very well. So, you got this back and forth. And then there's another
13 person on page 20 that says, hey, I have this totally different idea. Let's use
14 measuring contact force for a stencil cutting blade or a drawing pen. Again,
15 that's not what's in the combination, but people are throwing out these ideas,
16 people are shooting down ideas.

17 And then finally, at the bottom is the portion where they actually
18 think this is Wade's portion of the post where he comes back and says, well,
19 how about we use the strain gauge? I'm thinking of using a constant
20 measurement of force on the head including its weight. At least he said that
21 would be useful. Well, okay, that does say measurement of force. I'll give
22 him that, but it doesn't really talk about measuring contact force, and there's
23 this confusion about you're measuring the weight of the head, what does that
24 mean, how would that work, and the Petition didn't explain how that could
25 be used to calculate a contact force.

1 In the Reply, they mentioned this post on page 19 of the thread that
2 talked about measuring upward pressure. But again, this is hodgepodge.
3 This measuring upward pressure was related to not the strain gauge that
4 Wade was suggesting, but this IESP-12 force sensor, which is not part of
5 their proposed combination. So, I'm going to move to some of the
6 dependent claims. Are there any further questions on Claims 1? Okay. I
7 think I'm going to -- I don't believe we talked about this in the Petitioner's
8 presentation, so I'm going to skip Claim 4 and rest on the briefing on that
9 one, unless Your Honors have any questions.

10 JUDGE JUNG: No, no questions.

11 MR. OAKS: This thing is a little laggy. I'm sorry. Okay, I want
12 to talk about Claims 5 and 7, and I'm on Slide 117. Petitioner also didn't talk
13 about these claims, but it's relevant because I'm going to eventually talk
14 about Claim 12 of the '698 patent and Claim 11 of the '381 patent, which
15 are related. So, what do Claims 5 and 7 teach? Well, Claim 5 teaches that
16 you compare the current contact force to an expected contact force. And
17 then Claim 7, which depends on that, says that then you can terminate the
18 build when a difference between the contact force and this expected contact
19 force indicates a fabrication error.

20 So, what does Petitioner say about these claims? Well, you can see
21 it right here, the highlighted portion. I mean, this is the entirety of the
22 Petition on Claim 5, one paragraph. It says, a POSITA would have known
23 or found obvious to introduce a threshold force, an expected force that they
24 then could compare to the current contact force. So, they are creating out of
25 whole cloth, a disclosure that is not in any of the references. This is on all

1 fours with the *Arendi v. Apple* case.

2 It says an expert can't come in and say this would have been
3 obvious, it's common sense, I'm going to create that and put it into the
4 combination when the references, which the printed publications that are
5 governing this IPR, do not disclose it. So, it's just facially improper, we
6 believe. So, Claim 5 fails for that reason. Claim 7 fails for the same reason.

7 The Reply tries to go back to Calderon, and you'll notice the
8 Petition -- here's the Petition in its entirety -- does not cite Calderon. The
9 Reply then tries to go to Calderon. You'll see there the highlighted citation
10 for a disclosure of these references. First of all, that's improper. It's not in
11 the Petition. It should not be considered, but even if it was considered, you
12 can go read those two passages. They don't have anything to do with
13 comparing forces or comparing a contact force to a threshold force.

14 This parenthetical says first that these passages -- I'm right after the
15 highlighting on Slide 119 that says discussing different Z-axis accuracy for
16 different build materials and requiring -- and so that portion, okay, yeah, I
17 think that's fair. It does discuss different Z accuracy for different build
18 materials, but then they say, and requiring contact force sensitivity for
19 accurate Z-start positions, above and below the surface. It doesn't talk about
20 contact force sensitivity. It definitely doesn't talk about comparison of a
21 contact force to an expected force. I believe Petitioner also didn't talk about
22 Claim 10 for the '698, so I will rest on the briefing on that one as well unless
23 there's questions, and go to -- I'm pointing at the wrong computer.

24 I'm on Slide 128. So, this is what I said. These are related to that
25 issue with Claims 5 and 7. So, it's Claim 12 of the '698, Claim 11 of the

1 '381 patent. Somewhat different, but they have the same basic requirement,
2 which is that you achieve a specified contact force. So, not only are you
3 comparing the force of what you allegedly detect or calculate and then
4 comparing it to a threshold, then you're actually trying to achieve some
5 specified force. So, it's even adding more. They're not dependent on Claims
6 5 and 7, but kind of related. And we'll see because the Petition uses the
7 same reasoning. They say this is the Petition for claim -- for one of these
8 two claims. I think this is out of the '698 patent.

9 So, Claim 12 -- similar to Claim 5, they say a POSITA would have
10 known or found it to be obvious to compare the contact force to a threshold
11 force. But again, as we saw from Claim 5, there's no disclosure of a
12 threshold force or any comparison. They're just adding that. They're
13 making that up out of whole cloth. So, there's not that. And then they go on
14 to say, well, once you do that, then you could achieve a specified force.
15 Well, that's even adding more undisclosed limitation -- or undisclosed
16 teachings in an attempt to show this claim, which is just not disclosed at all
17 in the prior art.

18 All right. I think that's it. Claim 11, we also didn't discuss. I'll
19 just rest on the briefing for that one as well. So, I'll just open it up for any
20 further questions on the Calderon Grounds.

21 JUDGE JUNG: I have no questions.

22 MR. OAKS: Okay.

23 JUDGE JUNG: Sixteen minutes left for rebuttal.

24 MR. GRISWOLD: Your Honor, we can go straight through?

25 JUDGE JUNG: Let me just take a vote. How many people want

1 to continue on? Petitioner wants to continue. Patent Owner wants to
2 continue. And the panel -- do you need to break?

3 MR. GUPTA: How much time we got left?

4 JUDGE JUNG: Okay.

5 MR. GRISWOLD: We have 18 minutes. I don't know that we'll
6 use it.

7 MR. OAKS: We've got another 30 minutes tops.

8 MR. GRISWOLD: Yeah, like another 30 minutes tops. You want
9 to take a break, or --

10 JUDGE JUNG: It looks like the panel is okay with continuing on,
11 so if you're ready, you can proceed if you wish.

12 MR. GRISWOLD: All right. I'm going to be very, very brief, and
13 then I'll cede my time to my colleague, Mr. Gupta. So, on RepRap, which is
14 different from *Blue Calypso*, we have 15 users who posted to this thread.
15 Nine discussed is the Z-axis calibration and collision detection. So,
16 interested persons did find the thread and interact with it. It was distributed
17 and *Blue Calypso*, no evidence of any kind of interaction distribution of the
18 article. And there was no evidence it was even indexed by the search
19 engine. And we have evidence that it was indexed by a search engine and
20 what type of indexing that search engine was able to do. There are 30 total
21 posts, so it's not like these -- the number of posts that we refer to in the
22 Petition were buried deep, deep in the discussion.

23 If you're interested, I have a case that I learned about in law school
24 that says -- that was basically an instance when a court held that 14 slide
25 presentation was printed and put onto poster boards at a conference, and then

1 not subsequently indexed or recorded anywhere. It was just available to
2 anyone who wanted to walk by and see it. It was a printed publication.
3 That's *In Re Klopfenstein*, 380 F.3rd 1345, and the discussion is at 1350. It's
4 a Fed Circuit case from 2004. That kind of shows how old I am.

5 JUDGE JUNG: Thank you for the cite, but that citation is not in
6 the record, correct?

7 MR. GRISWOLD: Yes, that's right.

8 JUDGE JUNG: Okay.

9 MR. GRISWOLD: That's right.

10 JUDGE JUNG: We'll just put it aside for --

11 MR. GRISWOLD: And then I think it's also well-established Fed
12 Circuit case law that we had discussed whether the strain gauge on the
13 extruder mount was better than the servo drive. It's established case -- Fed
14 Circuit case law that it needs only be suitable. It doesn't have to be better
15 than what's in the prior art. I've got another case for that if you're interested,
16 and this is *Intel Corp. v. Pact* -- P-A-C-T -- *XPP Schweiz*, S-C-H-W-E-I-Z,
17 and it's 61 F.4th 1373, Fed Circuit 2023.

18 JUDGE JUNG: Okay. Once again, new citations, correct?

19 MR. GRISWOLD: Yeah.

20 JUDGE JUNG: Not in the --

21 MR. GRISWOLD: Yeah.

22 JUDGE JUNG: -- record?

23 MR. GRISWOLD: Yes.

24 JUDGE JUNG: Okay. And the strength of your argument and
25 evidence does not require citing these additional cases, is that also correct?

1 MR. GRISWOLD: I think it depends on how you think that -- we
2 had discussed measuring the strength of the obviousness, the motivations to
3 combine against the advantages of the strain gauge, and if you think that that
4 is a concern, that case is relevant.

5 JUDGE JUNG: I just want to test the strength of your motivation.
6 Do you think your motivation stands on its own?

7 MR. GRISWOLD: Our motivation stands on its own. We think
8 it's the best option regardless of what -- yeah. And then I would just briefly
9 point you to Slide 131 and 132, and that's discussing the combination of
10 Calderon and RepRap. There's a whole paragraph that starts off, a POSITA
11 would have been motivated to apply the strain gauges from RepRap to
12 Calderon. It kind of continues on and explains the description. The very
13 last sentence of it is, the visual below demonstrates an exemplary three-
14 dimensional printer embraced by the Calderon-RepRap combination, where
15 the strain gauge example of RepRap is applied as Calderon sensing means.
16 So, that, I think, illustrates that we were not limited to the servo drive
17 embodiment.

18 JUDGE JUNG: Thank you, Mr. Griswold.

19 MR. GUPTA: I just have a few quick, quick hits regarding the
20 capillary design that we talked about on Slide 20 and 21. We see that the
21 Petition expressly mapped capillary design as an extruder. Both the '698
22 and the '381. In Slide 22, we'll see the Institution Decision adopting the
23 capillary as one of the mappings. So, this is something that was provided in
24 the Petitions and already recognized by the Board as one of the mappings to
25 the claims. I want to address the discussion about the precision of the

1 nozzle. The through-nozzle is about start and stop characteristics of the
2 dispenser, and not about control over the system. That's what our argument
3 was in the Petition, on page 25 of the Petition.

4 Just piggybacking on something the Patent Owner Counsel had
5 said about capillary design, that it requires precision. You know, just
6 piggybacking off that, that gives you additional motivation for calculating
7 the force as opposed to relying on the proxy. Slide 27. So, I want to read
8 Slide 27. This is the slide that we have about the claims in our Reply about
9 using the through-nozzle with the vibration sensor.

10 What Claim 54 says is the system of controlling the position of at
11 least one element of a dispensing system, including at least one dispenser.
12 So, we've got at least one dispenser. There's a vibration imparting device
13 and a detector for detecting a change in amplitude. Claim 59 then says
14 wherein the at least one dispenser includes at least one of a through-nozzle, a
15 needle valve, a capillary pen, or a quill pen.

16 So, the claim isn't directed to a multiple dispenser system or a
17 tabletop system. It's got at least one dispenser, and it could be one of those
18 things, including a through-nozzle design. There's actually another claim in
19 Warren directed to the multiple dispensers design. This is on Slide 33.
20 Claim 60 actually -- it's the next claim after Claim 59. Claim 60 actually
21 expressly talks about multiple dispensers. So, Warren knows how to claim
22 that. It didn't do that in Claim 59. And, just for your knowledge, the -- even
23 the tabletop design in Warren at paragraph 276 can include just a single
24 dispenser.

25 So, this idea of multiple dispensers or tabletop dispensers just is

1 not what Warren is talking about. Going to Slide 52, I think something I
2 heard was that there's only been a single presentation of Warren's application
3 as far as detecting or calculating. That's not true. On Slide 52, what we laid
4 out here is that we've consistently distinguished between detecting and
5 calculating. In '698, we focus here on the change in amplitude being
6 -- excuse me, the amplitude being changed or modulated by the contact of
7 the dispenser. And then later on, we also present this obviousness theory.

8 If you look at the '381, we also talk about calculating with
9 additional references like the Igasaki or Matsuyama references. So, there's
10 additional corroborating evidence for knowledge by a POSITA to calculate
11 the contact force from the change in amplitude. So, there's a little bit of a
12 difference in the petitions between our treatment of detecting and
13 calculating.

14 JUDGE JUNG: But those two references, they seem to go more
15 towards reasonable expectation of success.

16 MR. GRISWOLD: Yes.

17 JUDGE JUNG: It could be done, but not --

18 MR. GRISWOLD: Yes.

19 JUDGE JUNG: -- that it would have been done.

20 MR. GRISWOLD: I agree with that. And that's what we were
21 using those references for.

22 JUDGE JUNG: Okay.

23 MR. GRISWOLD: It's evidence that this is possible, because one
24 of the things that the Patent Owner was arguing, that they're saying that Dr.
25 Oswald says, is this is not a possibility. So, it was important for us to justify

1 not only that it was possible. As part of the obviousness analysis, it has to
2 be possible and there has to be a reason to do it. So, that's one half of that
3 equation, which is why we have that.

4 But that actually brings up Dr. Oswald's testimony. I'd like to go
5 to Slide 79, where Oswald actually talks about this correlation. So, what he
6 says is, you don't have to -- you have a direct relationship between frequency
7 and force without having to compute any moduli or anything for the system
8 by getting this information experimentally. So, through calibration,
9 correlation, experimentation, you can have these -- this relationship between
10 force and the frequency. Okay, I think that's good.

11 JUDGE JUNG: Okay. thank you.

12 MR. GRISWOLD: Thank you.

13 JUDGE JUNG: Are you ready to proceed?

14 MR. KAPADIA: Yes, I am.

15 JUDGE JUNG: Oh, yes. Please proceed.

16 MR. KAPADIA: Thank you, Your Honors. I don't think this is
17 going to take the full 16 minutes, but if you have questions, I'm happy to
18 answer them. First, with respect to the capillary design at Warren, I think
19 what Petitioner just said makes it very clear that if you look at the Petition
20 itself, the combination in the Petition that's presented, the combination of the
21 Petition is not for the capillary design. It's replacing the capillary design
22 with a through-nozzle design. The second issue that they raised, regarding
23 accuracy with the through-nozzle design, the start and stop and precision.
24 The capillary design requires surface tension, and Warren is teaching that
25 the vibration solution achieves that by getting to the surface accurately, and

1 that's exactly the start and stop.

2 When you're touching the surface, you have that surface tension.
3 When you're not touching the surface, you don't. The through-nozzle design
4 is a different approach where you're basically adjusting a valve and then
5 having material flow through that valve to go through kind of a conical
6 nozzle. The third issue that Petitioner raised with regards to Warren is that
7 those claims that they cited to in their Reply brief that they hadn't put into
8 their Petition, those claims are not about the multi-dispenser design. But if
9 you read those claims, they're not limited to that single design.

10 They say, I think at least -- I don't have the language in front of
11 me, but at least one or more dispensers, something to that effect. And it can
12 include multiple designs. If you look at Figure 3 of Warren, as we did when
13 we went through Patent Owner's slides, it shows multiple dispensers. So,
14 Patent Owner's position isn't that Warren can't have a tabletop tool with one
15 dispenser. It's that Warren is teaching an embodiment with multiple designs
16 as a tabletop tool in Figure 23A, for instance.

17 The fourth issue with respect to Warren is regarding calculating the
18 contact force. Petitioner's Counsel pointed to the Igasaki and Matsuyama
19 references. Those are not part of the combination, but the assertion is that
20 those references either tell you that you can calculate a contact force or
21 provide a reasonable expectation of success. What they didn't address is that
22 Dr. Oswald actually looked at those references, he addressed them, and he
23 explained why they don't map to the type of system that Warren is dealing
24 with. In particular, I believe he compared Figure 21 in Warren. If you
25 recall, that had the three different signals before, after contact, and then the

1 change in amplitude that was magnified by 30 times, compared that figure to
2 the figures in those references.

3 The amplitude change in those references, I believe, was a constant
4 amplitude. It was like a sine wave with a slight, like, a shift in amplitude in
5 the sine wave with the same frequency. It doesn't at all, not at all reflect the
6 type of complexity that Warren's system has in it. And it's part of the reason
7 why Dr. Oswald concluded that someone of skill in the art wouldn't have
8 been able to calculate the contact force.

9 The last issue about Slide 79 that Petitioner points to -- Petitioner's
10 Slide 79 -- that dealt with testimony from Dr. Oswald about a change in
11 frequency. We discussed several times why Warren specifically approached
12 his solution by saying a change in frequency doesn't work. I'm going with
13 the change in amplitude.

14 So, yes, maybe someone of skill in the art would know from a
15 change in frequency, this is now how I know to get to a contact force, but
16 that's not what Warren's system is dealing with. It's a change in amplitude.
17 So, for those reasons, there's no obviousness for the Warren Grounds. If
18 there are no further questions on those grounds or on Ground 2, then we'll
19 rest on the briefing.

20 JUDGE JUNG: I have no questions.

21 JUDGE OGDEN: I have one question. Could you respond to
22 Counsel for Patent Owner's argument that the evidence you presented on
23 your Slide 100 is a new argument that is untimely raised? And this is the
24 argument that it refers to some of the claims in Warren with respect to Claim
25 10 in the 531 proceeding.

1 MR. KAPADIA: So, I apologize, Judge Ogden. I'm Counsel for
2 Patent Owner and I did make that argument. So, I think your question is
3 directed to Petitioner's Counsel.

4 JUDGE OGDEN: Oh, I'm sorry.

5 JUDGE JUNG: Petitioner still has some time. You want
6 Petitioner to address it? Still have some time left over for rebuttal.

7 JUDGE OGDEN: Yeah, yeah, I would actually. Yeah, I'm sorry.

8 JUDGE JUNG: Okay, thank you, Mr. Gupta.

9 JUDGE OGDEN: Sorry for the confusion. Yeah, that would be
10 helpful. I should have asked before.

11 MR. GUPTA: So, we're at Slide 100, and this is not -- excuse me
12 -- these claims aren't a new argument. The argument has always been that
13 Warren is going to be able to detect planarity. This is just evidence in
14 advance of that argument. The point here is that there's been an accusation, I
15 guess -- maybe that's too strong a word, but the Patent Owner is suggesting
16 that the Petitioner's position is taking a claim construction. And what we
17 were doing was just looking at the meaning of the claims when we wrote our
18 Petition.

19 So, in one of the -- I think it's in the Sur-reply, there's a snippet on
20 that slide that says, what Warren detects is for a given point and not across
21 surface for a plane. And in response to that, I thought, well, is there really
22 any -- no argument at all or no evidence at all in Warren that supports
23 looking at multiple points. And what I found was Claim 63 and 74. So,
24 we're maintaining the same argument. It's just evidence to support that
25 argument. But that's really the only -- that was sort of the way that claim

1 came about. That's really all I can say about it.

2 JUDGE JUNG: Thank you.

3 JUDGE OGDEN: Okay, thank you.

4 MR. GUPTA: But --

5 JUDGE OGDEN: Sorry. Thanks for bearing with me and my
6 -- it's been a long day, I'm a little confused here, so thank you.

7 MR. GUPTA: That's okay. Thank you.

8 JUDGE JUNG: Mr. Kapadia, since Patent Owner is supposed to
9 have the last word, do you want to respond just to that one little issue?

10 MR. KAPADIA: Sure, Your Honor. Thank you, Your Honor. So,
11 I don't think this is going to take more than a minute. The suggestion was
12 that this new argument -- I think first of all, Petitioner's Counsel made it
13 clear that the evidence they're citing to is new evidence. It wasn't in their
14 prior submissions. Their second assertion, it's not a new argument. I think
15 that depends on what they're arguing. Are they arguing that mapping is
16 planarity? Well, that is a new argument. It's certainly not in their Petition
17 and certainly not in their Reply.

18 The third suggestion was we did this because of the Sur-reply
19 -- because their Sur-reply talked about at a given point and not a surface.
20 Well, if you go back and read Patent Owner's Response, this is on page 39 of
21 Patent Owner's Response. It talks about why Warren is determining things
22 at a given point, and then it figures out contact, and then it moves on. And
23 so that isn't an argument that Patent Owner introduced in its Reply. It was
24 part of page 39 of Patent Owner's Response.

25 JUDGE JUNG: Thank you, Mr. Kapadia. Thank you.

1 JUDGE OGDEN: Got it. Thank you very much.

2 JUDGE JUNG: All right. Thank you, gentlemen, for all your
3 presentation. It was very helpful. All your answers were very good. These
4 cases are submitted and we are adjourned. Enjoy the rest of your day.

5 (Whereupon the above-entitled matter went off the record at 3:16
6 p.m.)

IPR2025-00531 (Patent 9,168,698)
IPR2025-00532 (Patent 10,556,381)

PETITIONER:

Joshua A. Griswold
Yao Wang
Michael T. Hawkins
Kenneth W. Darby Jr.
FISH & RICHARDSON P.C.
griswold@fr.com
ywang@fr.com
hawkins@fr.com
kdarby@fr.com

PATENT OWNER:

Brian W. Oaks
Aashish G. Kapadia
Kevin J. Meek
Syed K. Fareed
McDERMOTT WILL & EMERY LLP
boaks@mwe.com
akapadia@mwe.com
kmeek@mwe.com
sfareed@mwe.com