

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

EXOTEC PRODUCT FRANCE SAS, U.S. PATENT NO.
EXOTEC NORTH AMERICA INC., 11,472,632
AND EXOTEC PRODUCT USA INC.,

Petitioner,

VS.

OPEX CORPORATION,

Patent Owner.

REMOTE VIDEOTAPED DEPOSITION OF
MATTHEW SPENKO, Ph.D.

TAKEN: January 23, 2025

TIME: 9:00 a.m.

JOB NO. 7114267

PAGES: 1 To 127

STENOGRAPHICALLY REPORTED BY:

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

1 DEPOSITION OF MATTHEW SPENKO, Ph.D., conducted
2 virtually, is taken on this 23rd day of January, 2025,
3 commencing at 9:00 a.m.

4 - - -

5 THE VIDEO OPERATOR: Good morning.
6 We are going on the record. The time is 9:10 a.m.
7 on January 23, 2025. Quality of recording depends
8 on quality of camera and internet connection of
9 participants. What's heard from the witness and
10 seen from his camera is what will be recorded.
11 Audio and video recording will continue to take
12 place unless all parties agree to go off the
13 record.

14 This is media unit number 1 in the
15 video-recorded deposition of Dr. Matthew Spenko
16 taken in the matter of Exotec versus Opex, filed in
17 the United States Patent and Trademark Office
18 before the Patent Trial and Appeal Board,
19 Case IPR2024-00850.

20 My name is Tim Tupiak. I'm the
21 videographer. The court reporter is Brandi
22 Bigalke. We are both with Veritext Legal
23 Solutions. I am not related to any party in this
24 action nor am I financially interested in the
25 outcome.

1 If counsel will now state their
2 appearances and affiliations for the record
3 beginning with the noticing attorney, after which
4 the reporter will administer the oath.

5 MR. PATNAIK: Goutam Patnaik. With
6 me is William Vieth, both from Desmarais LLP on
7 behalf of Opex.

8 MR. DOUGLAS: Good morning. This is
9 Chris Douglas. With me today is Brian Ellsworth.
10 Both of us are from Alston & Bird. We are here on
11 behalf of petitioner Exotec.

12 THE COURT REPORTER: Do all counsel
13 stipulate to the swearing of the witness remotely
14 by the court reporter?

15 (All counsel so stipulated and the
16 court reporter remotely swore in the witness:)

17 MATTHEW SPENKO, Ph.D.
18 Called as a witness and having been first duly
19 sworn, testifies as follows:

20 THE COURT REPORTER: Thank you.
21 You may begin, Counsel.

22 EXAMINATION

23 BY MR. PATNAIK:

24 Q. Good morning, Dr. Spenko.

25 A. Good morning.

1 Q. Where are you located right now?

2 A. Chicago, Illinois.

3 Q. Okay. Are you with counsel or are
4 you on your own?

5 A. I'm in my work office.

6 Q. Okay. Do you have any documents in
7 front of you?

8 A. I do. I have seven clean copies of
9 documents in front of me.

10 Q. No annotations of any kind on any of
11 the docs?

12 A. That's correct.

13 Q. Can we just go through what you
14 documents you have, and that will save us maybe
15 some effort later.

16 A. Yeah. I have my CV. I have the '632
17 patent. I have the Raizer patent. I have the
18 English translation of the Hangzhou patent. I have
19 Derby's declaration. I have the Goren patent. I
20 have the Chinese patent in Chinese. And then I
21 have what I refer to as the patent history,
22 although I think the lawyers use a different term,
23 for the '632 patent.

24 Q. And when you say "the Chinese
25 patent," that's just the original Chinese for the

1 Hangzhou reference?

2 A. Yeah. Yes, it is the Hangzhou patent
3 in its original Chinese.

4 Q. Anything else in front of you?

5 A. Nothing related -- pertaining to this
6 case.

7 Q. Anything on your computer open right
8 now?

9 A. No. No. The only thing I have open
10 on my computer is the Zoom window.

11 Q. Have you been deposed before? I
12 think you have.

13 A. I have.

14 Q. So the rules for the deposition will
15 correspond to what I think you have already
16 happened or have done.

17 I will ask questions. I will try to
18 be as clear as I can be. If you don't understand
19 my question, please ask me to clarify and I'll do
20 my best.

21 If you don't ask I'm going to presume
22 that you understood my question.

23 Is that a fair way to proceed?

24 A. That's fair.

25 Q. How did you prep for today's

1 deposition?

2 A. I read through all of the documents
3 that were given to me, and there were several
4 meetings with the Exotec lawyers.

5 Q. The ones that are on this Zoom call?

6 A. Yes.

7 Q. Anyone else that you met with to
8 prep?

9 A. There were -- there was another
10 lawyer on at least one Zoom call that we had. I
11 forgot his name. I think the lawyers can give you
12 his name. There may have been two, I'm not really
13 sure, at one point. You know, I didn't see video
14 so I wasn't sure who was on the call.

15 Q. How many times did you meet with
16 counsel to prep for the deposition?

17 A. I'm going to assume by you saying
18 "prep for deposition" that you mean every time that
19 I met with counsel since the start of my case. So
20 assuming that, I think we met I'm going to say more
21 than four times, less than six.

22 Q. Let me try to clarify.

23 I was asking just for today's
24 deposition. I assume you had some preparation with
25 counsel.

1 How many times did you prepare for
2 today's deposition?

3 A. We met yesterday, so that's once.
4 And yeah, you know, one more time before that that
5 was sort of kind of preparing for the deposition.
6 It was just sort of reviewing the case as well. I
7 mean, I think kind of everything here is prepping
8 for this deposition. So, you know, one, one and a
9 half. Something like that.

10 Q. When was the earlier meeting?

11 A. Last week -- early last week I think,
12 or late, you know, at the end of the week maybe two
13 weeks ago. I don't really remember.

14 Q. How long was that first meeting?

15 A. I don't -- I don't remember.

16 Q. How long was the meeting yesterday?

17 A. We met for about six hours.

18 Q. Can you explain, my understanding for
19 this case is that there was a previous expert that
20 put a declaration in, and then you were called in
21 to replace him.

22 Is that a fair characterization?

23 A. Yes, I think so.

24 Q. Do you recall when that occurred, the
25 transition?

1 A. I can only let you know that I was
2 contacted either late November or early December
3 about this case.

4 Q. And what did you first do when you
5 were contacted about this case?

6 A. Can you be more specific?

7 Q. Did you review any documentation?

8 A. Yes, I did.

9 Q. Did you review the declaration from
10 the previous expert? I think his name is Derby; is
11 that right?

12 A. Yes. One of the -- I don't know if
13 it was the first thing I did, but it was one of the
14 early things that I did was review the declaration
15 by Derby. And yes, that is his name.

16 Q. For your current opinions in regards
17 to this case, are you adopting all of Dr. Derby's
18 declaration?

19 A. I am.

20 Q. And that's without any alteration or
21 modification?

22 A. That is correct.

23 Q. Does that mean you agree with all of
24 the substance of his declaration?

25 A. Yes, it does.

1 Q. Is there anything in his declaration
2 that you disagree with or you would have said
3 differently?

4 A. There is nothing in his declaration
5 that I disagree with.

6 Q. So you're not disclaiming any part of
7 that declaration, correct?

8 A. What do you mean by disclaiming? I
9 don't know what that term means.

10 Q. Walking away from any of the opinions
11 provided in that declaration.

12 A. No, I am not.

13 MR. PATNAIK: Will, do we have the
14 exhibits yet?

15 MR. VIETH: Yeah, I can share those.

16 MR. PATNAIK: Could we put up
17 Dr. Spenko's CV, please.

18 MR. VIETH: Yeah. Pulling that up.

19 (Deposition Exhibit 2003 was marked
20 for identification.)

21 BY MR. PATNAIK:

22 Q. Dr. Spenko, I'll just tell you this
23 is the CV that we received for you. I just want to
24 make sure it's accurate and up-to-date.

25 MR. PATNAIK: Will, if you can flip

1 through it, or is there a way to give him control
2 to flip through it?

3 MR. VIETH: Yeah, I believe I can
4 give him control.

5 Dr. Spenko, I think you should have
6 control now.

7 THE WITNESS: Okay. Thank you.

8 Do you mind if I just use my clean
9 copy here?

10 MR. PATNAIK: I don't mind. But
11 we're going to mark what's on the screen as an
12 exhibit, and I just want to make sure we're looking
13 at the same thing.

14 THE WITNESS: Sure.

15 MR. PATNAIK: And while we're at it,
16 can we go and mark this as Exhibit 2003, Will, is
17 what we want to mark this.

18 MR. VIETH: It's marked as
19 Exhibit 2003, Spenko curriculum vitae.

20 BY MR. PATNAIK:

21 Q. Either -- I don't mind whatever you
22 want to look at, Dr. Spenko. I just want to
23 confirm that we're looking at the same thing. So
24 if you could flip through what's on the screen and
25 just confirm.

1 A. Oh, you want me to flip through and
2 see if this is the up-to-date CV?

3 Q. Correct.

4 A. Yeah. This is the latest CV that I
5 gave that is up-to-date. And there might be
6 another publication or two that I've added since
7 then, but this is the up-to-date CV.

8 Q. How would you describe your area of
9 expertise?

10 A. I would say I'm an expert in
11 robotics.

12 Q. Any specific aspect of robotics?

13 A. I cover a lot of different things.
14 Mostly I focus in mobile robotics would be as
15 opposed to manipulators. Mostly mobile robots.

16 Q. Does that include autonomous
17 vehicles?

18 A. That is a mobile robot, yes.

19 Q. For your purposes they're synonymous?
20 Or I should say autonomous vehicles
21 are an example of a mobile robot?

22 A. They're -- for the most part they're
23 synonymous. I'm sure at some point somebody is
24 going to find some strange reason why one thing
25 might not be exact with the other. But for all

1 intents and purposes they're the same.

2 Q. Do you believe that your work in
3 autonomous vehicles is relevant to the robots at
4 issue in this IPR?

5 MR. DOUGLAS: Object to form.

6 THE WITNESS: My expertise in mobile
7 robots is directly applicable to the patents in
8 this case.

9 BY MR. PATNAIK:

10 Q. Maybe you didn't get my question. I
11 was asking more for your work on autonomous
12 vehicles.

13 Is that work relevant to the robots
14 that are at issue in this IPR?

15 MR. DOUGLAS: Same objection.

16 THE WITNESS: So I thought I was -- I
17 think I did answer that. I think that all my work
18 in robotics and mobile robots and autonomous
19 vehicles is applicable to the -- to this case.

20 MR. PATNAIK: Will, can we mark, I
21 guess it's 2004, the Ion article, please.

22 MR. VIETH: Yeah, one second. I will
23 pull that up.

24 (Deposition Exhibit 2004 was marked
25 for identification.)

1 MR. VIETH: And also, we have
2 the -- if you want to go off the record very
3 briefly we can -- we have the Exhibit Share up and
4 running, and then we can just upload that to that
5 to be able to go through Veritext.

6 MR. PATNAIK: That's fine with me.

7 THE VIDEO OPERATOR: So we want to go
8 off the record?

9 MR. PATNAIK: Yes.

10 THE VIDEO OPERATOR: Going off the
11 record. The time is 9:25 a.m.

12 (Thereupon, a break was taken, and
13 then the proceedings continued as follows:)

14 THE VIDEO OPERATOR: We are going
15 back on the video record. The time is 9:33 a.m.
16 BY MR. PATNAIK:

17 Q. Dr. Spenko, sorry for the delay in
18 getting this up.

19 We have an article that's been marked
20 as Exhibit 2004. It's an Ion article entitled
21 Fault-Free Integrity of Urban Driverless Vehicle
22 Navigation with Multisensor Integration: A Case
23 Study in Downtown Chicago. It lists you as one of
24 the authors. It was received March 7, 2023,
25 revised September 24, 2023, and accepted October 2,

1 2023.

2 Do you see that?

3 A. I do.

4 MR. DOUGLAS: Objection to scope of
5 Exhibit 2004. Outside the scope.

6 BY MR. PATNAIK:

7 Q. Do you recognize this exhibit? Or
8 this article?

9 A. I do.

10 Q. And you're one of the authors; is
11 that correct?

12 A. Yes.

13 Q. Feel free to flip through it if you
14 want. My questions are going to be directed to the
15 second page. The text on the second page.

16 This article deals with mapping of
17 cities, correct, and certain difficulties that
18 occur when you try to map a city?

19 MR. DOUGLAS: Objection; scope.

20 THE WITNESS: Give me a second. So
21 it's -- give me a second to reread it. I've read a
22 lot of articles. Let me refresh my memory of what
23 this one is actually about, okay?

24 BY MR. PATNAIK:

25 Q. Of course.

1 A. Okay.

2 Q. So what --

3 A. I'm sorry. Can you ask the question?
4 I'm sorry. Can you ask the question? I don't
5 remember it. But --

6 Q. I'll re ask -- I'll ask a new
7 question. Sorry for talking over you.

8 Can you tell me at a high level what
9 this article is about?

10 A. Yeah. This article is about
11 navigating in urban environments and specifically
12 looking at multisensor integration for that
13 situation.

14 Q. And this navigation is for
15 applications with automated vehicles, or autonomous
16 vehicles, correct?

17 A. This is for -- this one, this
18 application is really focused on self-driving cars,
19 which are a type of autonomous vehicle.

20 Q. Turning to page 2, the second page of
21 the exhibit, I'm looking at the very first
22 paragraph on that page. The top paragraph. Right
23 there.

24 Second sentence reads, "This
25 requirement can be achieved with global navigation

1 satellite systems (GNSS) realtime kinematic (RTK)
2 positioning in open-sky environments, but buildings
3 surrounding urban streets limit satellite
4 visibility and can cause significant multipath
5 effects."

6 Do you see that?

7 MR. DOUGLAS: Objection; scope.

8 THE WITNESS: I do.

9 BY MR. PATNAIK:

10 Q. Can you just for me explain when you
11 say "global navigation satellite systems," what's
12 that referring to?

13 MR. DOUGLAS: Objection; scope.

14 THE WITNESS: GNSS is a umbrella term
15 for the different satellite systems, global
16 positioning system, BeiDou, GLONASS, and I forgot
17 what the Russian's system is. But whatever the --
18 all the different European, Chinese, U.S., and
19 Russian global navigation systems. Satellite
20 systems.

21 BY MR. PATNAIK:

22 Q. And what's realtime kinematic
23 positioning?

24 MR. DOUGLAS: Objection; scope.

25 THE WITNESS: That's a harder one to

1 explain. The last author, Boris Pervan, would have
2 a better understanding and could give you a better
3 explanation for that.

4 But it is basically a GNSS technique
5 that allows you to get greater accuracy from your
6 satellite positioning.

7 BY MR. PATNAIK:

8 Q. And open-sky environments, what does
9 that refer to?

10 MR. DOUGLAS: Objection; scope.

11 THE WITNESS: Open sky, I don't --
12 non obstructed sky. So a clear path from your
13 satellite to your receiver.

14 BY MR. PATNAIK:

15 Q. Why is that relevant to the work in
16 this paper?

17 MR. DOUGLAS: Objection; scope.

18 THE WITNESS: So the point of the
19 paper is that if you have a self-driving car and if
20 you need to maintain both high accuracy and
21 high-integrity levels, then you can achieve those
22 accuracy and integrity levels if you have open-sky
23 conditions so that you have a clear path from your
24 receiver to your satellite.

25 BY MR. PATNAIK:

1 Q. And when it says "can cause
2 significant multipath effects," what are multipath
3 effects?

4 MR. DOUGLAS: Objection; scope.

5 THE WITNESS: In this particular
6 application, multipath effects refer to satellite
7 signals that reach you both -- reach the receiver
8 both from -- directly from the satellite and also
9 bouncing off of buildings.

10 BY MR. PATNAIK:

11 Q. Why do they bounce off buildings?

12 MR. DOUGLAS: Same objection; scope.

13 THE WITNESS: Why do radio frequency
14 signals bounce off buildings, is that what you're
15 asking?

16 MR. PATNAIK: Yeah.

17 THE WITNESS: I mean, I don't
18 remember the underlying physics of my wave physics,
19 but -- light physics, but these are electromagnetic
20 waves, and electromagnetic waves bounce off of
21 objects and pass through other objects. I'd have
22 to go dig pretty deep back into my physics in order
23 to tell you the science behind that.

24 BY MR. PATNAIK:

25 Q. Let me ask it -- why are multipath

1 effects or the bouncing of the signals a problem
2 for the autonomous vehicles?

3 MR. DOUGLAS: Objection; scope.

4 THE WITNESS: Well, again, they're
5 not necessarily a problem for all autonomous
6 vehicles. They are in this particular case an
7 issue for self-driving cars if you want to maintain
8 both high accuracy and high integrity.

9 In this case, multipath -- multipath
10 signals can get you the same signal with different
11 amount of time between the time that a satellite
12 has sent that signal and the time the receiver
13 receives the signal.

14 BY MR. PATNAIK:

15 Q. Going to the next paragraph it reads,
16 "The exclusion of reflected GNSS signals is
17 essential to ensure positioning integrity for
18 driverless vehicles on urban roads. To exclude
19 these signals, three-dimensional environment maps
20 are needed to provide the means to trace GNS {sic}
21 signals."

22 Do you see that?

23 A. I do.

24 Q. Could you explain to me maybe in
25 plain English what that's conveying.

1 MR. DOUGLAS: Objection; scope.

2 THE WITNESS: So as I was talking
3 about in the last -- sort of last -- the answer to
4 the last question, if you want to maintain
5 positioning requirements on urban roads, it is
6 difficult to do that. You have to try to exclude
7 any of those reflected or multipath GNS signals.

8 I think you also asked about the
9 second paragraph -- or second sentence; is that
10 correct?

11 MR. PATNAIK: I did.

12 THE WITNESS: If you -- one method
13 that you could use to try to exclude these signals
14 is to create a three-dimensional map in order to
15 trace what those signals would be from the
16 satellite to your receiver.

17 BY MR. PATNAIK:

18 Q. Does that mean you exclude them and
19 then -- but you have them by a 3D map so it kind of
20 fills those gaps from your exclusion?

21 MR. DOUGLAS: Objection; scope.

22 THE WITNESS: Can you repeat the
23 question? I didn't understand it.

24 BY MR. PATNAIK:

25 Q. Yeah. I'm just trying to make sure I

1 understand what you're saying.

2 The exclusion of those reflected
3 signals, you're trying to keep them out, right,
4 because they create whatever issues they create?
5 But when you exclude them you have to fill them
6 with something, and it's the 3D map you're using to
7 fill them? Or fill that gap?

8 A. No. No, no, no, no. No. No. No.
9 No, not at all. I'm just -- so the
10 three-dimensional maps allow you to create this --
11 read the following sentence, this idea of shadow
12 matching, which identifies what GNS signals -- what
13 GNS signals, GNSS signals from which satellite
14 should be excluded in your -- in -- that's it.
15 Should be excluded.

16 Q. And the ones you're excluding are the
17 ones that are the multipath effects or creating the
18 multipath effects; is that right?

19 MR. DOUGLAS: Objection; scope.

20 THE WITNESS: So in this particular
21 case, if you are traveling in an urban canyon and
22 you have a self-driving car and you want to
23 maintain accuracy and positional integrity, then
24 you can identify which GNS satellites would
25 generate multipath signal errors if you had a

1 three-dimensional map of the city.

2 If you have a three-dimensional map
3 of the city you can -- and you identify those GNS
4 signals that would give you a multipath error,
5 could give you a multipath error, then you have the
6 ability to exclude those satellites from your --
7 from the signals that you're going to use to create
8 your position estimate.

9 BY MR. PATNAIK:

10 Q. Going to the end of that same
11 paragraph it states, "However, an excessive number
12 of such exclusions comes at the cost of RTK
13 positioning accuracy and loss -- loses -- losses of
14 carrier phase cycle ambiguities."

15 Do you see that language?

16 A. I do.

17 Q. Can you tell me what that means.

18 MR. DOUGLAS: Objection to scope.

19 THE WITNESS: I can sort of tell you
20 what that means. So again, this is more on the RTK
21 positioning carrier phase cycle ambiguity. If you
22 really want the details, like the hard-core physics
23 details, I can't give that to you.

24 But in general, the carrier phase
25 signal is a method to -- that allows you to do

1 realtime kinematic positioning to gain greater
2 accuracy. If you -- the more signals you have, all
3 right, in general in this -- for a GPS system, the
4 more satellites used for a GPS system -- sorry. I
5 say GPS, but really GNSS. Let's be clear here.
6 GPS is a subset of GNSS.

7 The more satellites that are used,
8 the higher accuracy you can obtain as long as those
9 signals aren't faulted.

10 BY MR. PATNAIK:

11 Q. And when you say "faulted," is that a
12 reference to the multipath effects?

13 MR. DOUGLAS: Objection; scope.

14 THE WITNESS: Faults, I think
15 multipath -- I'm not sure if multipath falls into
16 an error or is defined as a fault. Or I suppose it
17 could be -- it could sort of be both.

18 Generally though you don't think of
19 multipath as being a faulted signal on its own.
20 I'd have to -- I don't know about that one. That
21 one is a little wishy-washy on how you want to
22 classify that.

23 BY MR. PATNAIK:

24 Q. Going to the next paragraph, in the
25 middle of the paragraph it states, "The use of

1 high-quality navigation-grade inertial sensors
2 could slow down the error propagation, but their
3 cost is incompatible with driverless vehicle
4 applications."

5 Do you see that? It's in the middle
6 of the paragraph that starts, "Integration with
7 inertial navigation system."

8 A. Can you repeat? I don't see that.
9 Can you repeat the sentence that you're looking at?

10 Q. Sure. It's the sentence that says,
11 "The use of high-quality navigation-grade inertial
12 sensors could slow down the error propagation, but
13 their cost is incompatible with driverless vehicle
14 applications."

15 A. Okay. I see that sentence, yes.

16 Q. Is that saying that you could add
17 sensors to help with this issue but they're cost
18 prohibitive as far as the applications at issue
19 with autonomous vehicles?

20 MR. DOUGLAS: Objection to scope,
21 form.

22 THE WITNESS: You're still using the
23 term "autonomous vehicles" here, but the reality is
24 this has to do with self-driving cars in a life
25 critical situation here, which has much -- which it

1 has very strict requirements because of it's a life
2 critical situation and...

3 So in this particular situation you
4 could use tactical grade inertial navigation
5 systems. They do exist. And you may be able to
6 essentially buy your way out of this problem. And
7 the way we describe in this particular paper was
8 looking at a specific track of roads in Chicago
9 which is probably one of the most difficult tracks
10 that you could test. And we've transected that track
11 and we tried to identify how -- what types of
12 sensors would allow you to move from one end of the
13 transect to the other end of the transect.

14 So this is an extremely challenging
15 case that we were looking at. And in this
16 particular case it would have been possible to use
17 high-end, extremely high-end inertial navigation
18 sensors, and that would essentially meet the
19 accuracy and integrity requirements for this
20 particular transect that we investigated.

21 BY MR. PATNAIK:

22 Q. But I mean, I read that sentence
23 saying the cost is incompatible with the
24 applications, meaning it's too expensive, but
25 you're saying these applications are life critical,

1 right?

2 MR. DOUGLAS: Objection; scope.

3 THE WITNESS: Yes -- well, I don't
4 understand the question.

5 Is the question if these applications
6 are life critical?

7 BY MR. PATNAIK:

8 Q. I guess my question is what does it
9 mean to have a cost that's incompatible with an
10 application?

11 MR. DOUGLAS: Objection; scope.

12 THE WITNESS: So for this particular
13 paper what we're focused on was self-driving cars.
14 And we came to the conclusion, or we made the
15 assumption that nobody would want to add a sensor
16 that was 10s of thousands of dollars or higher to
17 the cost of a car.

18 So we were trying to be somewhat
19 practical here and noting that, hey, you could use
20 this sensor and it would solve this problem, but we
21 think it's probably not a very practical answer for
22 a self-driving car.

23 BY MR. PATNAIK:

24 Q. Besides the tall buildings in this
25 example, can you give me any other examples of

1 things that mitigate or cut against open-sky
2 environments?

3 MR. DOUGLAS: Objection to scope.

4 THE WITNESS: For this particular
5 case of the self-driving cars on this transect
6 through State Street in Chicago, we had trees that
7 would also interfere with open-sky conditions.

8 BY MR. PATNAIK:

9 Q. I assume tunnels would also interfere
10 with open-sky conditions?

11 MR. DOUGLAS: Objection; scope.

12 THE WITNESS: Tunnels do not allow
13 you to use GP -- I mean, I think we've all driven
14 through a tunnel. Your GPS is not -- not great in
15 it.

16 BY MR. PATNAIK:

17 Q. How about a roof, would that
18 interfere with an open-sky environment?

19 MR. DOUGLAS: Objection; scope.

20 THE WITNESS: How would you have a
21 roof in a -- in the downtown Chicago?

22 BY MR. PATNAIK:

23 Q. Or any type of cover. I mean, I
24 guess I'm trying to be as broad -- I mean, tunnel
25 could mean a lot of different things. I'm trying

1 to find different examples.

2 MR. DOUGLAS: Objection; scope, form.

3 THE WITNESS: I don't understand why
4 you'd put a roof in a -- I've never driven a car
5 under the roof.

6 BY MR. PATNAIK:

7 Q. Do you ever park a car in a garage
8 that's not a full garage, it just has a cover, like
9 a roof garage?

10 MR. DOUGLAS: Objection; scope.

11 THE WITNESS: No.

12 BY MR. PATNAIK:

13 Q. What would be the effect of a roof on
14 these sensors?

15 MR. DOUGLAS: Objection; scope.

16 BY MR. PATNAIK:

17 Q. If any.

18 A. Which sensors are you referring to?

19 Q. The sensors on the autonomous
20 vehicle.

21 A. Well, that's -- that's extremely
22 broad. We've been talking -- this entire time
23 we've been talking about GNS sensors. You mean GNS
24 sensors, or do you mean every possible sensor on
25 any autonomous vehicle ever?

1 Q. Let's start with GNS sensors.

2 A. So can you repeat the question,
3 please.

4 Q. What would be the effect of a roof on
5 the GNS sensors on the self-driving cars at issue
6 in the Ion article?

7 MR. DOUGLAS: Objection; scope.

8 THE WITNESS: I don't see what a
9 roof -- there's -- that's incompatible with what
10 this article is about. This article is about
11 driving down State Street in downtown Chicago.
12 There are no roofs there. There are other things.
13 There are L-tracks, there are buildings, there are
14 trees, but there are no roofs.

15 BY MR. PATNAIK:

16 Q. Is it your testimony that multipath
17 effects are limited to tall buildings?

18 MR. DOUGLAS: Objection; scope.

19 THE WITNESS: I don't understand the
20 question.

21 What do you mean by limited by --
22 only limited by tall buildings?

23 BY MR. PATNAIK:

24 Q. I'm trying to find out when multipath
25 effects occur.

1 Like which situations would create
2 multipath effects?

3 MR. DOUGLAS: Objection; scope.

4 BY MR. PATNAIK:

5 Q. You described it earlier -- go ahead,
6 I'm sorry.

7 A. For this particular case when we're
8 referring to GNS signals, there's an
9 electromagnetic signal. Electromagnetic signals
10 bounce off of all different types of materials, all
11 right. Sometimes a bounce -- so let's say I'm in
12 the middle of nowhere. They're still bouncing off
13 stuff, all right. It's still hitting the ground,
14 bouncing off the ground, bouncing off a tree, here,
15 there, anywhere, all right. All these signals are
16 not directly coming towards your receiver in the
17 car, they are bouncing off of everything.

18 In the city in this particular paper,
19 in this example of this self-driving car that we
20 have driving down the city, it is important to
21 consider those multipath errors because the tall
22 buildings make it a problem, all right. There's
23 lots of tall buildings. And because of that and
24 the signal, from my understanding, I'm not a --
25 from my understanding, is that bouncing off

1 these -- of these buildings creates a signal that
2 your receiver might receive and say, hey, that
3 signal is strong enough to consider. It might not.
4 It might bounce off a building and say that's a
5 weaker signal. I'm not going to consider that.
6 I've got a stronger signal coming directly from
7 this GNS satellite.

8 So sometimes you get multipath
9 errors. Their problems are exacerbated in urban
10 environments.

11 Q. So sticking with Chicago, as you
12 requested, if there's an overpass in Chicago, would
13 that create multipath effects or challenges?

14 MR. DOUGLAS: Objection; scope.

15 THE WITNESS: No.

16 BY MR. PATNAIK:

17 Q. Why not?

18 A. An overpass wouldn't bounce a
19 signal -- wouldn't bounce a GNS signal off of it
20 into your receiver.

21 Q. Wouldn't it create challenges as far
22 as the signals bouncing off the top of the -- I
23 guess the bottom of the overpass back to the
24 vehicle?

25 MR. DOUGLAS: Objection; scope.

1 THE WITNESS: No.

2 BY MR. PATNAIK:

3 Q. It wouldn't create any differences in
4 how the signal is received by -- on the car?

5 MR. DOUGLAS: Objection; scope.

6 THE WITNESS: You're talking -- your
7 first two questions were about multipath errors.

8 Are you still talking about multipath
9 errors?

10 MR. PATNAIK: Yes.

11 THE WITNESS: A tunnel going into --
12 sorry. Your example was an overpass. An overpass
13 would not cause multipath errors on a self-driving
14 car.

15 BY MR. PATNAIK:

16 Q. Why do you say that?

17 MR. DOUGLAS: Objection; scope.

18 THE WITNESS: Because they wouldn't.
19 Why would -- why would going under an overpass
20 create a multipath error? That makes no sense.

21 BY MR. PATNAIK:

22 Q. Wouldn't it change how the signals
23 are bouncing back to the sensors on the car?

24 MR. DOUGLAS: Objection; scope.

25 THE WITNESS: I don't -- I don't

1 understand your question. Why would the overpass
2 bounce a signal back to the receiver -- I'm sorry.
3 I just don't understand your question. It doesn't
4 make sense.

5 BY MR. PATNAIK:

6 Q. Well, I was using what you said about
7 the tall buildings, that it creates the multipath
8 effects by bouncing signals in different angles.

9 Did I get that wrong?

10 MR. DOUGLAS: Objection; form, scope.

11 THE WITNESS: No. Tall building
12 would bounce a GNS signal off of it, and it could
13 hit -- it could then -- the signal could then be
14 received by the car.

15 BY MR. PATNAIK:

16 Q. And you're saying that's not true
17 for -- you're saying the overpass would have no
18 effect on the signals received by the car; is that
19 right?

20 MR. DOUGLAS: Objection; scope.

21 THE WITNESS: That's not what I said.
22 You said would the overpass cause essentially a
23 multipath error on the car, and I said no, it would
24 not.

25 BY MR. PATNAIK:

1 Q. Okay. Would the overpass have any
2 effect on the signals and how they're bouncing
3 relative to the sensors on the car?

4 MR. DOUGLAS: Objection; scope.

5 THE WITNESS: It would not have any
6 effect on how a signal is bouncing into the car.

7 BY MR. PATNAIK:

8 Q. What about the signals emanating from
9 the car, would it change that?

10 MR. DOUGLAS: Objection; scope, form.

11 THE WITNESS: Wait. So we're talking
12 about -- we're talking about GNS signals here. GNS
13 signals come from the satellite and are received by
14 a receiver on the car. It's not a trans -- nothing
15 is transmitted by a car with respect to GNS
16 signals.

17 BY MR. PATNAIK:

18 Q. Fair.

19 What I'm asking is are there signals
20 emanating from the car sensors to help with
21 positioning?

22 MR. DOUGLAS: Objection; scope.

23 THE WITNESS: So are you talking --
24 you're talking about -- we are now moved on from
25 GNS signals. I just want to be clear that we're

1 talking about -- what type of sensors are we
2 talking about?

3 BY MR. PATNAIK:

4 Q. Are there any sensors that provide
5 signals from a car?

6 MR. DOUGLAS: Objection; scope.

7 THE WITNESS: In what context? You
8 have to be specific here.

9 BY MR. PATNAIK:

10 Q. For positioning. For autonomous
11 driving.

12 MR. DOUGLAS: Objection; scope.

13 THE WITNESS: Are you asking me in
14 general like what types of sensors self-driving
15 cars use, or are you asking me something in
16 particular about this paper? I just want to know
17 what context I'm talking about here because I
18 thought we were talking about the paper.

19 BY MR. PATNAIK:

20 Q. I'm beyond the paper. I'm asking
21 about --

22 A. Okay.

23 Q. What I'm trying to get at or
24 understand is will there be multipath effects
25 created by -- for signals that are coming from the

1 car going up to help with positioning for
2 autonomous vehicles?

3 MR. DOUGLAS: Objection; scope.

4 THE WITNESS: You said -- why are
5 these -- where are these signals? They're going up
6 to what?

7 BY MR. PATNAIK:

8 Q. I'm asking you are there any signals
9 that go from a car, an autonomous car to help with
10 positioning?

11 MR. DOUGLAS: Objection; scope.

12 THE WITNESS: Okay. Do you want like
13 a general overview of what sensors autonomous cars
14 might use? Is that what you're asking for?

15 BY MR. PATNAIK:

16 Q. There's no sensor that's providing a
17 signal from an autonomous car?

18 I mean, I'm asking a very general
19 question. And maybe it's -- I mean, I'm just
20 asking is anything coming from the car, any signals
21 coming from the sensors of the car?

22 MR. DOUGLAS: Objection; scope, form.
23 We're wandering way outside the scope here,
24 Counsel.

25 MR. PATNAIK: Let me see what he

1 says.

2 THE WITNESS: Autonomous cars use --
3 in general use many different types of sensors.
4 Some use -- there are a large number of sensors
5 that they use or can use. Even though no car is
6 fully autonomous, I'm going to make the assumption
7 here that we are talking about semiautonomous
8 features that are currently being implemented. And
9 some cars use -- don't have any signals let's say
10 that are -- don't have any signals coming --
11 emanating from the cars. Other types of cars,
12 other types of autonomous vehicles depending on the
13 manufacturer or who is -- you know, who is building
14 it, use sensors that do have active signals that
15 send signals out from a car.

16 BY MR. PATNAIK:

17 Q. Are those signals subject to
18 multipath effects? Potentially subject to
19 multipath effects?

20 MR. DOUGLAS: Objection; scope.

21 THE WITNESS: For self-driving cars
22 the signals -- multipath -- I'll put it this way.
23 Multipath is generally not an issue -- is
24 generally -- generally mostly is not -- is mostly
25 an issue for GNS signals. I have not come across

1 or familiar with multipath being a problem for any
2 other signals that might be -- may be used by a
3 self-driving car.

4 BY MR. PATNAIK:

5 Q. Are you familiar with Lidar?

6 MR. DOUGLAS: Objection; scope.

7 THE WITNESS: Very much so.

8 BY MR. PATNAIK:

9 Q. Is Lidar -- well, generally first,
10 what is Lidar?

11 MR. DOUGLAS: Objection; scope.

12 THE WITNESS: Lidar is a sensor
13 essentially light imaging detection and ranging.
14 It essentially gives you a range to a object.
15 Essentially gives you a range to an object.

16 BY MR. PATNAIK:

17 Q. Are you aware of any instances where
18 Lidar is used on a self-driving car?

19 MR. DOUGLAS: Objection; scope.

20 THE WITNESS: Yes.

21 BY MR. PATNAIK:

22 Q. Would Lidar be subject to
23 multipath -- or potentially subject to multipath
24 effects?

25 MR. DOUGLAS: Objection; scope.

1 THE WITNESS: I would say that
2 everything that we've ever done with Lidar on cars
3 we've never had to deal with multipath errors.

4 BY MR. PATNAIK:

5 Q. How about beyond cars, just robots in
6 general, have you used Lidar or aware of Lidar use
7 on robots?

8 MR. DOUGLAS: Form.

9 BY MR. PATNAIK:

10 Q. And being subject to multipath
11 effects?

12 A. I have used similar technology on
13 other robots, and we have not experienced any
14 multipath errors in anything that we've done.

15 Q. In the examples you're thinking of
16 with no multipath effects, are they ever -- do they
17 ever go under an overpass or a tunnel?

18 MR. DOUGLAS: Objection; scope.

19 THE WITNESS: I don't understand why
20 a Lidar would have any -- why a tunnel would have
21 any effect on a Lidar signal. That doesn't make --
22 it doesn't make sense.

23 BY MR. PATNAIK:

24 Q. Well, the examples you're thinking of
25 of applications of Lidar signals on robots, are

1 those all used in open-sky environments?

2 A. No.

3 MR. DOUGLAS: Objection; scope.

4 BY MR. PATNAIK:

5 Q. What type of things are prohibiting
6 or precluding them being in open-sky environments?

7 MR. DOUGLAS: Objection; scope, form.

8 THE WITNESS: It's cold outside and
9 we want to do the experiments in my lab.

10 BY MR. PATNAIK:

11 Q. Any other examples of non open-sky
12 environments in which you've used these
13 applications?

14 MR. DOUGLAS: Objection; scope.

15 THE WITNESS: It's meaningless. We
16 could do it anywhere. The idea that you need an
17 open-sky environment for a Lidar sensor makes no
18 sense. Open sky -- like as we're talking about --
19 referring to this paper is only dealing with GNS
20 signal. It's only important because of the impact
21 that it has on GNS signals.

22 BY MR. PATNAIK:

23 Q. Going back to the declaration that
24 you've adopted from Dr. Derby, there's an
25 obviousness analysis done in that, correct?

1 A. Let me go to that page.

2 Q. Well, just to be clear, I'm not
3 talking about a page. It's pretty much the whole
4 thing.

5 A. Okay. Yeah. I just want to make
6 sure I get all the legal terms correct. I've been
7 informed about them. But since it's not, you know,
8 my total area I want to make sure that I understand
9 the difference between obviousness and
10 anticipation. So I just want to make sure that I
11 understand that difference and I'm not saying
12 anything wrong from a legal standpoint.

13 Q. Sure. My understanding is that the
14 only opinion provided is an obviousness opinion,
15 there's no anticipation opinion.

16 Is that your understanding as well?

17 A. Let me just go back because I get
18 those two -- you know, I've been informed about
19 what they are. I just want to make sure that I'm
20 getting them right.

21 Q. Sure.

22 MR. PATNAIK: Will, just for
23 completeness, can you go ahead and put petitioner's
24 Exhibit 1003 into the exhibit room if he's going to
25 look at the dec.

1 MR. VIETH: Yes. Will do.

2 THE WITNESS: And I am reading page
3 25 of the exhibit. I don't know if you need to put
4 that up or not, but that's where I'm at.

5 MR. PATNAIK: Okay. I don't think we
6 need to put it up.

7 And by exhibit you mean the
8 declaration?

9 THE WITNESS: Yes.

10 All right. Yes, it is an obviousness
11 argument.

12 BY MR. PATNAIK:

13 Q. Is it your understanding that
14 obviousness is done on a patent by patent basis or
15 a claim by claim basis?

16 A. It is a -- we're looking at the
17 claims.

18 Q. And as part of that analysis I think
19 there was a discussion in the declaration about a
20 motivation to combine.

21 Do you recall that?

22 A. I do.

23 Q. And my question is, is it your
24 understanding that the motivation to combine is
25 also done on a claim by claim basis?

1 A. Can you -- sorry. I'm reading this.
2 Can you repeat the question, please.

3 Q. Sure.

4 Is it your understanding that the
5 motivation to combine analysis is also done on a
6 claim by claim basis?

7 A. So you mean that I'm looking at -- I
8 guess I don't quite understand what you mean by the
9 moti -- I'm having -- how do I explain this.

10 How would you claim -- how would
11 you -- like you're looking at motivation to combine
12 one claim with another claim? I mean, are you --
13 because you're combining -- you're looking at two
14 overall patents and saying these are in the related
15 field, but you're not just looking at the claim of
16 the combined patent.

17 So I guess I just want clarity here.
18 I want to make sure.

19 Q. I'm trying to understand the analysis
20 that you're adopting.

21 And my question is for your analysis,
22 for your motivation to combine part of your
23 obviousness analysis, was that done on a claim by
24 claim basis?

25 MR. DOUGLAS: Object to form.

1 THE WITNESS: As far as I understand,
2 it is on a claim by claim basis, I guess, as far as
3 I understand that question.

4 BY MR. PATNAIK:

5 Q. Do you have any past experience or
6 expertise in automated warehousing?

7 MR. DOUGLAS: Object to form.

8 THE WITNESS: I have done -- you can
9 see my CV. I've done an extreme amount of work on
10 autonomous vehicles and top -- robots, mobile
11 robots especially which would be directly
12 applicable to warehouse settings.

13 BY MR. PATNAIK:

14 Q. I saw on one of your past cases, I
15 think it's Okta versus Auto Store.

16 Do you recall that case?

17 A. Yes.

18 Q. And you were an expert in that case;
19 is that right?

20 A. That's correct.

21 Q. What did you opine on in that case?

22 MR. DOUGLAS: Object to scope.

23 THE WITNESS: You know, it was a
24 while ago, and I don't remember everything. There
25 were mostly -- I think it was -- it was definitely

1 some claim construction in there. We were
2 definitely talking a lot about -- definitely some
3 claim construction, and I don't remember everything
4 else that I opined on.

5 BY MR. PATNAIK:

6 Q. Did that case involve automated
7 warehouse operations?

8 A. It did.

9 Q. What aspects of automated warehouse
10 operations?

11 A. What do you mean?

12 What do you mean what aspects?

13 Q. Like generally, what about the --
14 what about automated warehouse operations was at
15 issue in that case?

16 MR. DOUGLAS: Objection; scope.

17 THE WITNESS: Honestly, I don't --
18 the case was I think a year and a half ago, or over
19 a year and a half ago. I don't remember exactly
20 what was in contention in that particular case. I
21 know it was a very, very big case, but I don't -- I
22 don't really remember.

23 BY MR. PATNAIK:

24 Q. And you testified or you opined on
25 behalf of the defendant in that case; do you

1 recall?

2 A. I'm sorry. I really don't remember
3 who was -- who was the defendant and who was the
4 plaintiff in that case.

5 Q. But it was a patent infringement
6 case; is that right?

7 A. Yes, it was a patent infringement
8 case.

9 Q. And you didn't provide any opinions
10 on validity or infringement; is that fair?

11 A. No, it's not fair. Honestly, I don't
12 remember.

13 Q. Okay. Do you recall what part of the
14 robots were at issue in that case as far as --
15 technically what parts of the robots were at issue?

16 A. I -- I don't. I'm sorry. I wish I
17 could be more helpful, but I -- there was something
18 to do with the -- actually something to do with a
19 container of some sort, but I don't -- I don't
20 really remember.

21 Q. Okay. When talking about automated
22 storage systems, are there commonalities or desired
23 characteristics of those systems that you're aware
24 of?

25 A. Can you be more specific? What do

1 you mean by commonalities with automated warehouse
2 systems?

3 Q. Are there certain goals that are
4 shared among automated warehouse -- or automated
5 storage systems?

6 MR. DOUGLAS: Object to form.

7 THE WITNESS: I mean, that's pretty
8 general. I would say one of the goal -- the goal
9 would be to reduce human labor. I would say that's
10 probably one of the goals that's shared among many
11 of these systems.

12 BY MR. PATNAIK:

13 Q. How about a desire for a small
14 footprint?

15 MR. DOUGLAS: Object to form.

16 THE WITNESS: I don't know what
17 you're referring to as a footprint.

18 BY MR. PATNAIK:

19 Q. The space that the system occupies or
20 requires.

21 A. What do you mean by system?

22 Q. The automated storage system,
23 whatever that entails.

24 A. So you're asking if having a -- just
25 so I get it clarified, get it right, you're asking

1 if it's a common goal among all automated warehouse
2 systems to have a small footprint?

3 Q. Correct.

4 A. Possibly, but I don't really see that
5 being a definite by any means. I could imagine
6 many scenarios where a small footprint isn't very
7 important.

8 Q. How about speed?

9 A. It could be a -- something that
10 people look for, but it doesn't necessarily have to
11 be a commonality among all warehouse -- automated
12 warehouse systems, no, it does not.

13 Q. Efficiency?

14 A. What do you mean by efficiency?

15 Q. We could start with cost efficient.

16 A. So cost. So not -- efficiency just
17 you mean inexpensive?

18 Q. Correct. We'll start with that.

19 A. So do you mean the overall system
20 cost, or do you mean the cost to run the system?

21 Q. Either.

22 A. You know, I would generally say that
23 in all commercial enterprises cost is an issue
24 that -- and most commercial enterprises want to
25 reduce their cost to increase their profits.

1 Q. How about energy efficiency, is that
2 an important characteristic?

3 A. What -- what energy efficiency are
4 you referring to?

5 Q. The resource it takes to run.

6 A. To run a robot, to run the entire
7 system, to --

8 Q. To run the entire system, which would
9 include the robots.

10 A. It could be, but it might also not
11 be. It depends on what your goals are as -- you
12 know, what your goals are for the warehouse. Maybe
13 you want to reduce the cost. I mean, that really
14 is not about energy, that's really about cost. So
15 maybe you want to reduce the cost in that regard if
16 you wanted to, but you may -- that may not be your
17 goal. Maybe your goal could be speed, and so you'd
18 be willing to spend more money to increase
19 the energy -- you know, and take an energy. It all
20 depends on what you want out of your warehouse and
21 what your particular needs are.

22 Q. Is safety a common goal of automated
23 warehouses?

24 A. I would argue that everybody -- that
25 everybody wants to maintain -- I mean, look, safety

1 is a common goal of all -- of everything we do.
2 And everybody always talks about safety. And
3 everybody needs to make -- maintain a safe working
4 environment, right. I mean, we got to meet OSHA
5 requirements, whatever they are.

6 Q. How about the ability to adapt an
7 existing warehouse, is that a common characteristic
8 among automated storage systems?

9 A. It all depends. It all depends.
10 Some people may want to have a current system that
11 they want -- current warehouse that they want to
12 have the system to adapt to it, other people may
13 want to build out a new warehouse. It all -- it
14 all depends.

15 Q. So the different characteristics that
16 we just went through, those are just tradeoffs
17 among whatever your aspirations are for a system?

18 A. They could be.

19 Q. You've reviewed the '632 patent,
20 correct?

21 A. Correct.

22 Q. Do you have an understanding of what
23 its overarching goal is, if any?

24 A. Reading it right now.

25 MR. PATNAIK: Will, can we go ahead

1 and put the '632 into the exhibit room.

2 MR. VIETH: Yeah. I will publish
3 that in one second.

4 I put it up in the exhibit room.

5 THE WITNESS: Is the question what
6 was the motivation of the '632 patent? Or can you
7 just repeat the question.

8 BY MR. PATNAIK:

9 Q. Is there an overarching goal of the
10 system contemplated or disclosed in the '632
11 patent?

12 MR. DOUGLAS: Object to form.

13 THE WITNESS: I don't see a
14 particular, you know, exact statement that says
15 this is the goal of the patent. There is a lot of
16 talk about, you know, its sort of background and
17 the summary of the invention.

18 I could be wrong. I mean, if you
19 point out a particular spot that says this is the
20 goal, I'm happy to read it.

21 BY MR. PATNAIK:

22 Q. Well, let's go on to Raizer.

23 MR. VIETH: Will, can we put Raizer
24 in the exhibit room.

25 BY MR. PATNAIK:

1 Q. You have Raizer, don't you,
2 Dr. Spenko?

3 A. I have it.

4 MR. VIETH: Raizer has now been
5 published in the exhibit room.

6 MR. PATNAIK: What's the exhibit
7 number, Will?

8 MR. VIETH: Exhibit 1005.

9 MR. PATNAIK: Thanks.

10 BY MR. PATNAIK:

11 Q. Why don't we turn to Paragraph 12 in
12 Raizer Exhibit 1005.

13 A. I'm there.

14 Q. I'll read part of Paragraph 12.
15 "Most prior art systems require major structural
16 changes in the facility and infrastructures, which
17 means that implementation requires 100 percent
18 overhaul of an existing warehouse right from the
19 starting gate."

20 And then I want to turn your
21 attention to Paragraph 16. "It is another purpose
22 of the present invention to provide an automatic
23 warehouse system that can be relatively
24 inexpensively and easily added to existing
25 warehouses operated by businesses."

1 Do you see that?

2 A. I see both of those, yes.

3 Q. And then the last paragraph I want to
4 draw your attention to is Paragraph 81 in Raizer
5 where it states, "Unlike existing systems, the
6 system of the invention is designed to plug and
7 play in any warehouse integrating with an already
8 in-use facility, shelving system, and
9 infrastructure resources of a conventional
10 warehouse."

11 Do you see that?

12 A. I do.

13 Q. Would you agree with me that Raizer
14 prioritizes for its system the ability to retrofit
15 an existing warehouse?

16 A. I would say that Raizer is definitely
17 touting that this is one of the benefits of the
18 system.

19 Q. In Raizer there's a reference to
20 anchor point navigation.

21 Are you aware of that?

22 Are you familiar with that?

23 A. Yes.

24 Q. What's your understanding of anchor
25 point navigation?

1 A. Based on the spec in Raizer, I think
2 that anchor point navigation is basically once the
3 mobile robot gets close to a designated anchor
4 point, it uses more precise -- let me see what it
5 says here. It will use more precise sensing and
6 motions to -- when it's around that anchor.

7 Q. And what's it doing prior to being
8 around that anchor point?

9 MR. DOUGLAS: Object to form.

10 THE WITNESS: It's going about its
11 business.

12 BY MR. PATNAIK:

13 Q. But it's doing it in a less precise
14 way; is that fair?

15 MR. DOUGLAS: Object to form.

16 THE WITNESS: I think the idea is
17 that when it gets close to the anchor point
18 navigation, it has to use more precise sensing and
19 motions.

20 BY MR. PATNAIK:

21 Q. Why does it want to use less
22 precise -- or what's the aspiration of using less
23 precise sensing and motions before it gets to
24 anchor points?

25 A. I think my interpretation of this, of

1 this anchor point navigation and, you know, I think
2 a person of ordinary skill in the art would say,
3 all right, we're going to -- this robot is moving
4 around using the sensors it needs to use to get
5 through to the course navigation, but when it gets
6 to these anchor points, you know, I think in Raizer
7 one of the examples of an anchor point was on these
8 transition zones where you got to move up from the
9 horizontal to vertical. And in those situations
10 it's like, all right, well, I got to use something
11 a little bit more precise in order to align my
12 drive system up these U-channel rails, and so at
13 that point I'll use these extra sensors. But I
14 don't need them before this, so I'm not going to
15 use them.

16 Q. Let me turn your attention to
17 Paragraph 80 of Raizer just to make sure my
18 understanding is shared with you. The end of
19 Paragraph 80 says, "This feature referring to
20 anchor point navigation provides significant
21 savings in energy and load on the sensor and
22 navigation system since the robot has to check
23 exactly where it is only when approaching its
24 destination."

25 Does that make sense to you?

1 A. Does the sentence make sense to me?
2 What do you mean by that?

3 Q. Well, the benefit of the feature
4 which is providing significant savings and energy
5 in load on the sensor.

6 A. I think it might possibly provide
7 some benefit in savings. I think the significant
8 is a bit much, personally. I think a person of
9 ordinary skill in the art would say, yeah, you
10 might get some energy savings out of that, but I
11 think the significant is a bit -- is pushing it.

12 Q. Do you have any sense or
13 understanding of what sensors are used on Raizer's
14 robots?

15 MR. DOUGLAS: Object to form.

16 THE WITNESS: The Raizer does give
17 some examples of potential sensors that might be
18 used. There's one that comes to mind, but I'd have
19 to go through and read -- you know, kind of reread
20 it to see if there's other specific examples that
21 Raizer uses.

22 BY MR. PATNAIK:

23 Q. What's the one that comes to mind?

24 A. So Paragraph 115 they talk about an
25 RFID sensor that is activated as a robot approaches

1 a designated terminal. So that's one example.
2 Again, I'd have to go through the rest of Raizer to
3 see if there's any particular examples of other
4 sensors that they talk about.

5 Q. We talked about Lidar before.
6 Would a robot like Raizer's use
7 Lidar?

8 A. It's possible. It could. It could
9 be helpful, but they might use other sensors
10 instead. It's entirely possible as well.

11 Q. What would be beneficial about using
12 Lidar on a robot like that disclosed in Raizer?

13 A. In general, Lidar gives nice,
14 accurate range information. And it's a -- on a
15 system like this it's probably relatively
16 inexpensive as well to use.

17 We've been going for about an hour
18 and a half. I'd like to take not a long break but
19 just a five-minute break to get some more water and
20 use the washroom.

21 MR. PATNAIK: Why don't we take --
22 ten-minute break is fine.

23 THE VIDEO OPERATOR: Going off the
24 record. The time is 10:37 a.m. This is the end of
25 media unit 1.

1 (Thereupon, a break was taken, and
2 then the proceedings continued as follows:)

3 THE VIDEO OPERATOR: We are going
4 back on the video record. The time is 10:50 a.m.,
5 and this is media unit number 2.

6 BY MR. PATNAIK:

7 Q. Welcome back, Dr. Spenko.

8 Did you talk to your counsel at all
9 during the break?

10 A. Chris did call me.

11 Q. Did you discuss the substance of your
12 testimony --

13 A. No.

14 Q. -- or the testimony in any way?

15 A. No.

16 Q. Going back to the anchor point
17 navigation, you'll agree that Raizer at least
18 believes that that is a unique feature of its
19 system?

20 MR. DOUGLAS: Object to form.

21 THE WITNESS: I would agree that
22 Raizer points out that it is one of several
23 features that makes his -- makes this patent -- or
24 makes the system unlike existing systems.

25 BY MR. PATNAIK:

1 Q. And anchor point navigation is
2 dependent at some level on the software at issue,
3 right? The software at use?

4 MR. DOUGLAS: Object to form.

5 THE WITNESS: What do you mean by
6 that? Can you be more specific on that?

7 BY MR. PATNAIK:

8 Q. Sure.

9 Raizer -- will you agree with me that
10 Raizer uses automated mapping? Do you know what I
11 mean by that?

12 MR. DOUGLAS: Object to form.

13 THE WITNESS: I would -- can you
14 explain what you mean by automated mapping?

15 BY MR. PATNAIK:

16 Q. Why don't we --

17 A. It could mean a few different things.

18 Q. Why don't we look at Paragraph 84 of
19 Raizer.

20 A. Okay.

21 Q. And I'm looking at the second part of
22 Paragraph 84. "The robots are preloaded with
23 proprietary software which includes the warehouse
24 layout, routes, intersections, and designated areas
25 (this mapping survey is recorded by a survey mode

1 of the robot's software). Each robot utilizes
 2 dedicated maneuvering algorithms and a proprietary
 3 fine positioning procedure to enable precise, quick
 4 and efficient loading."

5 Do you see that?

6 And maybe -- my question is like when
 7 I see that description, especially with respect to
 8 survey mode, it sounds like to me Raizer is using
 9 the robots to go out and kind of map the area.

10 A. That's a fair assessment.

11 Q. Would it be fair to call that
 12 automated mapping when the robot is doing the
 13 mapping?

14 A. I mean, he uses the term "survey
 15 mode." I don't know if the term "automated
 16 mapping" is used somewhere else in the -- in the
 17 spec here. So, I mean, I'm -- I'll just use the
 18 term here survey mode. But looks like there -- I
 19 mean, it's doing a mapping survey. So, you know,
 20 take it as he writes it there.

21 Q. And to be clear, it's the robots
 22 doing the legwork to be able to map it for that
 23 survey mode?

24 MR. DOUGLAS: Object to form.

25 THE WITNESS: It's not clear. I

1 think that a person of ordinary skill in the art
2 would see this and say, all right, so this mapping
3 survey is recorded by a survey mode of the robot
4 software. So the robot has some software on there
5 that they're naming whatever survey mode, and it is
6 doing a mapping of the warehouse layout. I mean,
7 it doesn't really quite make sense that it's not
8 really doing routes, but, you know, that, you know,
9 the warehouse layout seems to be done by the robot.
10 Or can be done by the robot. Put it that way.

11 BY MR. PATNAIK:

12 Q. How -- in Raizer from Paragraph 84,
13 what is the role of the software that's described
14 with respect to -- the aspects that include the
15 survey mode?

16 MR. DOUGLAS: Object to form.

17 THE WITNESS: You've got to be more
18 specific on that. I don't -- it's too general. I
19 don't understand.

20 BY MR. PATNAIK:

21 Q. How important is a software to the
22 workings of Raizer's robots?

23 MR. DOUGLAS: Object to form.

24 THE WITNESS: I would point out that
25 all robots have software, and it's important for

1 all robots to -- I mean, software -- I mean, maybe
2 there's some weird example out there of some robot
3 that, you know, somebody wrote some weird paper
4 about a robot that does a new software. But in
5 general, software is important to all robots.

6 BY MR. PATNAIK:

7 Q. As a POSITA, is the software
8 important to your understanding of how Raizer
9 works?

10 MR. DOUGLAS: Object to form.

11 THE WITNESS: I think a person of
12 ordinary skill in the art would see this and note
13 that the -- you know, the software here is not --
14 is not really key to understanding what's happening
15 here. There is some information about the
16 software, but overall it's not -- you know, it's
17 not -- you know, a survey mode, when he says the
18 mapping survey is recorded by a survey mode or the
19 robot software, okay, we get it, there's algorithms
20 out there that can do that, but person of ordinary
21 skill in the art would understand that and say,
22 okay, that can be done.

23 BY MR. PATNAIK:

24 Q. And that is also true for the fine
25 positioning procedure, the software used for that?

1 A. Say the question again because you --

2 Q. Sure.

3 Is that answer also applicable to the
4 software used for the fine positioning procedure?

5 MR. DOUGLAS: Object to form.

6 THE WITNESS: I'm sorry, I -- what
7 was the original -- just give me the full-on
8 question again because I got lost in my head.

9 BY MR. PATNAIK:

10 Q. Without access to the fine
11 positioning procedure software, would you still be
12 able to, as a POSITA, implement Raizer's teachings?

13 MR. DOUGLAS: Object to form.

14 THE WITNESS: What do you mean
15 without access? What do you -- I don't understand
16 what access you are given or not given with respect
17 to the software.

18 BY MR. PATNAIK:

19 Q. Do you -- well, let me ask, do you
20 need the software to understand how Raizer works?

21 MR. DOUGLAS: Object to form.

22 THE WITNESS: Like do I need -- like
23 you're saying like Raizer wrote some software,
24 programmed his robots, and I need to have access to
25 understand -- to that actual software?

1 BY MR. PATNAIK:

2 Q. Yeah. To understand how the software
3 works to accomplish what Raizer is disclosing.

4 A. I think that there are -- I think
5 that there are -- a POSITA would understand --
6 would not need to read Raizer's soft -- you know,
7 source code in order to enact this patent here. I
8 think that patent is the set of instructions to --
9 to make this patent is perfectly fine.

10 Q. You spoke earlier about the terminals
11 in Raizer system, what it does to go vertical.

12 Do you know what I'm talking about?

13 A. I did. I was referring to -- I think
14 in that particular example I was referring to
15 number 44, I believe. Or 46. I can't really tell
16 from the numbers here, but one of those numbers,
17 that sort of curved piece that's used to transition
18 from horizontal to vertical, yeah.

19 Q. And this is the way the robot goes
20 vertically?

21 MR. DOUGLAS: Object to form.

22 THE WITNESS: I mean that's -- that's
23 kind of vague. It's a -- it's the part of the
24 system that allows the robot -- or that the robot
25 uses to transition from horizontal movement to

1 vertical movement. I'll put it that way.

2 BY MR. PATNAIK:

3 Q. Well, let's go to Paragraph 111 of
4 Raizer. The end of 111.

5 Are you there?

6 A. Yes, I'm there.

7 Q. "A curved piece of rail called the
8 terminal is attached to the bottoms of the vertical
9 rails where they reach the ground. This is the
10 only place where robots could connect or disconnect
11 from the rails in order to climb to or descend from
12 the shelves."

13 Do you see that?

14 A. No. Hold on. Let me read the
15 paragraph here.

16 Yeah, you're referring to the last
17 two sentences of Paragraph 111?

18 Q. Yes.

19 A. I see that.

20 Q. So you'll agree that these terminals
21 are the only places in Raizer where the robots can
22 go vertical or descend to the ground?

23 MR. DOUGLAS: Object to form.

24 THE WITNESS: I think -- I think
25 that's -- you said that in a slightly weird way.

1 These are the locations that allow
2 the robot to transition from horizontal to vertical
3 and then vertical back down to horizontal on the
4 ground.

5 BY MR. PATNAIK:

6 Q. Okay. Let me ask it this way.

7 There's no other way disclosed in
8 Raizer to go vertically up the shelves; is that
9 true?

10 MR. DOUGLAS: Object to form.

11 THE WITNESS: Again, you said it in a
12 weird way because when it's traveling up the --
13 just the vertical rails, it's traveling vertically
14 up the shelves. So again, this is like a
15 transition piece that allow the robot to transition
16 from horizontal to vertical and vertical back down
17 to horizontal, and these are the places where it
18 does that, so.

19 BY MR. PATNAIK:

20 Q. And I'm not trying to be cute,
21 Doctor. I just --

22 A. Okay. All right.

23 Q. I want to understand the scope of
24 this terminal --

25 A. Sure.

1 Q. -- and what it means and your
2 understanding of it. I'm not trying to put words
3 in your mouth. You can correct me.

4 It's me just trying to understand are
5 these the -- are these the only entry points to go
6 vertical up the shelves from the ground as
7 disclosed in Raizer?

8 MR. DOUGLAS: Object to form.

9 THE WITNESS: So, yeah, it's
10 generally the robot cannot move, cannot transition
11 from horizontal to vertical and vice versa without
12 one of these. So the robot is not -- the Raizer
13 doesn't disclose another method to transition from
14 horizontal to vertical.

15 BY MR. PATNAIK:

16 Q. But I want to be even more clear on
17 this point.

18 It's from the ground up the shelves
19 when you say horizontal to vertical?

20 A. Yes. I'm not referring to -- I think
21 there's another disclosure in 7B where Raizer is
22 officially -- well, actually, so in that case
23 they're also using these items 44 but -- and then I
24 guess technically the robot is being -- moving
25 horizontally. But the terminal, the curved piece

1 of rail, the terminal is the only place where the
2 robots can connect or disconnect from the rails.

3 Q. And the way Raizer is set up, those
4 ramps, the U-shaped ramp at the bottom of the
5 terminal, those are facing away from the shelves
6 towards the aisle; is that correct?

7 A. So I think that that curved piece of
8 rail is the terminal. So just for the terminology
9 to be correct, that is the terminal and those do
10 face the aisle.

11 Q. They actually go into the aisle a
12 little bit, correct?

13 A. I mean, they go beyond -- they're not
14 flush with the vertical rails. I mean, there's
15 definitely some protrusion there for sure.

16 Q. The terminals help Raizer with its
17 ability to retrofit a warehouse, right, because you
18 can add it on to an existing shelving unit?

19 MR. DOUGLAS: Object to form.

20 THE WITNESS: That's not entirely
21 clear. I think the idea is that the entire
22 system -- I mean, it's like the entire system is
23 there to be retrofitted onto an existing warehouse,
24 right. So this is a, you know, it's like you could
25 put these rails, these vertical rails on any

1 vertical rail that you have in your system, right.
2 So and then the curved -- the terminals, 44, allow
3 you to transition. So in that sense they're
4 helping you -- you know, helping this system do
5 its -- you know, do its thing. I don't know how
6 else to put it.

7 BY MR. PATNAIK:

8 Q. So just to make sure I understand, so
9 Raizer system contemplates adding vertical tracks
10 to a shelving unit with the terminal at the bottom
11 so that the robots can go vertically.

12 Is that a fair characterization?

13 A. So Raizer characterizes adding rails,
14 adding these rails to existing shelving. That's
15 one of the benefits of it. Of course you could
16 build the system from scratch too. It's not like
17 it precludes that. But one of the benefits of this
18 system is that it adds on to existing shelving, and
19 the curve piece is -- that terminal piece is the
20 piece that allows the robot to transition from
21 horizontal to vertical and vice versa.

22 Q. I think you referenced it earlier
23 when we were talking about the role of the
24 terminal. If you look at Figure 11. We can go --
25 I mean it's Figure 10 and Figure 11 A, B, C, and D

1 in Raizer.

2 A. Okay.

3 Q. Those figures show the switching of
4 vertical to horizontal once you're up in the
5 shelving unit, fair?

6 A. Figures 10, 11, A and B -- let me go
7 back to the -- let me go back to Raizer where he
8 describes them.

9 Yeah, so Figure 10 schematically
10 shows the junction between vertical and horizontal
11 rails. And then Figure 11 A through E show how the
12 robot is changing from travelling in a vertical
13 direction to the horizontal direction at that
14 junction between those rails.

15 Q. And for -- this is when we're in the
16 shelves north of the ground, vertical to the
17 ground, correct?

18 MR. DOUGLAS: Object to form.

19 BY MR. PATNAIK:

20 Q. Let me -- I'll retract that question.
21 Let me ask it a different way.

22 The Figure -- Figure 11 A, B, C, and
23 D is only utilized when the robot is off the
24 ground, up the terminal, and in the shelving units?
25 Or on the side of the shelving units?

1 A. Not necessarily. If you had a lower
2 shelving unit that you needed to get to and you had
3 one arm -- it's very reasonable that you could have
4 one arm that has reached the junction at the
5 proper -- and while your other arm is still on,
6 either on the ground or in the junction, in that
7 curved junction 44. So it's entirely possible you
8 could do that.

9 Q. How many terminals -- how many
10 terminals can there be in Raizer's system on a
11 given shelving unit?

12 MR. DOUGLAS: Object to form.

13 THE WITNESS: I don't recall any
14 specific point in Raizer that talks about a
15 limitation to the number of terminals.

16 BY MR. PATNAIK:

17 Q. Would it make sense to have multiple
18 terminals on a shelving unit if you're also going
19 horizontal through Figure 11 once you're in the
20 shelves?

21 MR. DOUGLAS: Object to form.

22 THE WITNESS: I just want to make
23 sure we're thinking the same.

24 Can you rephrase that, or do you have
25 like a drawing or something? Like what -- what do

1 you mean?

2 BY MR. PATNAIK:

3 Q. Let's back up a second.

4 So my understanding of Raizer is that
5 the terminal is the infrastructure used to get the
6 robot from the ground to go vertical up the
7 shelves, fair?

8 A. That's fair.

9 Q. Okay. And then there's this other
10 thing in Figure 11 that's used to help transition
11 once in the shelving unit the robot from going
12 vertically to going horizontally across the shelves
13 to a given storage site; is that fair?

14 A. Yeah, that's fair.

15 Q. My question is why go up multiple
16 vertical posts on a shelving unit from multiple
17 terminals if you also have the ability -- or you
18 already have the ability to go horizontally across
19 the shelves once you're vertical, you're above the
20 ground?

21 MR. DOUGLAS: Object to form.

22 BY MR. PATNAIK:

23 Q. Does that make sense?

24 A. Why go -- why have multiple -- so
25 kind of, but I just want to make sure because I'm

1 envisioning something in my head. And I know from
2 teaching students that half the times that I'm
3 envisioning something in my head, they're
4 envisioning something different. So I just want to
5 make sure what's in my head is the same thing
6 that's in your head on this one.

7 Q. Let me back up again. So the -- I'm
8 trying to understand what number of terminals makes
9 sense on the system. On a shelving unit.

10 A. Okay.

11 Q. And you're telling me -- what is the
12 number that makes sense for you?

13 MR. DOUGLAS: Object to form.

14 THE WITNESS: Well, I think that's a
15 design decision that a POSITA would have to make in
16 their warehouse. It depends on the warehouse and
17 how it's set up. You know, how you want to
18 configure it. I think that's kind of like one of
19 the -- supposed to be, you know, these benefits of
20 these systems is that you -- there are -- you know,
21 you set it up the way you want to in your
22 particular warehouse.

23 BY MR. PATNAIK:

24 Q. All right. I may come back to that.
25 With the terminal, Raizer's robots

1 are -- when they descend, they come out in the
2 aisle again, correct?

3 A. They descend. As they descend from
4 the vertical they are back into the aisle, yes.

5 Q. Let's switch gears and turn our
6 attention to Hangzhou.

7 MR. PATNAIK: Will, what exhibit
8 number is Hangzhou?

9 MR. VIETH: That's Exhibit 1006. I
10 will move that into the public as well. And to be
11 clear, that's the English translation of Hangzhou.

12 BY MR. PATNAIK:

13 Q. I assume you've read this, right,
14 Doctor, and considered it?

15 A. Yes.

16 Q. Why does Hangzhou need two layers
17 under the bottom shelf?

18 A. What do you mean by the two layers?

19 Q. Well, I'll direct you to Paragraph
20 474 of the declaration that you're adopting.

21 A. I'm there.

22 Q. And my question is why does Hangzhou
23 need two layers under the bottom shelf?

24 A. The lower layer is used for the robot
25 to travel in.

1 Q. Why does Hangzhou need to drop off a
2 container when it wants to turn 90 degrees under
3 the req?

4 A. Could you highlight where that is
5 said.

6 Q. Look at Hangzhou Paragraph 73.
7 Exhibit 1006, Paragraph 73.

8 A. Okay. Yeah, I finished reading it.
9 Can you ask the question again.

10 Q. Why does Hangzhou need to drop off
11 the container before it turns 90 degrees?

12 A. Presumably to I think -- again, I
13 think you could read this -- a POSITA would read
14 this and say that you don't want the containers to
15 turn as well. You don't really need them to so,
16 you know, drop the container in there and spin
17 around.

18 Q. There's nothing like the Raizer
19 survey mode disclosed in Hangzhou, is there?

20 MR. DOUGLAS: Object to form.

21 THE WITNESS: I'd have to go through
22 the thing and identify if there is or if there
23 isn't. To my recollection, I don't -- I don't -- I
24 simply don't know.

25 BY MR. PATNAIK:

1 Q. My understanding of Hangzhou, and I
2 want you to correct me if I'm wrong, is that
3 Hangzhou was more of a manual, it was pre-mapped
4 routes that were permitted by the -- permitted for
5 the robots.

6 MR. DOUGLAS: Object to form.

7 THE WITNESS: I don't understand what
8 you mean by pre-mapped routes.

9 BY MR. PATNAIK:

10 Q. Well, if you go through the
11 embodiments, like Figure 10, for instance, it
12 highlights the routes that were available to
13 Hangzhou. Hangzhou's robots.

14 A. Yeah. Figure 10 looks at, you know,
15 at all the -- a number of different routes that
16 these robots can take.

17 Q. And there's nothing in Hangzhou that
18 discloses where the robots are the ones surveying
19 the warehouse and figuring out what the routes are
20 that are available?

21 MR. DOUGLAS: Object to form.

22 THE WITNESS: Again, I'd have to go
23 through the document and identify if there is or if
24 there isn't. I -- which we can do, but to my
25 recollection, I can't answer that.

1 BY MR. PATNAIK:

2 Q. Do the robots in Raizer also need to
3 drop off their items before turning 90 degrees?

4 A. There's nothing in Raizer that I know
5 of that talks about dropping off any items.

6 Q. There was also -- I mean, I know it
7 wasn't one of the obviousness references, but there
8 was a reference to Goren as far as prior art.

9 Do you recall that?

10 A. Yes.

11 Q. Goren actually disclosed two
12 different robots, right, like a floor robot and a
13 lift robot; is that right?

14 A. Let's take a look at Goren and see.

15 It describes two robots, one or more
16 lift robots and floor robots.

17 Q. That's similar to Hangzhou, correct,
18 with two different types of robots; the trolley in
19 Hangzhou and then the stacking robot?

20 A. It has similarities to Hangzhou in
21 that there's two different types of robots that are
22 performing two distinct tasks. Or let me rephrase
23 that.

24 I wouldn't say two distinct tasks,
25 but are doing different tasks.

1 Q. And both are -- one robot is going on
2 the floor, the other robot is lifting things up
3 shelves, true, in both --

4 MR. DOUGLAS: Object to form.

5 BY MR. PATNAIK:

6 Q. -- references?

7 A. Yeah. So it's using these -- it's
8 using floor robots to travel along -- among all the
9 shelving units on the floor, and then it's using
10 lift robots to move independently of those floor
11 robots vertically over the -- over the shelving
12 units and transfer it -- that want transfer
13 containers between the shelves and the floor
14 robots.

15 Q. And you're speaking of Goren right
16 now?

17 A. I'm speaking of Goren. So in that
18 sense it has similarity to Hangzhou, which uses
19 robots to travel, you know, on the floor, and then
20 other robots to move material from the -- from the
21 vertical shelves to some -- you know, some spot.
22 So there are some similarities there.

23 Q. I was a little confused why Goren was
24 even disclosed.

25 Is there anything that Goren adds

1 that's not already in Hangzhou?

2 MR. DOUGLAS: Object to form.

3 THE WITNESS: I think Goren simply
4 points out that the -- that travelling underneath
5 shelves was well-known at the time that the '632
6 patent was published.

7 BY MR. PATNAIK:

8 Q. Do you have an opinion about which of
9 the robots between those used in Raizer and those
10 used in Hangzhou are more complex?

11 MR. DOUGLAS: Object to form.

12 THE WITNESS: Flexity is a -- excuse
13 the pun, a complex issue. So in what form do you
14 mean -- you know, what do you mean by complex? It
15 can mean a lot of different things.

16 BY MR. PATNAIK:

17 Q. I think the goal of Hangzhou, at
18 least in part, was easy to deploy, convenient to
19 maintain, and cheap.

20 You'll agree with that?

21 MR. DOUGLAS: Object to form.

22 THE WITNESS: Do you have a specific
23 location in the Hangzhou patent that has those
24 terms in it?

25 BY MR. PATNAIK:

1 Q. Yeah. Give me one second.

2 Why don't we look at Hangzhou's
3 abstract in Exhibit 1006. At the end of the
4 abstract it says, "The system is easy to deploy,
5 convenient to maintain, and low in cost. A large
6 number of robots operate concurrently by means of
7 dispatching systems so that the overall efficiency
8 is high."

9 A. So those are the claims by Hangzhou,
10 that's what he thinks -- or Hangzhou thinks is some
11 of the benefits of that system.

12 Q. Are Hangzhou's robots faster or
13 slower than Raizer's system?

14 MR. DOUGLAS: Object to form.

15 BY MR. PATNAIK:

16 Q. Do you know?

17 A. Are they faster? So do they move at
18 a higher speed, or do they complete the job faster?

19 Q. The latter.

20 A. Do they complete the job of
21 transitioning an object on a shelf to some
22 distribution point?

23 Q. Yeah.

24 A. I think no POSITA could tell what the
25 speed of the robot is based upon the patent. And

1 it would depend highly on what type of robot you
2 actually build.

3 Q. Well, I'm talking about the robots
4 that are disclosed in the patents.

5 A. I understand. I guess I mean how
6 fast do you want to run them. I mean, as a POSITA
7 that's one of your design decisions. Do you use
8 high quality things that go faster, or, you know,
9 do you use bigger motors. Those go faster on your
10 robots.

11 You know, like it all depends. It's
12 all the engineering. You know, the speed in which
13 these things operate is all dependent on the
14 engineering that you do.

15 Q. Would you agree with me that the
16 stacking robot in Hangzhou is going to be faster
17 than a vertical climbing robot in Raizer,
18 especially with the use of the terminal and the
19 arms to be vertical?

20 MR. DOUGLAS: Object to form.

21 BY MR. PATNAIK:

22 Q. All else being equal?

23 A. No. It might be, it might also not
24 be.

25 Q. You don't think Raizer's functioning

1 with the use of the arms and going vertical is a
2 little more complex than Hangzhou's?

3 MR. DOUGLAS: Object to form.

4 (Simultaneous speaking.)

5 THE WITNESS: What kind of complexity
6 are you talking about?

7 BY MR. PATNAIK:

8 Q. We'll stay with time.

9 Don't you think it takes longer to do
10 Raizer's robot than Hangzhou's two robots?

11 MR. DOUGLAS: Object to form.

12 THE WITNESS: I think any POSITA
13 would be guessing there. I think it depends on the
14 actual implementation and the engineering involved
15 in this. And you say with all things equal, but
16 all things are not equal. It's -- different robots
17 have different components in it. You can't just
18 use the same components in every -- in all these
19 robots.

20 BY MR. PATNAIK:

21 Q. How do Hangzhou's robots know how to
22 get around the floor?

23 A. What do you -- that's very vague.
24 What do you mean by how does a robot know how to
25 get around the floor? That's -- what do you mean?

1 Q. No, no. I'm being specific.

2 How do Hangzhou's robots know where
3 to go on the automated floor in the warehouse?

4 MR. DOUGLAS: Object to form.

5 THE WITNESS: I'm sorry. I -- I'm --
6 how does a robot know where to go on the floor? I
7 mean --

8 BY MR. PATNAIK:

9 Q. Is there anything disclosed in
10 Hangzhou that shows a POSITA how it maps the
11 warehouse at issue?

12 MR. DOUGLAS: Object to form.

13 THE WITNESS: Anything... say the
14 last part of the question, how it maps to position?
15 How it maps its position?

16 BY MR. PATNAIK:

17 Q. How it maps the warehouse.

18 A. Where does it say in there that it
19 maps the warehouse?

20 Q. Is it your position that it doesn't
21 need to map the warehouse?

22 MR. DOUGLAS: Object to form.

23 THE WITNESS: All right. Let me take
24 a look here, I guess.

25 Actually, I'm just looking at -- I'm

1 sorry. We're talking about Hangzhou, correct?

2 MR. PATNAIK: Correct.

3 THE WITNESS: All right. I'm just
4 looking at the Hangzhou here.

5 So I don't see the word "map" in
6 Hangzhou, so I think that was your question.

7 BY MR. PATNAIK:

8 Q. So is it your position mapping is not
9 required for these robots to get around the
10 warehouse?

11 MR. DOUGLAS: Object to form.

12 THE WITNESS: Do you mean -- what
13 kind of mapping? Is this mapping done by the
14 robots or just a general map?

15 MR. PATNAIK: Either.

16 THE WITNESS: That you have?

17 MR. PATNAIK: Either. I'm just
18 asking for what's disclosed in Hangzhou and how it
19 does it.

20 THE WITNESS: I think a person of
21 ordinary skill in the art wouldn't really care that
22 much like if it's disclosed or not. I mean,
23 getting around the warehouse is not a hard -- is
24 not hard. You either have -- you know, you could
25 have the robots do the mapping, you could create a

1 map beforehand, and -- but generally, I mean, could
2 you do it without a map, yeah, probably. But
3 generally that's not good practice. Generally you
4 would go with -- you would create a map of some
5 sort.

6 BY MR. PATNAIK:

7 Q. Is there any disclosure in Hangzhou
8 on how its trolley robots determine the layout of
9 the warehouse?

10 A. I don't see anything specific in
11 Hangzhou that talks about that, you know, that
12 layout. But again, I don't think it's that
13 important. I think a person of ordinary skill in
14 the art sees this and is like all right, well,
15 create a map. Like, done. Not an issue.

16 Q. Am I correct that your obviousness
17 analysis implements Hangzhou's ability to go under
18 the shelf with Raizer's robots that can go
19 vertical?

20 A. What do you mean by implements? Like
21 Hangzhou implements -- yeah, could you just clarify
22 what you mean by implements.

23 Q. Well, let me back up then.

24 Your obviousness analysis is
25 basically combining these two references, correct?

1 A. It's looking at Raizer in view of
2 Hangzhou.

3 Q. Right.

4 And I'm asking more specifically the
5 parts of Hangzhou that you're looking at -- the
6 robot's ability to go under the shelves combined
7 with Raizer's robots, true?

8 MR. DOUGLAS: Object to form.

9 THE WITNESS: I think Raizer itself
10 shows the robots can go under the shelves. But in
11 addition to that you could look at Hangzhou to say
12 even if you don't believe that, look at Hangzhou
13 and it shows you to go underneath the shelves.

14 BY MR. PATNAIK:

15 Q. Well, let's look at the declaration
16 in Paragraph 110.

17 It states, "A person of ordinary
18 skill in the art" --

19 A. Sorry. Hold on. I'm not there yet.

20 Q. Sure. This is Exhibit 1003.

21 A. All right. I'm there.

22 Q. It states, "A person of ordinary
23 skill in the art would have combined these
24 references to provide the system of Raizer with
25 reduced congestion and prevention of traffic jams

1 while also maximizing efficient use of space, such
2 as by running the robots of Raizer and passages
3 under the shelves as disclosed in Hangzhou in order
4 to organize the routes of traffic in and around the
5 warehouse to reduce congestion and prevent traffic
6 jams when the robots are busy filling in orders as
7 disclosed in Raizer."

8 Do you see that language?

9 A. I see that.

10 Q. Is the modified system that you
11 envision where you combine these two references,
12 you're using Raizer's robots, true?

13 A. Yes.

14 Q. And that's because Hangzhou's robots
15 don't show climbing vertically in part, right?

16 MR. DOUGLAS: Object to form.

17 THE WITNESS: I don't know how to put
18 it other than you look at Raizer's robots, and then
19 in view of Hangzhou's ability to run them under
20 shelves, and I don't know, that's how I'm looking
21 at this, at this combination of the two patents.

22 BY MR. PATNAIK:

23 Q. So, I mean, this combination in part
24 is to help eliminate the need for Hangzhou's
25 stacking robot, right?

1 A. I don't think so. I think the
2 combination is there just to show here's Raizer,
3 and, you know, Hangzhou shows that we can go
4 underneath the shelves and turn around and all that
5 stuff. So it's not about eliminating any sort of
6 stacking robots, it's mostly like here's Raizer and
7 in view of Hangzhou, let's move around underneath
8 the shelves and spin in place.

9 Q. Give me one second.

10 So is it your testimony that in your
11 combination you could still use the stacking
12 robots?

13 A. No, I didn't say that.

14 Q. Maybe I misunderstood. You say it's
15 not about eliminating any sort of stacking robots,
16 so I'm trying to understand the system you envision
17 here.

18 A. I'm simply pointing out like take a
19 look at Raizer, right, the systems of Raizer. And
20 it says it right here at 110, you pointed it out
21 here, so such as by running the robots of Raizer in
22 passages under shelves as disclosed in Hangzhou.
23 So I'm not talking about any type of vertical
24 robots, that's all I'm -- that's all I'm talking
25 about.

1 Q. To modify Raizer so that you can have
2 the robots go under, you would need to elevate the
3 lowest shelves in Raizer, is that right, to make
4 the room for those robots?

5 A. Elevate them from what?

6 Q. From what's disclosed in the patent
7 right now where they're close to the ground.

8 A. I don't think there's any disclosure
9 in the patent. I mean, the patent has pictures
10 of -- you know, it's all relative. You say close,
11 taller, I mean, it's all relative.

12 Q. So it's your testimony that you don't
13 have to change anything on Raizer's shelving units?

14 A. I think the pictures depicted in
15 Raizer are one embodiment and show an illustration
16 of what a shelf is, but I don't think it's like the
17 only shelf -- Raizer is not saying this is the only
18 shelf you could use, it's just saying here's a
19 shelf, here's what a general shelf looks like.

20 The important part is not the shelf
21 here, the important part is the robot and the rails
22 in that system.

23 Q. So there's nothing in Raizer you
24 would need to change to make room for the robots
25 underneath the shelves?

1 A. My point in Raizer is I think perhaps
2 there's some implication there that these shelves
3 are the only shelves that Raizer -- that the Raizer
4 robot could work on even in view of Hangzhou to
5 travel underneath. And I'm saying that Raizer's
6 pictures of shelves are simply just that, pictures
7 of generic shelves that -- and there's nothing more
8 to that.

9 Q. Raizer was published before Hangzhou
10 was filed, correct?

11 A. So let's take a look. And excuse me
12 because I get these confused all the time. There's
13 always like five dates on these patents. So let's
14 take a look here. And you can correct me if I'm
15 wrong, but I'm looking at PCT filed, and -- so on
16 Raizer, and that is July 9, 2015. And so PCT, I'm
17 not exactly sure what PCT -- the acronym for PCT
18 stands for, I must admit that.

19 So it's my understanding that that is
20 though the filing date, and so July 9, 2015. And I
21 think you asked for Hangzhou, and it looks like
22 Hangzhou applied January 15, 2019. Although
23 there's the public -- application publication date
24 of July 9, 2019.

25 Q. I guess let me follow up then.

1 A POSITA drafting Hangzhou would have
2 been aware of Raizer's robots, right?

3 MR. DOUGLAS: Object to form.

4 THE WITNESS: A POSITA -- I think
5 that in the POSITA -- okay. So let me see. July
6 9, 2015, July -- yes. January 11, 2017 Raizer. So
7 a POSITA who did his homework and looked at other
8 application -- other patents could have been aware
9 that Raizer existed.

10 BY MR. PATNAIK:

11 Q. Is there any reason why Hangzhou
12 didn't adopt the robots in Raizer?

13 MR. DOUGLAS: Object to form.

14 BY MR. PATNAIK:

15 Q. In your opinion?

16 A. You'd have to ask Hangzhou on that.

17 Q. You're talking -- go ahead.

18 A. Sorry. We're coming up on another
19 hour here, and I'd like to have lunch in a little
20 bit. I can go for a few more minutes, but then I'd
21 like to have a lunch break.

22 Q. Okay. Give me one second.

23 You were talking about the embodiment
24 in Raizer and the figures, and how the shelving
25 units don't necessarily disclose that you have to

1 move or elevate the lower shelf.

2 Did I get that right?

3 A. No. All I said was that the shelving
4 units in Raizer were one depiction of shelves. And
5 I think that they're not necessarily the exact type
6 of shelves you need to use for Raizer to work.

7 Q. Is it your position that the figures
8 in Raizer aren't necessarily to scale?

9 A. No, I didn't say that. All I said
10 was that the shelving units were one depiction of
11 shelves that could be used.

12 MR. PATNAIK: Okay. Why don't we
13 take a break.

14 THE VIDEO OPERATOR: Going off the
15 record. The time is 11:47 a.m. This is the end of
16 media unit number 2.

17 (Thereupon, a break was taken, and
18 then the proceedings continued as follows:)

19 THE VIDEO OPERATOR: We are going
20 back on the video record. The time is 12:22 p.m.,
21 and this is media unit number 3.

22 BY MR. PATNAIK:

23 Q. Dr. Spenko, did you discuss the
24 substance of your testimony during our break, our
25 lunch break?

1 A. No.

2 Q. Did you meet with counsel?

3 A. No.

4 Q. Let's do this. I want to try to do
5 some drawings on Figure 1 from Raizer. This is
6 going to be a little clunky, Doctor, because it's
7 on Zoom. But I'm going to do my best, and so bear
8 with me a little bit.

9 So we have in front of you Figure 1
10 from Raizer. And you're welcome to confirm that if
11 you want.

12 A. Yes.

13 Q. So what I want to do is kind of go
14 through different permutations with the combination
15 of Hangzhou and Raizer, okay?

16 A. Okay.

17 Q. What's possible.

18 A. I'm sorry to interrupt. Can you just
19 change the screen so that the entire figure is
20 shown. Thanks.

21 Q. Is that big enough for you to see?

22 A. I can see it now. Thank you.

23 Q. All right. Why don't we start with
24 the row adjacent to F1. The top row. And let's
25 say I want to get something to B4, let's say the

1 third shelf up.

2 Doctor, why don't you put where -- or
3 why don't you tell Will where you would want to
4 place the terminal that's disclosed in Raizer.
5 I'll give you -- wherever you want to put it on B1
6 or the row adjacent to F1.

7 A. Well, you're making the assumption
8 that there's just one terminal.

9 Q. I'm saying you can put as many
10 terminals as you want, and you can do whatever you
11 want with it.

12 A. So -- all right. Let me go back to
13 the description of this here. Hold on a second.

14 Okay. What are your goals -- what
15 are like your overall design goals that you have
16 for your system?

17 Q. Well, I'm assuming -- I'm assuming
18 right now that we're using Raizer as disclosed, and
19 I'm adjacent to -- I'm looking to get a delivery to
20 B4, the third shelf up.

21 A. Okay.

22 Q. And I'm starting at F1.

23 A. You're starting at F1.
24 What's starting at F1?

25 Q. The robot is at F1.

1 A. So the robot is at F1 and it needs to
2 get to B4?

3 Q. Yes.

4 A. So what's the overall design goal?
5 So that's like the specific goal for the, you know,
6 I have one location that I want to get, but what's
7 the overall goal of the system that you're trying
8 to set up?

9 Q. I'm actually just trying to use
10 Raizer as disclosed right now.

11 A. No, I get that. I can use Raizer as
12 disclosed, but as -- acting as a person of ordinary
13 skill in the art, we're trying -- we're not just
14 setting up this -- you're not, like you're just
15 saying, hey, here's Raizer, let's just set it up so
16 that we can pick off one shelving unit, right.
17 Like you're going to set it up as Raizer is
18 disclosed to automate most if not all of this
19 warehouse.

20 So I want to know what your design
21 goals are for the whole warehouse because you're
22 just talking about this one particular instance in
23 isolation, but that's not how anybody would design
24 the system.

25 Q. So, okay, if you take Raizer as

1 disclosed, we know that one of its priorities we
2 went through is to be able to be retrofitting a
3 prior warehouse, right?

4 A. Right.

5 Q. So we should assume that.

6 A. Got it.

7 Q. What other parameters would you like?

8 A. Well, you know, where are -- where do
9 you want to go in the system? Do you want to go
10 how many robots do you have, how much, you know --
11 you know, that would be a good start. Like where
12 do you want to go? Where do you want to go in the
13 system and how many robots are you going to
14 purchase? Let's start there.

15 Q. For the sake of this exercise why
16 don't we presume we're just doing one robot at a
17 time just to show the potential path given the
18 parameters that we know exist in Raizer as
19 disclosed.

20 A. I guess I wasn't clear in my question
21 there. Obviously, yeah, for maybe the sake of this
22 hypothetical here we can go with one robot at a
23 time. But are you just saying I'm going to set up
24 this automated warehouse and I'm just going to buy
25 one robot and just have one robot operate in this

1 entire warehouse, or do you have multiple robots --
2 let me finish, do you have multiple robots working
3 in this warehouse, and then we're just going to
4 focus and isolate on one of those robots for this
5 particular hypothetical?

6 Q. The latter.

7 A. Okay. So I've got multiple robots
8 that I am going to design this system for. And
9 that's my question, how many of those do we have?

10 Q. What number makes sense to you?

11 A. It all depends, right. How much
12 money do you have to spend on your automation in
13 your warehouse. How fully do you want to automate
14 this thing. The more robots we have, things can --
15 you know, things can -- we can -- we have more
16 potential for problems, but we also have more
17 opportunities for, you know, faster times, right.

18 So there's all a big trade-off here.
19 And I want to know what you are trying -- what's
20 your design goals here for this system.

21 Q. Are the number of robots a parameter
22 that's disclosed in any embodiment of either Raizer
23 or Hangzhou?

24 MR. DOUGLAS: Object to form.

25 BY MR. PATNAIK:

1 Q. Their disclosures are provided?

2 A. Well, I don't think they have to be.
3 I think a person of ordinary skill in the art,
4 whether they are or not, I think that the systems
5 are set up for multiple robots. And I think a
6 person of ordinary skill in the art clearly
7 identifies that there would be multiple robots
8 here. There's multiple pictures throughout Raizer
9 that show multiple robots.

10 For example, the picture on the front
11 page shows a system of three robots. Shows an
12 example. There's multiple examples in Hangzhou
13 when you look at the figures that show multiple
14 robots, you know, top down view of multiple robots.
15 So I think it's pretty clear to a POSITA that the
16 system is set up to use multiple robots.

17 Q. And I'm agreeing with you that we're
18 using multiple robots.

19 A. Great. How many do you want?

20 Q. Does it matter for this exercise?

21 A. Yeah. Yeah, it does matter. Because
22 if you were to tell me that you had a very few
23 number of robots then I'd say, all right, well,
24 let's not spend more money on multiple junctions
25 where we can get into the -- fit into the vertical

1 or transition from the horizontal floor to the
2 vertical.

3 If you said if we had -- well, if we
4 had more we'd have to -- you know, I would say,
5 well, if we had more then we're going to need to
6 add more junctions because we want to have more
7 places for robots to -- more pathways for the
8 robots to move through.

9 Q. Where are those issues disclosed in
10 either of those references?

11 A. I mean, I think a person of ordinary
12 skill in the art reads the references and clearly
13 sees this. This is an issue where we're trying
14 to -- you know, it's just like more pathways gives
15 us more opportunities.

16 Q. So you can't go through this
17 hypothetical until you know the number of robots?

18 A. I want to be sure that you are not
19 saying that we just have one single robot --

20 Q. We've passed that. I've already said
21 we have it. I already said multiple robots, so
22 we're past that.

23 A. Could you agree in this hypothetical
24 that we have a large number of robots so that, you
25 know, we could have many multiples of them on the

1 floor and on vertical rails and horizontal rails on
2 the shelving at the same time?

3 Q. Okay.

4 A. So we have a giant system with many
5 robots in this that are capable to be both on the
6 floor and the wall at the same time. So if that is
7 the situation, I would put junctions -- I could put
8 them at any one of those rails across B1 through
9 B6. Exactly which ones, I don't know. But I would
10 start with maybe three and see which ones -- see
11 which ones -- that's how that works. And then
12 maybe move on from there and add more as needed.

13 Q. And when you're saying junction
14 you're talking about the terminal, right?

15 A. I'm sorry. I thought that was the
16 question.

17 Q. I was asking about the terminal.

18 A. Yeah. I thought that was the name
19 that they used.

20 Q. I just want to be clear, the
21 nomenclature I'm -- the terminal is that ramp we
22 discussed earlier today.

23 A. 44, correct?

24 Q. Yes, that's right.

25 A. Yeah, I guess I used the wrong term.

1 I guess I used the term "junction." I thought that
2 they maybe had used junction. Maybe I'm getting
3 mixed up. But I think we're -- we're both
4 referring to 44.

5 Q. Okay. So where do you want -- where
6 do you want it?

7 A. Let's put one in the middle. Yeah.
8 And let's start one in the middle, and let's go
9 start at either end. We'll start there.

10 So this would be -- I want to make
11 this clear, this is a starting point. If you were
12 to say this is exactly where, you know, a POSITA
13 would put them, I disagree. I would think that the
14 POSITA would see this to be a good starting point
15 and see how the system runs.

16 Q. Okay. So we used red dots to signify
17 the terminals in the row adjacent to F1, and I'm
18 trying to get to I think I said B4 before in that
19 row.

20 A. Okay.

21 Q. And we're starting -- our starting
22 point is where the F1 arrow is.

23 A. I see that.

24 Q. Okay. So which terminal would you
25 like it to go vertical on of the three that we've

1 indicated?

2 A. Well, it has two options here. And
3 you can either go in the first one or the second --
4 the one in the middle. Let me rephrase that.

5 You could go to the one on the left
6 or you could go to the one in the middle so that we
7 can be clear.

8 Q. Okay. And this is Raizer as it
9 currently exists?

10 A. What do you mean that this is Raizer
11 as it --

12 Q. Obviously this analysis modifies
13 Raizer to make it permissible to go under, right?
14 I'm just starting with an example of Raizer as it
15 currently exists without your modification.

16 MR. DOUGLAS: Object to form.

17 THE WITNESS: I think the
18 modification is irrelevant in this case. You're
19 simply -- you simply asked me if I need -- if I'm
20 starting in F1, so I'm assuming -- maybe I mis --
21 maybe I have this incorrect, but F1 seems to be in
22 the aisle right there.

23 BY MR. PATNAIK:

24 Q. You're right. You're right.

25 A. If F1 is in the aisle, if the robot

1 is in the F1 on the aisle, and it needs to get to I
2 think you said third shelf up in B4 --

3 Q. Yeah.

4 A. And I'm assuming -- yeah, this is
5 aisle 1 before that you have just highlighted, then
6 yes, it's -- I mean, I stand by my statements.
7 Whatever I said so far, I stand by my statements.

8 Q. Do you care which one of the two that
9 you pointed to as far as the terminal is the left
10 one or the center one?

11 A. Do I care?

12 Q. Uh-huh.

13 A. I think you need to set up -- you
14 know, I don't think -- I don't think it's going to
15 make -- for a single robot in this hypothetical,
16 when I have a single robot going -- that's the only
17 thing that's operating, a single robot, nothing
18 else is going on in this situation, I don't think
19 it matters much.

20 Q. Okay. So why don't we go up, Will,
21 just draw a line from F1 to the middle terminal.
22 And this is in yellow. And then we'll assume it
23 goes vertical to the third shelf up from there.

24 Are you with me, Dr. Spenko?

25 A. I'm with you.

1 Q. And then it goes to B4.

2 Is that a fair representation of how
3 Raizer --

4 THE COURT REPORTER: I'm sorry --

5 THE WITNESS: There was an audio
6 problem there. Can you repeat?

7 BY MR. PATNAIK:

8 Q. Yeah.

9 Is that a fair representation of how
10 Raizer as disclosed works or looks to work?

11 MR. DOUGLAS: Objection;
12 mischaracterizes.

13 THE WITNESS: I think it's a -- fair
14 representation... I think everything disclosed in
15 Raizer would indicate to a person of ordinary skill
16 in the art that this is a reasonable way to set up
17 your -- to set up your warehouse.

18 BY MR. PATNAIK:

19 Q. And then if it wanted to go down it
20 could just go back on the same path, go to the
21 terminal, go down the terminal, and then back to
22 the floor?

23 MR. DOUGLAS: Object to form.

24 THE WITNESS: Can you repeat -- you
25 said if it wants to go down.

1 BY MR. PATNAIK:

2 Q. Well, at some point the robot wants
3 to go back on the ground, correct?

4 A. I think that is reasonable to assume
5 the robot is going to go to the ground to return to
6 a picking station.

7 Q. All right. It could go back the same
8 path it came, correct?

9 A. It could, yes.

10 Q. And it could go back down on a
11 different terminal, one of the other three,
12 correct?

13 A. It's possible.

14 Q. Okay. That's fine. Let's move to
15 another example.

16 This one is going to presume that
17 we've modified Raizer so that you can go under the
18 aisles -- or under the rows, the shelving rows,
19 okay?

20 A. Okay.

21 Q. We're going to start at F3 as a
22 starting point of the robot. All the same other --
23 you can -- the same assumptions you made for the
24 previous one, and we want to deliver to B4 in the
25 row adjacent to F4 because I want to show going

1 under, right?

2 A. Okay. So we're starting in F3.

3 Q. Uh-huh.

4 A. And we want to go to B4 in F4.

5 Q. Yeah.

6 MR. PATNAIK: Will, let him tell you
7 where the terminals are. I don't want you to put
8 anything on it without Dr. Spenko telling you where
9 to put them.

10 But we're going to the B4 in the row
11 adjacent to F4. So you can underline that B4,
12 Will, in a different -- a color other than yellow.
13 Can you put it under that B4, not over it?

14 BY MR. PATNAIK:

15 Q. Okay. Same third shelf up -- or not
16 same, but a third shelf up.

17 Okay, Dr. Spenko?

18 A. I understand the -- I understand the
19 setup here.

20 Q. Where would you like to put the
21 terminals on the row adjacent to F4?

22 A. Let's -- so in this case I'm going to
23 continue -- I'm going to start off and I'm going to
24 sort of start off and say that my initial
25 configuration for these terminals, I'm going to put

1 them on each -- you know, each end in the middle of
2 all the rows.

3 Q. Each end in the middle? Okay.

4 A. Yeah.

5 Q. Got it.

6 So those are all going to be red just
7 like the prior. Those are the terminals on the row
8 adjacent to F4.

9 Now presuming that you start at F3
10 and you're modifying Raizers so it can go under
11 those shelves, is there a specific path you would
12 like to go to get to the terminals?

13 A. No, there's no specific path that I
14 want to take. There's many options.

15 Q. Sure.

16 Is there a specific terminal you
17 would like to go up?

18 A. There's not -- just like in the first
19 one, there's not a specific one that I want to.
20 There are many options that I can do. I mean, you
21 know, in the first one I pointed out and you said
22 oh, going up the second one. The second one -- the
23 one in the middle that's fine. Could have also
24 gone up the first one. It doesn't -- you know,
25 it's irrelevant.

1 What you're doing by giving me those
2 junctions is giving you options to move places.
3 That's what you're looking for. So is there a
4 specific path that I want to go on, no, there is
5 not.

6 Q. How about we start at F3, go across
7 the -- down the aisle, and then go down underneath
8 the B3 shelves.

9 A. You could. You could go underneath
10 the B1 shelves. You could go around these shelves.
11 You could go from B2 or B3 or B4. You could go --
12 there is different options.

13 Q. I understand, Doctor. I'm asking for
14 an example just so we can see it graphically what
15 it would look like.

16 A. Well, put one in, you know.

17 Q. Okay. I was just asking you if you
18 had a preference. If you don't --

19 A. I have no preference. I don't
20 understand where this is going, so I don't
21 understand what -- there's no basis for me to have
22 a preference here.

23 MR. PATNAIK: Okay.

24 Why don't we go down B3. Go across
25 and underneath B3, Will. Can we use a different

1 color too, Will.

2 BY MR. PATNAIK:

3 Q. And it has to get around the
4 terminal, right, Doctor? It has to get to the
5 front of the terminal to go up?

6 MR. DOUGLAS: Object to form.

7 THE WITNESS: I don't understand what
8 you mean it has to get around the terminal, it has
9 to get to the front of the terminal.

10 BY MR. PATNAIK:

11 Q. It has to get to the entrance of the
12 terminal where the ramp goes down into the aisle;
13 is that fair?

14 MR. DOUGLAS: Object to form.

15 BY MR. PATNAIK:

16 Q. To go vertical?

17 A. The robots -- let's -- the robots --
18 part of the robots drive units, I don't know what
19 the number is, I think it's 24. I could be
20 incorrect on that, but I believe that's labeled 24.
21 Have to align themselves with the -- with 44, the
22 terminals for the robot to transition from the
23 horizontal to the vertical.

24 Q. And the ramp is facing towards the
25 aisle that's between F4 and F5, correct, or in F4,

1 that area?

2 A. Yeah. It comes out. Yes.

3 Q. Okay. Is that correct what Will just
4 did from F3 to that middle terminal?

5 MR. DOUGLAS: Object to form.

6 THE WITNESS: What do you mean by
7 correct?

8 BY MR. PATNAIK:

9 Q. Is that a reasonable representation
10 of how a robot could go if it's going underneath
11 the shelves?

12 A. I think these are coarsely drawn
13 paths that could represent how the -- how a robot
14 might travel from F3 to the terminal in between B3
15 and B4 of aisle 4.

16 Q. Okay. And then it goes up the -- it
17 goes vertical and then over to B4, right?

18 A. Sure.

19 Q. Now, in the modifications to Raizer
20 that permit it to go -- permit the robots to go
21 under the shelves for the whole row, why don't we
22 start for the row adjacent to F5, why don't -- or
23 why don't we go to F6. Go lower to give us some
24 room.

25 If we go starting at the end of the

1 row on the left in that row adjacent to F6 and we
2 want to go to the same -- sorry, to B4 in that row,
3 do you want to put the terminals in the same spot
4 or do you want to change where you put the
5 terminals?

6 A. Say that -- what are we -- where are
7 we starting?

8 Q. We're starting at the end of the
9 shelving unit adjacent to F6. We're starting right
10 there.

11 A. Okay. So robot is over in that spot
12 right there where the cursor is?

13 Q. Yeah.

14 MR. PATNAIK: You can put a dot there
15 or whatever you want, Will.

16 THE WITNESS: Okay.

17 BY MR. PATNAIK:

18 Q. Then we're going to the third shelf
19 up in B4 adjacent to F6.

20 A. Okay.

21 Q. And with the modification of Raizer
22 we're permitted to go under the shelf. And that
23 would just go across -- if it's going under the
24 shelf it would just go across under the shelf --
25 I'm sorry, terminal is in the same spot,

1 Dr. Spenko, on that row?

2 A. Yes. Let's start with this. In this
3 hypothetical let's put the terminals in the same
4 spot.

5 Q. Again, the terminals are going to be
6 red in the row adjacent to F6. And if we go under
7 the row, under that row of shelves, go across, and
8 then we're going up that middle terminal again,
9 it's similar to the prior one, Doctor, where you
10 have to go down and into the aisle and then up
11 again to get to the terminal entrance.

12 MR. DOUGLAS: Object to form.

13 THE WITNESS: You are showing one
14 possible path to get from your start to your end
15 location.

16 BY MR. PATNAIK:

17 Q. Okay. Is this a reasonable
18 representation of what one possible path looks like
19 with the way the system is set up?

20 A. I think you're -- I understand what
21 you're drawing.

22 Q. Do you want to give me another
23 example or a different possible path that shows it
24 in a different way or another representation?

25 A. Sure. Go start in the -- no, you can

1 just -- I mean, you can just draw it over there if
2 you want --

3 Q. I'd rather -- I'd rather do a
4 different one just so we have clarity.

5 A. Let me say just this, okay, and you
6 can draw -- if you want to draw it, you can draw
7 it.

8 You could obviously go down first and
9 then travel through the aisle. You could go over
10 into B1 and then out into the aisle. You could go
11 into B2 and then out into the aisle. Those are
12 some other paths that are potential paths.

13 Q. Is what was -- what Will is drawing
14 in the row adjacent to F8, is that one --

15 A. That is another potential path that
16 you could take from that start location to the end
17 location.

18 Q. Is there any other path you'd want to
19 show?

20 A. I don't know. I don't know what
21 you're going to be asking me, so I reserve the
22 right to add in additional paths based upon what
23 you're going to ask me.

24 Q. I mean, the exercise for me, Doctor,
25 was to understand how these robots could go given

1 the terminals and their use to go vertical up the
2 shelving units. And I'm just looking for, you
3 know, what it may look like, those paths.

4 A. There are multiple other paths that
5 we haven't even disclosed yet that are possible.
6 I -- again, I don't know what you're going -- what
7 you're asking me, what you're getting at here. So
8 I reserve the right to -- I don't know if we
9 reserve, that may be a silly term to use, but I
10 know here that there are other -- many other ways
11 to accomplish this same goal.

12 Q. But you'll agree with the way Raizer
13 works that you would need to go vertical on the row
14 in which you're trying to get to a storage unit,
15 correct?

16 A. No, not at all. I could go up into
17 this -- into the first one, the first terminals on
18 the left to get over there as well.

19 Q. Maybe I'm not understanding.
20 You don't need to -- you could go --
21 can you say that again.

22 A. Oh, on the row.

23 Q. Yeah, on the row.

24 A. Well, I think Raizer discloses an
25 opportunity to travel above the -- if we look at

1 Figure 7B, I believe. My figures are out of order
2 now. Let me get to Raizer.

3 Yeah, so Raizer also discloses Figure
4 7B. So it allows you to get to a vertical -- it
5 allows you to -- you could travel up a junction
6 44 -- sorry, terminal 44, on a different row than
7 what you are trying to pick from.

8 Q. So get across the rail basically in
9 the sky above the aisle? I'm sorry. Get across an
10 aisle above it.

11 MR. DOUGLAS: Object to form.

12 THE WITNESS: I think Figure 7B is
13 fairly straightforward, and it just -- I think the
14 question you asked was do you have to travel up the
15 same -- if you want to pick something out of the
16 row do you have to travel up a junction -- sorry,
17 terminal, on that same row. And Raizer discloses a
18 method where that is not the case.

19 BY MR. PATNAIK:

20 Q. Got it.

21 MR. PATNAIK: Will, why don't we mark
22 that as our next exhibit. It's an annotated Figure
23 1 of Raizer. Will, I believe that's 2004 {sic}.

24 (Deposition Exhibit 2005 was marked
25 for identification.)

1 BY MR. PATNAIK:

2 Q. With the Raizer works, Dr. Spenko,
3 will you agree that there's no instance where it's
4 driving into the columns?

5 A. I don't understand what you mean by
6 driving into a column. Like driving a robot
7 into -- like ramming itself into a column?

8 Q. Well, do you have an understanding
9 what the phrase "driving a vehicle into a set of
10 columns" is, or --

11 A. To a -- in a general sense I can
12 imagine what driving a vehicle into a column is,
13 but I suppose you're referring to a specific --
14 something specific in the -- in the patent. So
15 maybe if you could point me in that direction.

16 Q. Sure. Let me -- claim 23 of the '632
17 patent. Let's go there.

18 A. '632 patent, claim 23, is that what
19 you said?

20 Q. Yes. And I'm looking at the element
21 that starts with "Driving a first of the vehicle
22 under."

23 A. I'm sorry. Can you say that again.
24 I missed that.

25 Q. I'm looking at the element or the

1 limitation that starts with "Driving a first of the
2 vehicle under one or more of the storage racks."

3 A. Okay.

4 Q. Do you see that?

5 A. Yeah.

6 Q. Near the end of that limitation it
7 says, "The step-up driving, the first vehicle
8 includes driving the first vehicle into a first of
9 the columns and a first of the aisles."

10 Do you see that?

11 A. I see that.

12 Q. Will you agree with me that Raizer
13 doesn't actually disclose driving a vehicle into a
14 first of the columns and a first of the aisles?

15 MR. DOUGLAS: Object to form.

16 THE WITNESS: I think Raizer in view
17 of Hangzhou discloses driving a vehicle, driving a
18 first of the vehicle under one or more of the
19 storage racks along the path that crosses one or
20 more aisle, wherein the step of driving the first
21 vehicle includes driving the first vehicle into a
22 first of the columns in a first of the aisles.

23 BY MR. PATNAIK:

24 Q. You'll agree that Raizer alone
25 doesn't accomplish that?

1 A. I think Raizer describes a system
2 that can drive anywhere along, but that it's Raizer
3 in view of Hangzhou that addresses that claim.

4 Q. Other than in -- in Raizer alone,
5 other than the use of the terminal, is there any
6 other way to get into the column?

7 MR. DOUGLAS: Object to form.

8 THE WITNESS: What do you mean get
9 into the column?

10 BY MR. PATNAIK:

11 Q. The language we've been a talking
12 about, a first vehicle into a first of the columns.
13 How does Raizer do that other than
14 using the terminal?

15 A. I'm sorry. Can you just repeat the
16 same question or read it back to me? I don't know.
17 Whichever is easier.

18 Q. How does Raizer drive a first vehicle
19 into a first of the columns in a first of the
20 aisles other than through use of the terminal?

21 MR. DOUGLAS: Object to form.

22 THE WITNESS: Because -- so how does
23 it get into the column. How does it get into
24 the -- that's what you're asking, how it gets --
25 are you asking how it gets underneath the column or

1 how it gets onto the vertical rail on the column?

2 BY MR. PATNAIK:

3 Q. I mean you interpreted this claim as
4 part of your analysis, so however -- why don't you
5 tell me how you interpreted it.

6 A. I know. But I have to get -- I need
7 to get clarity on the question.

8 Q. The question is how does Raizer
9 actually practice this element from the claim?

10 A. Okay. All right.

11 MR. DOUGLAS: Object to form.

12 THE WITNESS: Well, I think it's
13 Raizer in view of Hangzhou that addresses this
14 claim, and so I think that it's the combination of
15 the two of them that does.

16 BY MR. PATNAIK:

17 Q. So it's not Raizer alone, correct?

18 MR. DOUGLAS: Form.

19 THE WITNESS: I think that it is
20 Raizer in view of Hangzhou that renders this claim
21 obvious.

22 BY MR. PATNAIK:

23 Q. You don't want to answer when I ask
24 it's not Raizer alone?

25 MR. DOUGLAS: Objection; asked and

1 answered.

2 THE WITNESS: I don't know how else I
3 can say this. You know, so it's Raizer in view of
4 Hangzhou. It's not -- yeah, that's how I want to
5 say it, I guess.

6 MR. PATNAIK: Okay. Just for the
7 record, I want to make clear that that annotated
8 version of Figure 1 from Raizer that we went
9 through is now labeled as Exhibit 2005.

10 Dr. Spenko, I have no further
11 questions at this time.

12 MR. DOUGLAS: Can we take a
13 ten-minute break?

14 MR. PATNAIK: Sure.

15 THE VIDEO OPERATOR: Going off the
16 record. The time is 1:09 p.m., and this is the end
17 of media unit 3.

18 (Thereupon, a break was taken, and
19 then the proceedings continued as follows:)

20 THE VIDEO OPERATOR: We are going
21 back on the video record. The time is 1:19 p.m.
22 This is media unit 4.

23 MR. DOUGLAS: Thank you, Dr. Spenko,
24 for your time today. I don't have any questions.

25 MR. PATNAIK: Thank you, Dr. Spenko.

1 THE WITNESS: Thank you, everybody.

2 THE VIDEO OPERATOR: All right. We
3 are going off the record. The time is 1:20 p.m.
4 This concludes today's testimony given by
5 Dr. Matthew Spenko. The total number of media
6 units used was four, and they will be retained by
7 Veritext Legal Solutions. Thank you.

8 THE COURT REPORTER: Counsel, this is
9 the court reporter. Before anyone logs off, I'm
10 assuming you both would like a copy of the
11 transcript. Does anyone want a rough?

12 MR. PATNAIK: I'll take a rough.

13 MR. DOUGLAS: That would be great.
14 Thank you.

15 THE COURT REPORTER: Thanks so much.

16 (Whereupon, the remote video
deposition was terminated at 1:20 p.m.)
17
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C E R T I F I C A T E

STATE OF MINNESOTA:

: SS.:

COUNTY OF HENNEPIN:

BE IT KNOW, that I, Brandi N. Bigalke, RPR, RSA, Stenographic Court Reporter, do hereby certify that the foregoing transcript of MATTHEW SPENKO, Ph.D., in the matter of EXOTEC PRODUCT FRANCE SAS, EXOTEC NORTH AMERICA INC., AND EXOTEC PRODUCT USA INC., versus OPEX CORPORATION, is true, correct and accurate;

That said transcript was prepared under my direction and control from my stenographic shorthand notes taken on the 23rd day of January, 2025;

That I am not related to any of the parties in this matter, nor am I interested in the outcome of this action;

That the cost of the original has been charged to the noticing party, and that all parties who ordered copies have been charged at the same rate for such copies;

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WITNESS MY HAND AND SEAL this 28th of January, 2025.

Brandi N. Bigalke, RPR

Brandi N. Bigalke, RPR, RSA, CSR
CSR License No. 84-004870

1 Christopher Douglas

2 Christopher.douglas@alston.com

3 January 28, 2025

4 RE: Exotec Product France SAS, Et Al. v. Opex Corporation
5 1/23/2025, Matthew Spenko , Ph.D. (#7114267)

6 The above-referenced transcript is available for
7 review.

8 Within the applicable timeframe, the witness should
9 read the testimony to verify its accuracy. If there are
10 any changes, the witness should note those with the
11 reason, on the attached Errata Sheet.

12 The witness should sign the Acknowledgment of
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14 Copies should be sent to all counsel, and to Veritext at
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16 Return completed errata within 30 days from
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Exotec Product France SAS, Et Al. v. Opex Corporation

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Matthew Spenko , Ph.D.

Date

Exotec Product France SAS, Et Al. v. Opex Corporation
Matthew Spenko , Ph.D. (#7114267)

ACKNOWLEDGEMENT OF DEPONENT

I, Matthew Spenko , Ph.D., do hereby declare that I
have read the foregoing transcript, I have made any
corrections, additions, or changes I deemed necessary as
noted above to be appended hereto, and that the same is
a true, correct and complete transcript of the testimony
given by me.

Matthew Spenko , Ph.D.

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