

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4
5 PENUMBRA, INC.,

6 Petitioner,

7 v.

8 RAPIDPULSE, INC.,

9 Patent Owner.

10
11 Case IPR2024-01261

12 Patent 11,406,402

13
14
15 Deposition of BRIAN J. BROWN

16 Conducted virtually via Zoom

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21 Reported by: THERESA A. VORKAPIC,

22 CSR, RMR, CRR, RPR

1
2 Deposition of Brian J. Brown, conducted
3 virtually via Zoom, pursuant to notice before
4 Theresa A. Vorkapic, a Certified Shorthand
5 Reporter, Registered Merit Reporter, Certified
6 Realtime Reporter, Registered Professional
7 Reporter and a Notary Public in and for the State
8 of Illinois.
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1 A P P E A R A N C E S (Continued)

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C O N T E N T S

EXAMINATION OF BRIAN J. BROWN	PAGE
Examination By Mr. Sanders	6

E X H I B I T S

PREVIOUSLY MARKED EXHIBITS	PAGE
1001 US Patent 11,406,402	8
1007 Ofek Reference, US Patent 10,322,230	56
1008 Mullins Reference, US Patent 11,197,977	64
1011 Rubinstein Reference, US Patent 3,955,574	117
1012 Yang Reference, US 2017/0238953	23

P R O C E E D I N G S

THE REPORTER: Would you raise your right hand, please.

(The witness was duly sworn.)

BRIAN J. BROWN,
called as a witness herein, having been first duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. SANDERS:

Q Good morning.

A Good morning.

Q Would you please state your full name.

A Brian J. Brown.

Q What is your address?

A 178 Jandel Avenue NE, Hanover, Minnesota.

Q Is there any reason you cannot testify truthfully and accurately today?

A Not that I'm aware of.

Q Other than being a part of this Zoom, are you communicating in any other way with any people?

A I am not.

1 Q Have you spoken with Dr. Ross?

2 A I have not.

3 Q Do you have any materials related to this
4 case with you?

5 A I do.

6 Q Okay. What are they?

7 A I have the documents that have been
8 supplied to me by my counsel. Do you want me to
9 list off what those documents are?

10 Q Well, you don't need to go through one by
11 one, but could you categorize them?

12 A Yes. I do have copies of previous IPRs, I
13 have copies of declarations, I have copies of
14 prior art.

15 Q Do any of those have any writings on them?

16 A They do not.

17 Q So during this deposition, we'll be taking
18 a look at a subset of those materials, your
19 declaration in this case, in this IPR, as well as
20 some of the exhibits. You can feel free to let us
21 know what's most convenient for you. You can look
22 at them on the copies that you have, we can put

1 them on the screen, we can drop them into the chat
2 and you can open them up on your computer,
3 whatever works for you just let us know and we'll
4 do it that way, okay?

5 A Sounds good.

6 Q So the first thing I'd like to do is turn
7 to the '402 patent which is Exhibit 1001.

8 A Okay. I have it in front of me.

9 Q I'd like to direct your attention to the
10 claims.

11 A I am at the claims.

12 Q And specifically to Claim 3, Claim 3
13 recites the claim term: A positive amount of exit
14 flow, right?

15 A Yes, that is a portion of Claim 3.

16 Q Claim 4 recites a positive amount of exit
17 flow is within a specific range, correct?

18 A Claim 4 states that the positive amount of
19 exit flow is limited to that range.

20 Q Claim 13 recites a positive amount of exit
21 flow as well, right?

22 A It also does discuss the positive amount

1 of exit flow of which has been limited.

2 Q Claims 14, 16 and 17 all recite specific
3 amounts to which the positive amount of exit flow
4 is limited, right?

5 A Yes, that it has been limited to, that is
6 correct.

7 Q Do you agree that a positive amount of
8 exit flow is an amount of exit flow above zero?

9 A As you have stated it, a positive amount
10 of exit flow is something that is above zero,
11 correct.

12 Q Do you agree that a positive amount of
13 exit flow does not include no or zero exit
14 flow?

15 A I'm going to have you just reask that
16 question, please.

17 Q Do you agree that a positive amount of
18 exit flow does not include no exit flow?

19 MR. ODA: Objection. Form.

20 BY THE WITNESS:

21 A That's actually something I haven't really
22 given any thought to. I'm trying to think whether

1 the value of zero would be viewed as something
2 that is positive or negative, and the value of
3 zero, I guess, could be either one.

4 Q Do you have an opinion as to whether a
5 positive amount of exit flow can include no exit
6 flow?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A I'm saying right now that in my opinion
10 the value zero could be positive or negative.
11 It's -- yeah, it's kind of neutral.

12 BY MR. SANDERS:

13 Q In your opinion, does a positive amount of
14 exit flow include zero exit flow?

15 MR. ODA: Objection. Form.

16 BY THE WITNESS:

17 A I'm saying right now that it could. Zero
18 is at that midpoint between positive and negative,
19 so it's hard to say whether it's positive or
20 negative. It's something I haven't given much
21 thought to.

22

1 BY MR. SANDERS:

2 Q For purposes of your opinions in this
3 proceeding, have you implied an interpretation of
4 the claim term positive amount of exit flow that
5 includes no or zero exit flow?

6 MR. ODA: Objection. Form.

7 BY THE WITNESS:

8 A I have provided opinions on the limit of
9 positive of exit flow.

10 BY MR. SANDERS:

11 Q For purposes of your opinions, have you
12 included zero exit flow as a lower limit on the
13 positive amount of exit flow?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A I have provided opinions on the zero
17 amount of exit flow as being below the limit of a
18 positive amount of exit flow.

19 BY MR. SANDERS:

20 Q For purposes of your opinions in this
21 proceeding, have you implied an interpretation of
22 positive amount of exit flow that requires an

1 amount of exit flow above zero?

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A I don't recall if I ever -- if I have
5 provided an opinion that positive amount of exit
6 flow must be above zero as far as the definition
7 of positive exit flow.

8 BY MR. SANDERS:

9 Q Is there a lower limit on positive amount
10 of exit flow as that claim term is used in the
11 '402 patent that you've applied for purposes of
12 your opinions?

13 MR. ODA: Objection. Form.

14 BY THE WITNESS:

15 A When you ask is there a lower limit, a
16 lower limit to what?

17 BY MR. SANDERS:

18 Q Positive amount of exit flow.

19 MR. ODA: Objection. Form.

20 BY THE WITNESS:

21 A Is there a specific claim you're referring
22 to or are you referring to this whole family of

1 claims that we're talking about?

2 BY MR. SANDERS:

3 Q I'm referring specifically to the claim
4 term positive amount of exit flow.

5 A Okay. So please reask the question.

6 Q Is there a lower limit on positive amount
7 of exit flow as that claim term is used in the
8 '402 patent that you've applied for purposes of
9 your opinions?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A I do not recall providing a lower limit,
13 but that's not to say I did not, but I don't
14 recall providing one.

15 BY MR. SANDERS:

16 Q Would in your view a system that has zero
17 exit flow meet the claim limitation positive
18 amount of exit flow?

19 MR. ODA: Objection. Form.

20 BY THE WITNESS:

21 A The claim term a positive amount of exit
22 flow is not what's being claimed. What's being

1 claimed is a limit -- it's limited to a positive
2 amount of exit flow.

3 BY MR. SANDERS:

4 Q When you say limited to a positive amount
5 of exit flow, do you mean limited to an amount of
6 exit flow above zero?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A That is not what I mean.

10 BY MR. SANDERS:

11 Q What do you mean?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A I think what I mean is what we're trying
15 to interpret what the claim says, and if that's
16 what we're discussing what does the claim mean, is
17 that what you're asking me?

18 BY MR. SANDERS:

19 Q Yes. I'm asking you about the claim term
20 positive amount of exit flow.

21 A Yes. And so we've discussed what positive
22 amount of exit flow can mean, and I think I've

1 given you an opinion that it could be zero, but
2 it's zero or above. So that is the definition of
3 positive amount of exit flow.

4 Q Let's take a look at Claim 1. In the last
5 clause of Claim 1, it requires controller
6 configured to, among other things, control fluid
7 flow in and out from the distal end of the
8 catheter, right?

9 A Correct.

10 Q Do you agree that an aspiration
11 thrombectomy system in order to satisfy Claim 1
12 needs to have a controller that will control flow
13 into the distal end of the catheter?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A I do not agree that all thrombectomy
17 systems have to have a controller to control flow
18 into the distal end of the catheter.

19 BY MR. SANDERS:

20 Q Certainly. My question was a bit
21 different.

22 In order to satisfy Claim 1, do you agree

1 an aspiration thrombectomy system needs to have a
2 controller configured to control flow into the
3 distal end of the catheter?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A The controller is controlling the opening
7 and closing of the valves, and I would say then
8 the pressure is what's controlling the in and out
9 flow.

10 BY MR. SANDERS:

11 Q Do you agree that an aspiration
12 thrombectomy system in order to satisfy Claim 1
13 needs to have a controller configured to open and
14 close the valves such that it produces pressure
15 that controls flow into the distal end of the
16 catheter?

17 MR. ODA: Objection. Form.

18 BY THE WITNESS:

19 A At a high level, yes, as far as what
20 you're saying, that is basically what is
21 occurring.

22 BY MR. SANDERS:

1 Q Do you agree that an aspiration
2 thrombectomy system in order to satisfy Claim 1
3 needs to have a controller configured to open and
4 close the valves such that it produces pressure
5 that controls flow out of the distal end of the
6 catheter?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A It must have a controller that is opening
10 and closing valves that change the level of vacuum
11 in order to control flow in and out of the distal
12 end of the catheter. So it's making decisions on
13 whether it wants to have flow in or whether it
14 wants to have flow out.

15 BY MR. SANDERS:

16 Q Now I'd like to turn to some more general
17 considerations. You can put the '402 patent
18 Exhibit 01001 aside. I'd like to talk about the
19 characteristics of an aspiration thrombectomy
20 system starting with the aspiration catheter.

21 Do you agree an aspiration catheter has a
22 length?

1 MR. ODA: Objection. Form.

2 BY THE WITNESS:

3 A Yes.

4 BY MR. SANDERS:

5 Q In your experience, about how long is an
6 aspiration catheter?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A It really depends upon what it's being
10 used for.

11 BY MR. SANDERS:

12 Q An aspiration catheter for use for
13 removing a thrombus or clot in the brain, about
14 how long are those catheters?

15 MR. ODA: Objection. Form.

16 BY THE WITNESS:

17 A Aspiration catheters for removing
18 thrombus, which is typically located in the
19 cerebral vessels, are typically about
20 125 centimeters in length.

21 BY MR. SANDERS:

22 Q Do you agree that it takes time for fluid

1 to travel the length of an aspiration catheter?

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A Yes, it takes time for it to travel and
5 obviously depending on the length, it can take
6 more or less time.

7 BY MR. SANDERS:

8 Q Aspiration catheter has flexibility,
9 right?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A Neurovascular aspiration catheters do have
13 flexibility.

14 BY MR. SANDERS:

15 Q Part of the reason an aspiration catheter
16 has flexibility is that it needs to be advanced
17 through blood vessels, right?

18 A Arterial aspiration catheters, yes, are
19 typically advanced through the blood vessel.

20 Q An aspiration catheter can become clogged
21 or corked by a clot, right?

22 A Arterial aspiration catheters can be

1 corked or clogged by clot, correct.

2 Q When an arterial aspiration catheter gets
3 clogged, and aspiration is being applied, that can
4 suck down on the catheter, right?

5 MR. ODA: Objection. Form.

6 BY THE WITNESS:

7 A If a vacuum is applied to the lumen of the
8 catheter and the catheter is corked on the distal
9 end, there can be a reduction in the diameter of
10 the catheter.

11 BY MR. SANDERS:

12 Q In that situation where there's been a
13 reduction in the diameter due to vacuum pressure
14 being applied while the catheter is corked at the
15 distal end, when the vacuum pressure is relieved,
16 the catheter can then expand, right?

17 MR. ODA: Objection. Form.

18 BY THE WITNESS:

19 A It has that potential, yes.

20 BY MR. SANDERS:

21 Q Does that expansion of the catheter after
22 the vacuum pressure is relieved have an effect on

1 fluid flow through the catheter?

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A It can impact fluid flow.

5 BY MR. SANDERS:

6 Q How?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A I guess I would have to see the specifics
10 of the catheter system to answer that question.

11 BY MR. SANDERS:

12 Q What specifics would be relevant in your
13 view?

14 A What is connected to the catheter, for
15 instance, sources of fluids, pressure, vacuum of
16 the materials that the catheter is made of,
17 whether the catheter is corked or non-corked.

18 Q Let's consider to a valve aspiration
19 catheter system, that's what Yang addresses,
20 right?

21 A I believe so.

22 Q When a valve closes suddenly, that causes

1 a water hammer effect?

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A If you are referring to the Yang catheter,
5 Yang does disclose that the rapid closing of the
6 vacuum valve will cause a water hammer effect.

7 BY MR. SANDERS:

8 Q What is a water hammer effect?

9 A The water hammer is kind of playing on the
10 word "hammer," which is an object striking
11 something. In this particular case, you have
12 fluid that is moving and when that valve closes,
13 that moving fluid strikes the surface of that
14 valve, very similar to a hammer striking a
15 surface, and very similar to when a hammer strikes
16 a surface, you get a rebound, and so you get a
17 rebound of this fluid and that's the water hammer
18 effect.

19 Q How does that water hammer effect flew
20 affect fluid flow through the catheter?

21 A Well, at the time of the closing of the
22 valve, the water hammer would create a pressure

1 wave that would travel in the reverse direction of
2 the initial fluid direction.

3 Q Would that fluid be flowing in the
4 direction of the distal end of the catheter?

5 MR. ODA: Objection.

6 BY THE WITNESS:

7 A It would be a pressure wave that would be
8 traveling in that direction.

9 BY MR. SANDERS:

10 Q What would occur when the water wave
11 reaches the distal end of the catheter?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A That pressure wave could cause fluid to
15 flow out of the distal end of the catheter.

16 BY MR. SANDERS:

17 Q Let's take a look at the Yang reference.
18 It's Exhibit 1012.

19 A I have it in front of me.

20 Q You agree that Yang discloses the water
21 hammer effect, correct?

22 A I do agree with that, yes.

1 Q Let's take the situation where there's a
2 water hammer effect from closing the vent valve
3 and vacuum pressure is being applied.

4 Do you understand that?

5 A I believe I understand the sequence that
6 you're talking about. I guess I am less familiar
7 with a water hammer effect associated with that.

8 Q Let's take a step back.

9 Which valve or valves does Yang disclose
10 closing to produce a water hammer?

11 MR. ODA: Objection. Form.

12 BY THE WITNESS:

13 A It would be best if I could see
14 specifically in the specification where you're
15 looking, and then I can give you an answer.

16 BY MR. SANDERS:

17 Q Well, I'll tell you that the water hammer
18 effect is discussed, for example, in Paragraph 108
19 but I'm not intending for that to be exclusive.
20 I'm asking more generally because you might want
21 to rely on other parts of Yang, and that's fine.

22 I'm just asking the general question which

1 valves, if any, does Yang disclose closing
2 produces water hammer?

3 MR. ODA: Objection. Form.

4 BY THE WITNESS:

5 A I believe that Yang generally is referring
6 to the closing of the vacuum valve.

7 BY MR. SANDERS:

8 Q And is the vent valve in Yang a different
9 type of valve than a vacuum valve?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A I do not recall whether Yang specifies the
13 type of valves he is using.

14 BY MR. SANDERS:

15 Q Maybe I can assist there. Take a look at
16 Figure 13 in Yang.

17 A I am there.

18 Q Do you see that Yang discloses a solenoid
19 valve 314?

20 A I do see that.

21 Q And that's a valve that serves as a valve
22 to regulate the vacuum pressure, right?

1 A It serves, yes, to open and close the
2 passageway to the vacuum chamber.

3 Q Let's take a look at Figure 14.

4 A Okay.

5 Q Do you see there's a valve there 414?

6 A Yes.

7 Q And that valve regulates both vacuum
8 pressure and vent pressure, right?

9 MR. ODA: Objection. Form.

10 BY THE WITNESS:

11 A It opens and closes the passageways to the
12 atmospheric pressure chamber or the vacuum
13 pressure chamber.

14 BY MR. SANDERS:

15 Q Go to 131, do you see that 414 is
16 identified as a solenoid valve?

17 A I do see that.

18 Q You agree that Yang discloses solenoid
19 valves, right?

20 A I do agree that Yang does disclose
21 solenoid valves.

22 Q And Yang discloses that a solenoid valve

1 can be used as both a valve for connecting to the
2 vacuum pressure and as a valve for connecting to
3 atmospheric pressure, right?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A Yes. He is showing a solenoid valve being
7 connected to the -- connecting the lumens coming
8 from the vacuum chamber collection canister and
9 from the atmospheric pressure chamber.

10 BY MR. SANDERS:

11 Q Do you agree that closing a solenoid valve
12 can produce a water hammer effect?

13 MR. ODA: Objection. Form.

14 BY THE WITNESS:

15 A At a very high level, yes. And the reason
16 I say that is a solenoid valves is not a very
17 definitive description of the type of valve. So
18 it is a whole family of valves, and this entire
19 family of valves can have solenoids on them.

20 BY MR. SANDERS:

21 Q We can go back to Paragraph 108.

22 Do you see there's a sentence there that

1 starts: "Water hammer..."?

2 A Yes.

3 Q That sentence and the following sentence
4 describe the water hammer effect, right?

5 MR. ODA: Objection. Form.

6 BY THE WITNESS:

7 A It does describe what Yang is defining as
8 water hammer.

9 BY MR. SANDERS:

10 Q After those two sentences, you see there's
11 a sentence that starts: "A pressure surge..."?

12 A Yes.

13 Q It states: "A pressure surge or wave is
14 generated inside the lumen 40 of the aspiration
15 catheter 10 when a solenoid or valve closes and
16 stops the fluid flow suddenly or other pulse
17 generator is activated".

18 Do you see that?

19 A I do.

20 Q Is Yang teaching that when solenoid valve
21 414 is closed that can produce a water hammer?

22 MR. ODA: Objection. Form.

1 BY THE WITNESS:

2 A He is teaching here that when a valve or a
3 solenoid and I believe when he says here a
4 solenoid or valve, he may be missing a comma, but
5 he's kind of saying solenoid or basically saying
6 the valve is the solenoid meaning the solenoid is
7 the valve closes you get the sudden fluid stop.

8 Now, in Figure 14, the valve is 414. What
9 he's not specifying here is which of the lumens of
10 414 he is closing.

11 BY MR. SANDERS:

12 Q Do you understand Yang to be disclosing
13 that when the valve to the vacuum source is closed
14 that that can produce a water hammer effect?

15 A What he is disclosing here is just the
16 general principles of water hammer so that when a
17 valve closes that you can create a water hammer
18 effect.

19 Q And based on your reading of Yang, is Yang
20 teaching that when a valve to the vent -- excuse
21 me. I'll start again.

22 Based on your reading of Yang, is Yang

1 teaching that when the valve to the vacuum source
2 is closed that can result in a water hammer
3 effect?

4 A I do believe that Yang does teach that in
5 his patent.

6 Q Based on your reading of Yang, is Yang
7 teaching that when the valve to the vent source is
8 closed that that can result in a water hammer
9 effect?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A I don't recall if he teaches that or not.

13 BY MR. SANDERS:

14 Q Would whether Yang teaches that a water
15 hammer effect can result from closing the valve to
16 the vent source have been relevant to your
17 opinions in this IPR?

18 MR. ODA: Objection. Form.

19 BY THE WITNESS:

20 A I don't recall it having relevance.

21 BY MR. SANDERS:

22 Q Is Yang's teaching that when the valve to

1 the vacuum source is closed, that can result in a
2 water hammer effect relevant to your opinions in
3 this IPR?

4 A Yes.

5 Q How is it relevant?

6 A It's relevant because the closing of the
7 vacuum valve can create the pressure pulse that
8 then travels up the lumen of the catheter to the
9 distal end creating high pressure or a pressure
10 change at the distal end of the catheter.

11 Q Based on your reading of Yang, does Yang
12 disclose any other way to create high pressure or
13 a pressure change at the distal end of the
14 catheter besides the water hammer effect?

15 MR. ODA: Objection to form.

16 BY THE WITNESS:

17 A Yes, it does.

18 BY MR. SANDERS:

19 Q What is that other way that you believe
20 Yang discloses?

21 MR. ODA: Objection. Form.

22 BY THE WITNESS:

1 A As shown in Figure 14, Yang's catheter is
2 connected to an air fluid at atmospheric pressure,
3 at least that is being -- the atmospheric pressure
4 is what's being defined in Figure 14. Yang is not
5 limited to just atmospheric pressure.

6 BY MR. SANDERS:

7 Q Would use of atmospheric pressure provide
8 a sufficient pressure to have flow out from the
9 distal end of Yang's catheter?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A If you are referring to a catheter being
13 used in a medical procedure and the catheter being
14 placed in an artery, atmospheric pressure alone
15 would not create flow out of the distal end of the
16 catheter, but atmospheric pressure, what they're
17 referring here is venting to atmospheric pressure,
18 would create a pressure change at the distal end
19 of the catheter.

20 BY MR. SANDERS:

21 Q I'd like to direct your attention to
22 Paragraph 168 of Yang.

1 A I am there.

2 Q In Paragraph 168 of Yang, Yang is
3 discussing Figures 25A through C, right?

4 A That appears to be correct.

5 Q And in the second sentence of
6 Paragraph 8168, Yang states: "Merely stopping the
7 vacuum is not sufficient to loosen the clot".

8 Do you see that?

9 A I do see that.

10 Q Do you have an understanding of that
11 sentence?

12 A Just reading that sentence alone is
13 difficult to understand it, but as I read on, I
14 believe what it's saying is that by releasing the
15 vacuum and allowing the clot to relax is found to
16 aspirate the cork more efficiently than just
17 releasing vacuum, excuse me, stopping the vacuum.

18 Q Pardon me. The next sentence after the
19 one I read reads: "Completely releasing (venting
20 to atmospheric pressure) the vacuum and allowing
21 the clot to relax before reapplying a vacuum is
22 found to to aspirate the corked clot most

1 efficiently".

2 It that's the sentence you were referring
3 to, right?

4 A That is, yes.

5 Q Do you have an understanding of that
6 statement?

7 A Yes. I believe Yang is teaching here that
8 changing the pressure at the distal end of the
9 catheter is a more efficient way of -- excuse me,
10 cycling that change in pressure is more efficient
11 way to aspirate the corked clot.

12 Q You agree with Yang's observation
13 completely releasing venting to vacuum pressure
14 allowing the clot to relax before reapplying
15 vacuum is found be to aspirate a corked clot most
16 efficiently?

17 MR. ODA: Objection. Form.

18 BY THE WITNESS:

19 A I don't know if I would agree to most
20 efficiently. I would -- I'm not sure why he used
21 the word "most", but it would be more efficiently.

22 BY MR. SANDERS:

1 Q Why do you say that you don't know if
2 you'd agree with Yang's use of "most efficiently"?

3 A I believe that there are other ways of
4 doing it that may be more efficient.

5 Q What other ways do you have in mind?

6 MR. ODA: Objection. Form.

7 BY THE WITNESS:

8 A Yang also teaches that he can vent to a
9 positive pressure, and that may be more efficient
10 than just venting to atmospheric pressure.

11 BY MR. SANDERS:

12 Q You agree that Yang states venting to
13 atmospheric pressure is found to aspirate a corked
14 clot most efficiently, right?

15 A I agree that that is what is said here.
16 I'm not convinced that that is what he meant.

17 Q I'd like to direct your attention to
18 Paragraph 170.

19 A Okay.

20 Q This paragraph is still discussing
21 figures -- excuse me, I'll start again.

22 Paragraph 170 is still discussing

1 Figure 25 and discusses figures 25A, B and C,
2 right?

3 A That appears to be correct.

4 Q I'd like to focus on Figure 25B and the
5 description of it that starts with the second
6 sentence of Paragraph 170.

7 Do you see that?

8 A Yes, for Figure 25B.

9 Q It states: "Then, as shown in Figure 25B,
10 the release valve 2514 is opened while the vacuum
11 valve 2516 stays open".

12 Do you see that?

13 A I do.

14 Q Do you agree that that describes a state
15 where both the vent and vacuum valves are open?

16 A I'm going to pull up Figure 25B.

17 Q Sure.

18 A Please reask your question.

19 Q I asked whether the sentence that I read
20 from Paragraph 170 describes a state where both
21 the vent and vacuum valves are open?

22 A Yes. They are both open in this figure.

1 Q When you say "this figure", you're
2 referring to 25B, right?

3 A I am.

4 Q For clarity, the horizontal lines in 2514
5 and 2516 signify open valves, right?

6 A That is my understanding.

7 Q Just for completeness when there's a
8 vertical line in 2514 or 2516 as in Figures 25A
9 and 25C, that signifies a closed valve, right?

10 A In these figures, yes, the vertical line
11 would indicate closed. At a higher level if the
12 line is perpendicular to the flow that means
13 closed. If your line is parallel to your flow,
14 then it is open.

15 Q I'd like to return to Paragraph 170.

16 A Okay.

17 Q To the sentence after the one that I read.
18 That sentence states: "Because the release
19 Line 2518 and the vacuum Line 2520 are in fluid
20 communication, either directly or via at least a
21 portion of catheter 2510, the vacuum is applied
22 mainly through the release line 2518, dropping

1 vacuum applied to the catheter".

2 Do you see that?

3 A I do.

4 Q Do you agree that Yang discloses having
5 both valves open as shown in Figure 25B drops the
6 vacuum that's applied to the catheter?

7 A Yes, I agree that's what you just read and
8 looking at Figure 25B that that is one of the
9 embodiments that Yang has for reducing or dropping
10 the vacuum.

11 Q I'd like to turn to the last sentence of
12 Paragraph 170.

13 It states: "Then another cycle from
14 Figure 25A to Figure 25C begins by closing the
15 release valve 2514 and opening the vacuum valve
16 2516".

17 Do you see that?

18 A I do.

19 Q You agree that statement refers to doing
20 two things, closing the vent valve and opening the
21 vacuum valve?

22 A Yes. I agree that that is talking about

1 the steps of closing what we were referring to
2 here as the vent valve and then opening the vacuum
3 valve.

4 Q You said in your answer "and then opening
5 the vacuum valve".

6 Is it your view that that sentence when it
7 says closing the release valve 2514 and opening
8 the vacuum valve 2516 is disclosing a sequence?

9 MR. ODA: Objection. Form.

10 BY THE WITNESS:

11 A It is my opinion that what we have just
12 read is describing a sequence of steps of closing
13 the vent valve and then opening the vacuum valve.

14 BY MR. SANDERS:

15 Q You agree there's nothing in the sentence
16 that discloses the relative timing of closing the
17 release valve and opening the vacuum valve?

18 MR. ODA: Objection. Form.

19 BY THE WITNESS:

20 A I am basing my interpretation of this
21 largely on what is being described above it as far
22 as the sequence of opening and closing the other

1 valves. They are done independently of each other
2 so there's no reason to believe that in the final
3 step that it would be done differently.

4 BY MR. SANDERS:

5 Q How is -- let me start again.

6 A sequence of valve operation that Yang
7 discloses is opening the vent valve while the
8 vacuum valve stays open, correct?

9 A Correct.

10 Q Are you saying that Yang discloses other
11 sequences of valve operation?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A I'm not sure I'm understanding your
15 question. As far as in general does Yang disclose
16 other valve sequences?

17 BY MR. SANDERS:

18 Q Yeah. Let me ask it again. I'll rephrase
19 it.

20 Other than Yang's disclosure of opening
21 the vacuum valve -- let me start again. Sorry.

22 Other than Yang disk's disclosure of

1 opening the vent valve while the vacuum valve
2 stays open, does Yang disclose in your view any
3 other relative timing of valve operation?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A Yang in Figures 25A through 25C is showing
7 one embodiment of opening and closing valves to
8 create pressure changes on the distal end of the
9 catheter. This is the only figure that I'm aware
10 of that he shows the sequence of valves opening
11 and closing, but he speaks to valves opening and
12 closing elsewhere within his specification that
13 may differ from what we're seeing here in Figures
14 25A through 25C.

15 BY MR. SANDERS:

16 Q Does Yang disclose closing the release
17 valve before opening the vacuum?

18 MR. ODA: Objection. Form.

19 BY THE WITNESS:

20 A As we read in Paragraph 170, I believe the
21 last sentence does describe that.

22 BY MR. SANDERS:

1 Q You believe that the last sentence of
2 Paragraph 170 describes a sequence of valve
3 operation; is that correct?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A Yes, it describes the sequence of closing
7 the release valve 2514 and opening the vacuum
8 valve 2516.

9 BY MR. SANDERS:

10 Q Do you believe Yang discloses the relative
11 timing of closing the release valve 2514 and
12 opening the vacuum valve 2516 in that sequence?

13 MR. ODA: Objection. Form.

14 BY THE WITNESS:

15 A He does not put time valves in that
16 sentence. He is just describing the closing of
17 one valve and the opening of another valve. And
18 as I earlier stated, following the sequence of
19 opening and closing the valves in the previous
20 figures of 25, meaning 25A, B and C, the valves
21 were each actuated independent of each other.

22 BY MR. SANDERS:

1 Q Using Yang's valves that are actuated
2 independent of each other, one valve can be closed
3 before opening another or one valve can be opened
4 before closing another, right?

5 A Correct.

6 Q In Yang, there are three parts to
7 Figure 25, Figure 25A, Figure 25B, and Figure 25C,
8 right?

9 A Correct.

10 Q I'd like to take a look at your
11 declaration which is Exhibit 1005.

12 A Just give me a minute here to put Yang
13 back together.

14 Q No problem.

15 MR. ODA: While he's doing that, perhaps
16 at the end of this line of questioning we could
17 take a short break. It's been over an hour now.

18 MR. SANDERS: Sure. Let's just finish
19 this up.

20 BY THE WITNESS:

21 A I tell you what, I will put this back
22 together during a break.

1 BY MR. SANDERS:

2 Q Okay.

3 A I have my declaration in front of me.

4 Q Great. And could you turn to Page 131,
5 please.

6 A Okay, I am there.

7 Q You have at the top of that page what's
8 labeled Figure 25-DC.

9 Do you see that?

10 A I do.

11 Q That figure is not in Yang, correct?

12 A That is correct.

13 MR. ODA: Object to form.

14 BY MR. SANDERS:

15 Q Did you create that figure?

16 A I worked with the attorneys to create this
17 figure and have it put into my declaration.

18 MR. SANDERS: We can take a break.

19 (A recess was had.)

20 BY MR. SANDERS:

21 Q I'd like to stay on your declaration and
22 just go to a few paragraphs lower on Paragraph

1 234?

2 A Okay, I am there.

3 Q In Paragraph 234 you're discussing Yang,
4 right?

5 A That appears to be correct.

6 Q I'd like to direct your attention to the
7 last sentence.

8 In the last sentence you state that if
9 both valves are closed, there would not be any
10 resulting flow within the catheter, right?

11 A That is correct as far as resulting -- any
12 resulting flow within the catheter at the time
13 that we have both valves closed.

14 Q We discussed that Yang discloses the water
15 hammer effect, right?

16 A We did discuss that.

17 Q Can the water hammer effect be present
18 even when both valves are closed?

19 MR. ODA: Objection. Form.

20 BY THE WITNESS:

21 A Water hammer effect can occur when both
22 valves are closed but it depends on the timing of

1 when both valves are closed.

2 BY MR. SANDERS:

3 Q Why do you say it depends on the timing of
4 when both valves are closed?

5 A As we discussed earlier, the water hammer
6 effect occurs when you are aspirating so the
7 vacuum valve is open and the vent valve is closed
8 and then the vacuum valve is closed and now you
9 have a double closed state, and a water hammer
10 effect will occur.

11 Q Would that water hammer effect affect
12 fluid flow through the catheter while both valves
13 are closed?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A The water hammer effect would create a
17 pressure pulse that would then propagate to the
18 distal end of the catheter changing the pressure
19 on the distal end of the catheter and potentially
20 changing the fluid flow depending upon the timing
21 of it and the magnitude of it.

22

1 BY MR. SANDERS:

2 Q Would you agree that when the water hammer
3 effect is present and both valves are closed,
4 there can still be fluid flow through the
5 catheter?

6 A Yes. There still can be fluid flow, I
7 don't want to call it through the catheter but
8 maybe within the catheter associated with this
9 pressure pulse.

10 Q That was a better word.

11 Now I'd like to turn to the combination
12 that you've proposed of Yang and Mullins, okay?

13 A And where are you?

14 Q Sure. Let's start at the bottom of
15 Page 56, Paragraph 100.

16 A Okay, I'm there.

17 Q You have a sentence in Paragraph 100 that
18 starts at the bottom of Page 56 and goes to the
19 top of Page 57.

20 You state: "Additionally, using the
21 pressure sensor provided by Mullins on Yang's
22 device would help implement the most efficient

1 pressure changes to the catheter to reduce the
2 risk of complications from aspiration
3 thrombectomy, including clogged catheters and
4 excessive forward flow of material out of the
5 distal end of the catheter into a patient's
6 bloodstream, as explicitly taught by Mullins".

7 Do you see that?

8 A I do.

9 Q How does using the pressure sensor
10 provided by Mullins on Yang's device help
11 implement the most efficient pressure changes?

12 A I can continue to read because you'd like
13 me to the following paragraphs are going to answer
14 the question if you'd like me just to start
15 reading these paragraphs.

16 Q I'm just looking for your explanation of
17 how it would do that. If reading some sentences
18 is how you wish to answer the question, that's
19 certainly your prerogative, however you want to
20 answer it, I just want to understand your view of
21 how using the pressure sensor provided by Mullins
22 on Yang's device would help implement the most

1 efficient pressure change.

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A Well, pressure changes or the pressure
5 sensors are providing information to the
6 controller that allow the controller then to
7 operate in a predetermined cycle and that then
8 creates a very efficient dynamic aspiration cycle
9 to allow for improved aspiration of a thrombus.

10 BY MR. SANDERS:

11 Q How does information from the pressure
12 sensor provided to the controller provide for the
13 most efficient pressure changes?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A If we're changing pressure the most
17 efficient way of changing it is by monitoring it,
18 and the monitoring of it then will allow for the
19 controller to run its predetermined cycle of
20 changing the pressures.

21 BY MR. SANDERS:

22 Q You've used the word predetermined -- the

1 phrase predetermined cycle a couple of times.

2 What's your understanding of that term?

3 A I mean, I have not been asked to construct
4 that term, but, you know, if you're looking for my
5 definition of it, I mean it's probably the plain
6 and ordinary meaning of it and that's just
7 something that's set in advance.

8 Q Using the information from Mullins'
9 pressure sensor to control the cycle, the timing
10 of when the cycle switches between the aspiration
11 phase and the infusion phase depends on when the
12 pressure reaches a particular limit, right?

13 MR. ODA: Objection. Form.

14 BY THE WITNESS:

15 A If the embodiment of Mullins is using
16 pressure sensors to control a cycle, I believe
17 what you said is correct. That would just be one
18 of the many embodiments of Mullins.

19 BY MR. SANDERS:

20 Q Is that the embodiment that you're
21 discussing in Paragraph 100?

22 MR. ODA: Objection. Form.

1 BY THE WITNESS:

2 A I would say I'm referring to any
3 embodiment of Mullins that is describing the use
4 of a pressure sensor.

5 BY MR. SANDERS:

6 Q And focusing again on the sentence at the
7 end of Paragraph 100 that spans from the bottom of
8 Page 56 to the top of Page 57, how would using the
9 pressure sensor provided by Mullins on Yang's
10 device reduce the risk of complications including
11 clogged catheters and excessive forward flow of
12 material out of the distal end of the catheter
13 into the patient's bloodstream?

14 A Well, one of the ways would be if you're
15 monitoring the pressure, you understand the
16 ability for flow to be either going into the
17 catheter or out of the catheter, and then if you
18 have specific timing requirements, when I say
19 timing meaning predetermined amounts of fluid that
20 you want going into the catheter and predetermined
21 amounts of fluid that you want exiting the
22 catheter, the pressure sensors will help you

1 understand if you're at the proper pressures to
2 perform that.

3 Q How does operating in that way reduce the
4 risk of the complications that you describe?

5 MR. ODA: Objection. Form.

6 BY THE WITNESS:

7 A The complications that I'm describing here
8 include the clogged catheter so having a clogged
9 catheter can create complications during a medical
10 procedure, so if we can prevent the clogging of a
11 catheter, we can reduce the risk of having in a
12 complications and excessive forward flow of
13 material out of the distal end of the catheter
14 that can create the complication of embolic
15 material traveling distally and occluding the
16 distal vasculature.

17 BY MR. SANDERS:

18 Q Does monitoring the pressure using
19 Mullins' pressure sensor to be able to determine
20 the amounts of flow enable reducing the risk of
21 those complications?

22 MR. ODA: Objection. Form.

1 BY THE WITNESS:

2 A Please reread the question.

3 BY MR. SANDERS:

4 Q Sure. Does monitoring the pressure using
5 Mullins' pressure sensor in order to be able to
6 determine the amounts of flow enable reducing the
7 risk of the complications you mentioned of having
8 a clogged catheter for excessive forward flow in a
9 can cause distal migration of a clog?

10 MR. ODA: Objection.

11 BY THE WITNESS:

12 A I believe that is what Mullins is teaching
13 through one of his embodiments.

14 BY MR. SANDERS:

15 Q I'd like to direct your attention forward
16 a bit to Paragraph 102 that starts on the bottom
17 of Page 57.

18 A I am there.

19 Q I'd like to focus first on the first
20 sentence of the paragraph.

21 You state: "A POSA would also find it
22 obvious to implement monitoring the level of

1 vacuum pressure change at the distal end of the
2 aspiration catheter contemplated by Mullins within
3 Yang's aspiration thrombectomy system".

4 Do you see that?

5 A I do.

6 Q Why do you believe a POSA would have found
7 it obvious to implement monitoring the level of
8 vacuum pressure as Mullins contemplates within
9 Yang's aspiration thrombectomy system?

10 A Mullins has shown that by monitoring the
11 pressure inside the catheter he was able to
12 improve the performance of his catheter, and so
13 it'd be reasonable, then, for Yang to implement
14 that on his catheter.

15 Q What would be the benefit of monitoring
16 the level of vacuum pressure in the combination of
17 Yang and Mullins?

18 A It would be improving the performance of a
19 catheter. Mullins has shown that using his
20 technology provides for an improved performing
21 dynamic aspiration system. Yang has a dynamic
22 aspirating system and by combining them, you could

1 improve the performance of Yang.

2 Q You referred to improving the performance.
3 Can you explain what you mean?

4 A Again, it goes back to what we were
5 talking about in Paragraph 100 where we have a
6 catheter clogging or excessive forward flow which
7 can lead to clinical complications so the idea
8 here is to have a catheter that remains patent or
9 open and is able to perform the procedure without
10 complications whether it's related to the catheter
11 clogging or related to forward flow.

12 Q I'd like to focus on the third sentence of
13 Paragraph 102. It's at the top of Page 58.

14 You state: "Mullins discloses that a
15 lumen pressure sensor and a controller can be used
16 to monitor the pressure in the system and builds
17 on the concepts of altering vacuum pressure levels
18 by using a pressure sensor".

19 Do you see that?

20 A I do see that.

21 Q What do you mean when you say that Mullins
22 builds on the concept of altering vacuum pressure

1 sensor -- let me start again. I misspoke.

2 What do you mean in saying that Mullins
3 builds on the concept of altering vacuum pressure
4 levels by using a pressure sensor?

5 A I'm referring to builds on the concept
6 that is disclosed in Yang and so by using the
7 pressure sensors or monitoring the pressure in the
8 system, they can build upon the performance of
9 Yang.

10 Q Thank you. We can put away your
11 declaration at least for the moment.

12 A Okay.

13 Q I'd like to turn to the Ofek reference
14 which is Exhibit 1007.

15 A Okay. I have it in front of me.

16 Q I direct your attention to Figure 4 which
17 has two parts, 4A and 4.B?

18 A I am there.

19 Q Ofek discloses using solenoid valves,
20 right?

21 A I believe it does and I do see in Figure A
22 and Figure B the word solenoid valve.

1 Q I'd like to direct your attention to
2 Column 5 of Ofek. Specifically the end of the
3 paragraph that begins by discussing Figure 4A, the
4 end of that paragraph is at Lines 26 through 33.

5 A I do see that.

6 Q Ofek mentions that the valves that we were
7 looking at in Figure 4 can be combined into a
8 single valve such as a three-way valve, right?

9 A That is my understanding of what Ofek is
10 describing here.

11 Q Ofek does not mention any particular type
12 of three-way valve, right?

13 MR. ODA: Objection. Form.

14 BY THE WITNESS:

15 A He does mention a type of valve in Line
16 25.

17 BY MR. SANDERS:

18 Q Are you referring to the gate valve types
19 of valves?

20 A Correct. Now, that is above talking about
21 I believe this three-way valve.

22 Q Where do you see that discussion of a

1 three-way valve above?

2 A No. I'm referring to his mention of the
3 gate valve is above him disclosing the three-way
4 valve.

5 Q Does Ofek mention any type of three-way
6 valve?

7 A Not that I'm seeing in what we have read.

8 Q Is a gate valve type of valve a rotary
9 valve?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A A gate valve is typically not a rotary
13 style of valve.

14 BY MR. SANDERS:

15 Q I'd like to direct your attention still in
16 Column 5 to the paragraph that begins at the
17 bottom at Line 63?

18 A Okay.

19 Q The first few lines of the first sentence
20 of that paragraph it states: "Between each
21 impulse and after the series of impulses has
22 ended, the N.C. valve 140 closes and the N.O.

1 valve 150 opens..."

2 A Yes.

3 Q That refers to closing the vent valve and
4 opening the vacuum valve, right?

5 A It does as we have previously been using
6 the terms vent valve and vacuum valve.

7 Q That statement does not address the
8 relative timing of the N.C. valve closing and the
9 N.O. valve opening, right?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A In what we have read, it does not provide
13 specifics as far as the timing of these, but I
14 believe it allows for a person to adjust the
15 timing to do what is being described here.

16 BY MR. SANDERS:

17 Q In your view does Ofek allow for either
18 opening the N.C. valve -- let me start again.

19 In your view, does Ofek allow for closing
20 the N.C. valve before opening the N.O. valve as
21 well as opening the N.O. valve before closing the
22 N.C. valve?

1 MR. ODA: Objection. Form.

2 BY THE WITNESS:

3 A Yes. I believe what we have read here
4 will allow for what you have described.

5 BY MR. SANDERS:

6 Q I'd like to turn to addressing your
7 combination of Ofek and /Mullins. And we can go
8 back to your declaration Exhibit 1005. I'd like
9 to direct you to Page 195.

10 A I am there.

11 Q Specifically the Paragraph 361 the first
12 sentence. You state: "A POSA would also find it
13 obvious to implement monitoring the level of
14 vacuum pressure change at the distal end of the
15 aspiration catheter contemplated by Mullins within
16 Ofek's aspiration system".

17 Do you see that?

18 A I do.

19 Q Is the benefit of monitoring the level of
20 vacuum pressure in the Ofek/Mullins combination
21 the same as in the Yang/Mullins combination?

22 MR. ODA: Objection. Form.

1 BY THE WITNESS:

2 A Please reread the question.

3 BY MR. SANDERS:

4 Q Sure. Is the benefit of monitoring the
5 level of vacuum pressure in the Ofek/Mullins
6 combination the same as in the Yang/Mullins
7 combination?

8 MR. ODA: Objection. Form.

9 BY THE WITNESS:

10 A Yes. I think you could experience the
11 same benefits.

12 BY MR. SANDERS:

13 Q I'd like to turn to the end of
14 Paragraph 3671 which appears on the next page,
15 196, you state in the last sentence: "A POSA
16 would have recognized the benefit of controlling
17 the vacuum pressure levels and fluid flow at the
18 distal tip of the catheter, as disclosed in
19 Mullins, in the context of Ofek, which also
20 includes a pressure transducer, and it would have
21 been trivial to implement these within Ofek's
22 aspiration thrombectomy system".

1 Do you see that?

2 A I do see that.

3 Q What do you believe a POSA would have done
4 to implement Mullins' control over pressure levels
5 and fluid flow in Ofek's system?

6 A Well, what Mullins is teaching is control
7 of fluid on the distal end of his catheter so
8 pressure and fluid flow on the distal end of his
9 catheter and teaching that the control of that
10 fluid provides improved performance. So by
11 combining the teachings of Mullins with Ofek, Ofek
12 would have a better-performing device.

13 Q What modifications do you believe a POSA
14 would make to Ofek's system to implement Mullins'
15 teachings?

16 MR. ODA: Objection. Form.

17 BY THE WITNESS:

18 A Mullins teaches different amounts of
19 pressure, he teaches different amounts of flow
20 ratios that improve the performance of the
21 aspiration catheter. So taking the teachings of
22 Mullins of how to improve using the timing and

1 flow and pressures and implementing those on Ofek
2 you would have an improved system.

3 BY MR. SANDERS:

4 Q In improved system that you just referred
5 to, would the vacuum pressure levels and the fluid
6 flow at the distal tip of the catheter be
7 controlled using information from a pressure
8 sensor?

9 MR. ODA: Objection. Form.

10 BY THE WITNESS:

11 A Not necessarily. I mean, that would be
12 one embodiment, but the use of pressure sensors is
13 not mandatory in order to have the -- what is
14 being taught in Mullins as far as the change in
15 pressure and flow on the distal end.

16 BY MR. SANDERS:

17 Q What is a pressure transducer?

18 A Sorry. A pressure transducer is another
19 way of saying pressure sensor.

20 Q Why did you point out in the statement
21 that I read, the last sentence of Paragraph 361,
22 that Ofek also includes a pressure transducer?

1 A I believe Ofek discloses that his system
2 could incorporate a pressure transducer in one of
3 the embodiments.

4 BY MR. SANDERS:

5 Q How, if at all, would that pressure
6 transducer be used in your proposed combination of
7 Ofek and Mullins?

8 MR. ODA: Objection. Form.

9 BY THE WITNESS:

10 A Well, it could be used. When I say could,
11 it's not mandatory that it be used in order to
12 implement the teachings of Mullins on Ofek, but in
13 one of the embodiments of Mullins it teaches the
14 use of a transducer to get the characteristics of
15 Mullins and so Ofek could also do that because
16 Ofek already discloses that it could also include
17 a pressure transducer.

18 BY MR. SANDERS:

19 Q Let's then take a look at Mullins, Exhibit
20 1008.

21 A I have Mullins in front of me.

22 Q I'd like to direct your attention to

1 Column 26, and specifically to lines 23 through
2 30.

3 A Okay.

4 Q Do you agree that Mullins' invention
5 adjusts vacuum pressure or fluid displacement
6 based on feedback from a pressure or a flow sensor
7 to improve aspiration efficiency?

8 MR. ODA: Objection to form.

9 BY THE WITNESS:

10 A I don't believe that that is what is being
11 said here.

12 BY MR. SANDERS:

13 Q Let me ask the question more generally.

14 Do you agree that Mullins' invention
15 adjusts vacuum pressure or fluid displacement
16 based on feedback from a pressure or flow sensor
17 to improve aspiration efficiency?

18 MR. ODA: Objection. Form.

19 BY THE WITNESS:

20 A That is one of the embodiments or a couple
21 of the embodiments. Some of them rely on pressure
22 sensors, some of them rely on flow sensors, some

1 of them rely on predetermined programs.

2 BY MR. SANDERS:

3 Q Do you believe Mullins discusses the use
4 of what you called predetermined programs?

5 MR. ODA: Objection. Form.

6 BY THE WITNESS:

7 A I apologize. I don't -- I didn't realize
8 you were asking a question.

9 What is the question?

10 BY MR. SANDERS:

11 Q Sure. Where do you believe Mullins
12 discusses what you called predetermined programs?

13 A I would have to spend some time going
14 through this patent, but Mullins does refer to
15 having predefined parameters that he is operating
16 under.

17 Q What predefined parameters are you
18 referring to?

19 A Operating parameters.

20 Q What are those parameters?

21 A Again, I would have to find the paragraph
22 in here.

1 Q That's fine. Go for it.

2 A Okay. One example I found here is
3 column 28, starting on Line 1: "In one embodiment
4 the shake signal may be initiated for a predefined
5 number of cycles." So there it's predefined.

6 It would actually be much easier for me to
7 do this if we were to go to the section of my
8 declaration where we speak to this.

9 Q You're welcome to take a look at your
10 declaration. You have it available to you. Go if
11 that helps you to identify the appropriate
12 passages in Mullins, that's fine.

13 A The other examples that I am finding is
14 figures 46 shows a predefined cycle, Figure 49
15 shows a predefined cycle.

16 In Mullins, Paragraph 28 starting at
17 Line 59, in embodiment the pump may use positive
18 and negative fluid displacement to alter, infuse
19 and aspirate the catheter. In one embodiment, the
20 ratio of the infused aspirate cycle may be between
21 0.01 and 0.99 preferably the ratio will be between
22 0.1 and 0.9 or more preferably between .04 and

1 0.9. Those are predetermined cycles.

2 Q Let's go through each of those. First
3 focusing on Figure 46, I direct your attention to
4 column 26, lines 44 through 49.

5 A Please give me the column numbers again.

6 Q 26.

7 A Yes.

8 Q Lines 44 to 49, or maybe it's 43 to 49.

9 A Okay.

10 Q Figure 46 involves the use of defined
11 upper lower pressure limits, right?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A It doesn't say pressure limits here in
15 this paragraph.

16 BY MR. SANDERS:

17 Q Okay. Then let's take a look at Figure 46
18 to clear that up.

19 A Okay. Okay.

20 Q Figure 46 involves the use of defined
21 upper and lower pressure limits, right?

22 MR. ODA: Objection. Form.

1 BY THE WITNESS:

2 A Figure 46 does talk about lower pressure
3 limits reached, upper pressure limits reached.

4 BY MR. SANDERS:

5 Q In Mullins a determination of whether
6 lower pressure limit or upper pressure limit is
7 reached is based on information from a pressure
8 sensor, right?

9 MR. ODA: Objection. Form.

10 BY THE WITNESS:

11 A That would be one of the ways, yes, of
12 monitoring whether those are hit or not.

13 BY MR. SANDERS:

14 Q Does Mullins disclose other ways of
15 determining whether those are hit?

16 MR. ODA: Objection. Form.

17 BY THE WITNESS:

18 A I don't recall him disclosing other ways.
19 What he's talking about is predetermined limits
20 being hit.

21 BY MR. SANDERS:

22 Q The timing of when those predetermined

1 limits are hit depends on how the pressure changes
2 within the catheter, right?

3 MR. ODA: Objection. Form.

4 BY THE WITNESS:

5 A The timing, yes, will vary so that would
6 be something that would be a kind of a cause and
7 effect, so, yes, it's -- the pressure is changing.
8 The pressure may take longer or shorter to reach
9 its limit, but the constant that is being set that
10 is predetermined is the pressure. So that's
11 what's fixed. That's what's being -- that is what
12 is defining what your cycle is is the pressure
13 limits.

14 BY MR. SANDERS:

15 Q We'll now turn to the shake signal that
16 you preferenced at the top of column 28 and is
17 also shown in Figure 49. Let's focus on where
18 Mullins starts discussing the shake signal which
19 is at Column 27, Line 54.

20 A Okay.

21 Q You agree in this paragraph, Mullins is
22 describing that a shake signal can be used between

1 the pressure limits that we just discussed with
2 respect to Figure 46?

3 MR. ODA: Objection. Form.

4 BY THE WITNESS:

5 A In what you have asked me to look at here,
6 it is referencing Figure 50.

7 BY MR. SANDERS:

8 Q Let me rephrase.

9 Do you agree that Mullins is describing a
10 shake signal that is used between two pressure
11 limits?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A In what is being described or taught at
15 the top of 26 or let me see what -- it's
16 discussed, excuse me, at the top of 28.

17 Is that what you're asking?

18 BY MR. SANDERS:

19 Q I include what's at the top of 28 but I'm
20 asking more generally about the shake signal that
21 Mullins describes. So I'm asking about Mullins
22 entirety of its description of the shake signal so

1 I'll set that as the baseline for the question
2 just so you know so it's clear what I'm asking
3 about.

4 Do you agree that Mullins is describing a
5 shake signal that is used between two pressure
6 limits?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A In some of his embodiments, yes.

10 BY MR. SANDERS:

11 Q Do you believe that Mullins discloses any
12 embodiments where the shake signal is not used
13 between two pressure limits?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A I do not recall.

17 BY MR. SANDERS:

18 Q You have Mullins in front of you, if you
19 see any embodiment where Mullins is describing a
20 shake signal that is not used between two pressure
21 limits, would you please identify it for me.

22 A Again, I would have to spend considerable

1 time reading this. I do not have the luxury of
2 doing word searches.

3 Q Let's focus on Column 27, Lines 54 through
4 Column 28, Line 26.

5 My question is within that disclosure, do
6 you believe that Mullins discloses any embodiments
7 where the shake signal is not used between two
8 pressure limits?

9 MR. ODA: Objection. Form.

10 BY THE WITNESS:

11 A Line 60 of column 27, it says: "Another
12 aspect is the incorporation of a rate based
13 cycling of a negative and positive pressure
14 signal."

15 To me rate based would be time based.

16 BY MR. SANDERS:

17 Q That sentence at Column 27, Lines 60
18 through 62 is describing the rate-based cycling of
19 the shake signal itself, right?

20 A That is what you were asking me about.

21 Q I was asking something a little different
22 actually.

1 My question is: Is there any disclosure
2 in Mullins in the passage that I mentioned of a
3 shake signal that is not used between two pressure
4 limits? For clarify, I am not asking about the
5 shake signal itself, I'm asking about what spans
6 when it is used, in other words that the pressure
7 limits set schedule for use of the shake signal.
8 So that was a lot so I'll ask it again just to
9 make it a clean question.

10 In the passage that you identified from
11 columns 27 to 28, do you agree that Mullins is
12 describing a shake signal that is used between two
13 pressure limits?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A That is one of the embodiments and I
17 believe another embodiment is the one I just read
18 to you from 60 to 62.

19 BY MR. SANDERS:

20 Q In the embodiment that you referenced in
21 Column 27, Lines 60 to 62, what do you believe
22 triggers the use of the shake signal?

1 MR. ODA: Objection. Form.

2 BY THE WITNESS:

3 A That is not disclosed in what I'm reading
4 here

5 BY MR. SANDERS:

6 Q In the embodiment that you mentioned
7 Column 27, Lines 60 to 62 does Mullins in your
8 view disclose what causes use of the shake signal
9 to stop?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A Not in what I have read so far.

13 BY MR. SANDERS:

14 Q In the passage from Column 27, Line 54 to
15 Column 28, Line 26, does Mullins disclose any
16 criteria for stopping or starting a shake signal
17 other than reaching a pressure limit?

18 MR. ODA: Objection. Form.

19 BY THE WITNESS:

20 A Yes. Going back to Line 1 of Column 28,
21 it says: "In one embodiment, the shake signal may
22 be initiated for a predefined number of cycles".

1 BY MR. SANDERS:

2 Q Is that shown in Figure 50?

3 MR. ODA: Objection. Form.

4 BY THE WITNESS:

5 A It is difficult to tell.

6 MR. ODA: Counsel, once you reach a good
7 spot, I think we might be due for another break.

8 MR. SANDERS: After we finish this, that
9 would be fine.

10 BY MR. SANDERS:

11 Q So in the -- let me start again.

12 In Mullins, does it disclose what
13 initiates use of a shake signal for a
14 predetermined number of cycles?

15 MR. ODA: Objection. Form.

16 BY THE WITNESS:

17 A It may but I'm not sure where.

18 BY MR. SANDERS:

19 Q We can confine the discussion to
20 Column 27, Line 54 through Column 28 Line 16.

21 In that passage, does Mullins disclose
22 what triggers the shake signal to be initiated for

1 a predetermined number of cycles?

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A What you have to ask me to read here, it
5 goes on to talk about another embodiment where
6 then the shake signal is initiated based on a
7 specific pressure indicative of catheter occlusion
8 or partial occlusion, but I cannot find anywhere
9 where it talks about what initiated it in the
10 first embodiment.

11 MR. SANDERS: Let's take a break.

12 MR. ODA: Sounds good.

13 (A lunch recess was had from 12:30 p.m. to
14 1:00 p.m. CST.)

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1 A F T E R N O O N S E S S I O N

2 BRIAN J. BROWN,

3 called as a witness herein, having been previously
4 duly sworn and having testified, was examined and
5 testified further as follows:

6 EXAMINATION (Resumed)

7 BY MR. SANDERS:

8 Q I'd like to turn to Mullins that we were
9 discussing before the break and specifically to
10 the passage that's at column 28, lines 59 to 64.

11 Do you understand correctly that you
12 believe this discloses use of a predetermined
13 cycle?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A I believe that it defines predetermined
17 parameters for a cycle, yes.

18 Q Does this embodiment in your view involve
19 use of a pressure or flow sensor?

20 MR. ODA: Objection to form.

21 BY THE WITNESS:

22 A It does not say here in this paragraph

1 what is controlling it.

2 BY MR. SANDERS:

3 Q Do you have an opinion on that issue?

4 MR. ODA: Object to form.

5 BY THE WITNESS:

6 A I believe that the parameters that Mullins
7 is defining as far as one of his embodiments can
8 incorporate any of his control mechanisms.

9 BY MR. SANDERS:

10 Q What do you mean by Mullins' control
11 mechanisms?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A The items that we've been discussing
15 already, relative sometimes the use of sensors,
16 possibly not the use of sensors, basically a
17 controller that's controlling the flow and the
18 pressure on the distal end.

19 BY MR. SANDERS:

20 Q What do you mean by possibly not the use
21 of sensors?

22 MR. ODA: Objection. Form.

1 BY THE WITNESS:

2 A I'm saying he's not making it clear here
3 whether he is or not using sensor for these
4 particular parameters.

5 BY MR. SANDERS:

6 Q We talked earlier about the benefits of
7 using a pressure sensor for addressing clogging
8 and avoiding having too much flow out of the
9 distal end, right?

10 A We spoke of the use of a pressure sensor
11 as being one of the ways of controlling the
12 pressure and flow out of the distal end.

13 Q Go to Column 26, Lines 55 to 64.

14 A I am there.

15 Q I'd like to focus first on the first
16 sentence. That sentence is describing use of a
17 pressure sensor, right?

18 A One can assume it's a pressure sensor
19 saying it's continuously measuring the pressure.

20 Q It states the pump will continuously
21 measure the pressure within the catheter lumen
22 during the procedure.

1 Do you see that?

2 A I do see that, yes.

3 Q Where is the pressure sensor located?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A Well, being it says the pressure within
7 the catheter, I would have to assume it's within
8 the catheter.

9 BY MR. SANDERS:

10 Q Does the phrase the pump will continuously
11 measure the pressure provide any information to
12 you about where the sensor is located?

13 A It does not change my opinion.

14 Q Does Mullins identify where within the
15 catheter the pressure sensor is located?

16 MR. ODA: Objection. Form.

17 BY THE WITNESS:

18 A I do not recall if it gives a specific
19 location.

20 BY MR. SANDERS:

21 Q Does it matter for purposes of your
22 opinions?

1 MR. ODA: Objection. Form.

2 BY THE WITNESS:

3 A It would matter relative to maybe the
4 algorithm that is being used but it probably would
5 be able to function if located in multiple areas.

6 Q Mullins traces priority back to
7 applications that were filed in 2017 or 2018,
8 right?

9 A I'm sorry. You said Mullins does?

10 Q Yes.

11 A Yes. It does appear to go back to
12 December of 2017.

13 Q In that time period, how small could you
14 have a pressure sensor?

15 MR. ODA: Objection. Form and scope.

16 BY THE WITNESS:

17 A There were pressure sensors probably as
18 small as the head of a needle.

19 BY MR. SANDERS:

20 Q Turning to Column 26, same paragraph we
21 were looking at starting at Line 55, Mullins is
22 describing switching from vacuum pressure to a

1 positive pressure depending on whether pressure
2 limits have been reached, right?

3 MR. ODA: Objection. Form.

4 BY THE WITNESS:

5 A Okay. Please reask your question.

6 BY MR. SANDERS:

7 Q Let me actually take it a little more step
8 wise.

9 Do you agree that in the absence of an
10 occlusion or a partial occlusion of the catheter,
11 there will be free flow of fluid through the
12 catheter?

13 MR. ODA: Objection. Form.

14 BY THE WITNESS:

15 A When?

16 BY MR. SANDERS:

17 Q When the catheter is inserted into a
18 patient and either vacuum pressure or positive
19 pressure is being applied.

20 MR. ODA: Objection. Form.

21 BY THE WITNESS:

22 A So in the absence of an occlusion, you're

1 asking whether there will be a free flow through
2 the catheter if either the vent valve or the
3 vacuum valve are open?

4 BY MR. SANDERS:

5 Q Yes. Yes.

6 A Yes, depending upon what you're defining
7 as free flow but you'll always have a pressure
8 loss which is referred to as a head loss with any
9 type of flow, and so of the various scenarios that
10 we can discuss that would probably be the free-est
11 flowing of the various situations.

12 BY MR. SANDERS:

13 Q In the paragraph of Mullins at Column 26,
14 Line 54 to 64, Mullins refers to free flow of
15 fluid through the catheter in the absence of an
16 occlusion or partial occlusion when vacuum
17 pressure is being applied, right?

18 MR. ODA: Objection. Form.

19 BY THE WITNESS:

20 A He is using the term free flow during that
21 situation, yes.

22 BY MR. SANDERS:

1 Q Do you agree that when a clot occludes or
2 partially occludes, that would cause the vacuum
3 pressure inside the catheter to increase?

4 A Correct.

5 Q Why does that happen?

6 A Typically because there is a pressure
7 delta that's associated with flow, and so you will
8 have pressure on the proximal end of the catheter,
9 pressure referring to the vacuum, and that vacuum
10 then will decrease as you go towards the distal
11 end of the catheter with flow but once flow stops,
12 then that pressure, meaning the vacuum, will be
13 able to become a constant over the length of a
14 catheter, therefore increasing the vacuum on the
15 distal end.

16 Q You agreed that the pressure inside the
17 catheter will vary depending on whether there is
18 free flow through the catheter versus a clogged
19 catheter?

20 MR. ODA: Objection. Form.

21 BY THE WITNESS:

22 A Yes, based on what I just described to

1 you.

2 BY MR. SANDERS:

3 Q You agree -- I think you already stated
4 this but I just want to make sure I understand.
5 You agree that if a clot is clogging the catheter
6 flow through the catheter may be slowed or
7 interrupted?

8 MR. ODA: Objection. Form.

9 BY THE WITNESS:

10 A Yes. Referring to the catheters that we
11 are discussing here in this -- in Mullins.

12 BY MR. SANDERS:

13 Q Now I'd like to focus on the next
14 paragraph of Mullins which is paragraph that spans
15 from 26, 65 to 27, 17.

16 A I've read it.

17 Q Mullins describes reversing the pressure
18 when the pressure inside the catheter reaches a
19 low limit, right?

20 A It says the pump will reverse at some low
21 level -- at some low limit of pressure.

22 Q Mullins system determines whether that low

1 limit has been reached using a sensor that's
2 monitoring the pressure, right?

3 MR. ODA: Objection. Form.

4 BY THE WITNESS:

5 A Yeah, it does not say here whether it's
6 using a pressure sensor or not, but it is
7 referring to having pressure limits.

8 BY MR. SANDERS:

9 Q How would you know if you've reached the
10 low pressure limit without monitoring the
11 pressure?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A As I've said before, Mullins does teach
15 the use of pressure -- teaches the use of pressure
16 sensors so there's a very good chance that they're
17 using the pressure sensors here. Whether you have
18 to use them or not is unknown to me.

19 BY MR. SANDERS:

20 Q Do you agree that the time it takes for
21 the low limit to be reached will depend on the
22 degree of occlusion of the catheter?

1 MR. ODA: Objection. Form.

2 BY THE WITNESS:

3 A It will -- that will be one of the
4 factors, yes.

5 BY MR. SANDERS:

6 Q Do you agree in a catheter is completely
7 occluded then flow into the catheter will stop?

8 A If it is completely occluded or another
9 way of saying it, corked, then yes, flow entering
10 the catheter will stop.

11 Q I'd like to focus on the next two
12 paragraphs in Mullins, Column 27, Line 18 through
13 30.

14 A Okay.

15 Q Mullins describes when the low pressure
16 limit is reached, then fluid displacement is
17 reversed, thereby, increasing the pressure, right?

18 A Correct.

19 Q Mullins discloses that the application of
20 this reversed fluid flow can push the clot toward
21 the catheter tip, right?

22 A Correct.

1 Q Mullins' application both vacuum pressure
2 and positive fluid displacement causes the clot to
3 become more free within the catheter, right?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A Please reread the question.

7 BY MR. SANDERS:

8 Q Mullins' application of vacuum pressure
9 alternately with positive fluid displacement
10 causes the clot to become more free within the
11 catheter, right?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A I think that is one of the embodiments
15 that, yes, that Mullins teaches. Whether it has
16 to be fluid or clot displacement I'm not sure
17 whether that is required or not versus just a
18 pressure change.

19 BY MR. SANDERS:

20 Q Mullins refers to the clot becoming more
21 "free" in quotes within the catheter in the last
22 sentence the first of the two paragraphs we were

1 discussing at lines 25 to 26, right?

2 A Yes.

3 Q Mullins has reversed the pump to increase
4 the pressure in the catheter, that continues until
5 a high pressure limit is reached, right?

6 A Correct.

7 Q And the time it takes to reach the high
8 limit will depend on how clogged the catheter is,
9 right?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A Yeah, well, the amount that the catheter
13 is clogged will be one of the variables that will
14 dictate the time it takes to hit the high limit.

15 BY MR. SANDERS:

16 Q Does the amount that the catheter is
17 clogged affect the time that it takes to hit the
18 high limit?

19 MR. ODA: Objection. Form.

20 BY THE WITNESS:

21 A I believe that is what I just answered
22 but, yes, like I said, it will be one of the

1 variables that will dictate the time it takes for
2 you to hit the high limit. Others there's going
3 to be the capacity, speed of the pump, you know,
4 what the high limit value is. There could be a
5 number of variables.

6 BY MR. SANDERS:

7 Q My question is how so I'll start from the
8 beginning.

9 How does the amount that the catheter is
10 clogged affect the time that it takes to reach the
11 high limit?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A Yeah, I think in my opinion what's going
15 to influence it if we're strictly talking about
16 the clot itself, it is going to be the ability for
17 that clot to move and so it could actually become
18 two different things, one would be the amount of
19 the occlusion so you can envision let's say having
20 a static piece of clot that's adhered but it's not
21 fully occluded, you would have been able to have
22 some level of flow going past it or you could have

1 something that is fully occluded but the clot is
2 able to move and, therefore, it still has some
3 level of resistance, it would take a little bit
4 longer then to reach that high limit.

5 BY MR. SANDERS:

6 Q Why would it take longer reach the high
7 limit where there is a clot that fully occludes
8 but is able to move versus a static piece of clot
9 that is adhered that does not fully occlude the
10 catheter?

11 MR. ODA: Objection. Form.

12 BY THE WITNESS:

13 A If you have something that is fully
14 occluded but is capable of moving but still has
15 some level of resistance to moving and the pump
16 has the capacity to build up the pressure because
17 you now have something basically blocking it but
18 it -- it's still moving it's kind of like trying
19 to push a wagon, you can push harder and harder
20 but it still takes a force so your force is
21 increasing, so that would be the analogy.

22 BY MR. SANDERS:

1 Q In the situation where you have a clot
2 that has fully occluded the catheter but is able
3 to move -- actually strike that. I'll ask a
4 different question.

5 Would you agree that there is no risk of
6 flow out from the distal end of the catheter until
7 the pressure in the catheter builds up to overcome
8 the vacuum pressure in the catheter?

9 MR. ODA: Objection. Form.

10 BY THE WITNESS:

11 A In order for there to be flow out, the
12 pressure inside of the catheter must be greater
13 than basically blood pressure, and now what can
14 create that pressure can be multiple things.
15 We've talked about, for instance, the pressure
16 source providing that pressure and we've also
17 talked about the water hammer, so either one of
18 those or them combined can cause a pressure
19 increase that will cause flow out.

20 BY MR. SANDERS:

21 Q In a situation where a clot fully occludes
22 the catheter but is capable of moving, there can

1 be a time when positive pressure is being applied
2 but there is no flow out of the distal end of the
3 catheter, right?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A That would only be the case if the clot is
7 not moving, and as you said, if it's fully
8 occluded, corked and basically the cork is not
9 moving, yes, you would have no flow out of the
10 distal end of the catheter.

11 BY MR. SANDERS:

12 Q That could occur for a period of time
13 until the pressure is sufficient to start moving
14 the occlusion, right?

15 MR. ODA: Objection. Form.

16 BY THE WITNESS:

17 A That is my understanding.

18 BY MR. SANDERS:

19 Q We can put aside Mullins. I'd like to go
20 back to your declaration. And early on, Pages 24
21 to 25, Paragraph 57?

22 A I am there.

1 Q I want to talk about the nature of clots,
2 clots can carry in density, right?

3 A Basically, yes, their density, their
4 makeup, their composition.

5 Q Clots can vary in their cohesiveness,
6 right?

7 A Yes.

8 Q Some clots are more firm and cohesive than
9 others, right?

10 A Correct.

11 Q Those clots that are higher in density and
12 cohesiveness tend to stick more to the walls of
13 blood vessels, right?

14 MR. ODA: Objection. Form.

15 BY THE WITNESS:

16 A Yes, clots that are firmer typically are
17 defined as more organized, the more organized the
18 clot is typically the more adhered it is. If it's
19 at its what I referred to as its native location.
20 Now, if that more organized clot becomes an emboli
21 or a particle, then it is no longer adhered and,
22 therefore, we would not have the adhesion

1 characteristics that you are referring to.

2 BY MR. SANDERS:

3 Q Other clots are easier to break up and
4 stick less to the blood vessel walls, right?

5 MR. ODA: Objection. Form.

6 BY THE WITNESS:

7 A Yes, less organized thrombus clots are
8 easier to break up and are less adhesive if they
9 are in their native location.

10 BY MR. SANDERS:

11 Q Those less organized clots are easier to
12 dislodge from their location but have increased
13 chance of fragmentation that may lead to distal
14 migration of the fragments, right?

15 MR. ODA: Objection. Form.

16 BY THE WITNESS:

17 A Yes, there is a risk that they will
18 fragment easier.

19 BY MR. SANDERS:

20 Q Clots can vary in size, right?

21 A Yes.

22 Q In an aspiration procedure, the operating

1 physician may encounter a wide range of clots,
2 right?

3 A That is correct.

4 Q And the aspiration technique that's being
5 used needs to work for that wide range of clots,
6 right?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A The technique being used doesn't have to
10 work for a wide range, if you're going into a
11 situation where you have an unknown clot, it's
12 probably more ideal to use a catheter that's
13 capable of working across a wide range, but if you
14 know specifically what you're going after, you
15 could be more specific on the device that you are
16 selecting.

17 Q I'd like to turn from the nature of clots
18 to discussing some of the risks and safety issues,
19 and we can start in your declaration just a page
20 earlier, Page 23, Paragraph 55.

21 A Okay.

22 Q You state in the first two sentences:

1 "One of the major limitations of thrombus
2 aspiration devices is embolization of thrombus
3 debris downstream in the circulation."

4 A I'm sorry. You lost me where you're at.

5 Q Oh, Paragraph 55 at the bottom of Page 23.

6 A Very good, I'm there.

7 Q You state in the first two sentences:

8 "One of the major limitations of thrombus
9 aspiration devices is embolization of thrombus
10 debris downstream in the circulation. This risk
11 can be remarkable with large and organized
12 thrombi."

13 Can you explain what you mean by this risk
14 can be remarkable with large and organized
15 thrombi.

16 A The risk would be thrombus degree
17 downstream. The larger the thrombus, the greater
18 risk is that some of it is going to break a way.
19 The larger the thrombus, the more difficult it is
20 to aspirate and, therefore, the challenges of
21 aspirating it lead to some of the challenges of
22 not creating emboli.

1 Q I'd like to direct you forward to
2 Paragraph 293 of your declaration. I'll give you
3 the page.

4 A I'm at 293.

5 Q You refer in the first sentence of
6 Paragraph 293 to clinical safety concerns.

7 Do you see that?

8 A I see those terms, yes.

9 Q What clinical safety concerns are you
10 referring to?

11 A The clinical safety concerns I'm referring
12 to are embolic material flowing into the distal
13 vasculature and occluding the distal vasculature
14 therefore leading to potentially tissue death.

15 Q I'd like to direct your attention back to
16 Paragraph 250, I'll give you the page again. It's
17 on 143.

18 A I'm there.

19 Q You refer in the first sentence of that
20 paragraph to the inherent risks of positive exit
21 flow and distal migration of the clot?

22 A I do.

1 Q Are those inherent risks of positive exit
2 flow and distal migration of the clot the clinical
3 safety concerns that you just described?

4 A I believe they are.

5 Q Referring to in the first sentence of
6 Paragraph 250, to monitoring and controlling the
7 frequencies of the cycles, you state that that
8 would be necessary to minimize the risks of
9 forward flow.

10 Do you see that?

11 A You said you're on 250?

12 Q I am. Paragraph 250.

13 A Yes, Paragraph 250.

14 Q It's in the first sentence after the come
15 a, you state: "And would recognize monitoring and
16 controlling the frequencies of the cycles would be
17 necessary to minimize the risks of forward
18 flow"...

19 Do you see that?

20 A I do see that. Sorry I was not able to
21 find it earlier.

22 Q No problem. What do you mean by

1 monitoring the frequencies of the cycles?

2 A Well, as I read the content of this entire
3 section here, what they're referring to is being
4 able to monitor and control the performance of the
5 system and part of what they were doing is
6 altering some of the parameters of the cycle to
7 optimize the performance of the cycle.

8 Q Why would monitoring and controlling the
9 frequencies of the cycles be necessary to minimize
10 the risks of forward flow?

11 MR. ODA: Objection. Form.

12 BY THE WITNESS:

13 A I think what is being said here is that if
14 you were to implement some type of a monitoring
15 and controlling system, you are kind of making the
16 assumption that if you have the proper algorithms
17 in your system that you would be able to have a
18 system that performs better than a system that is
19 fixed, and so whether it's through natural
20 evolution that you're monitoring and adjusting or
21 whether you're doing it real time, both of them
22 would be capable of doing what's written here.

1 BY MR. SANDERS:

2 Q I want to turn to a different portion of
3 your declaration, the calculations that you
4 performed. And the section starts at
5 Paragraph 209 and it continues through
6 Paragraph 219, maybe 220.

7 A Would you like to start at 209?

8 Q I would, yeah.

9 So you performed calculations for two
10 catheter internal diameters, 0.61 inches and
11 0.88 inches, right?

12 A I'm going to correct you. I think it was
13 0.061 and 0.088 if I remember the second one.

14 Q Yes. That's what I meant to say. I guess
15 I didn't say it. Perfect.

16 Now, for the catheter with the internal
17 diameter 0.61 inches, you calculated a blood flow
18 rate of 1.0 milliliters per second, right?

19 A The catheter to diameter of 0 point 061
20 inch diameter was reported in the literature as
21 having an I believe 4 milliliter per minute flow
22 rate and I'm sorry, I don't have the exact numbers

1 right here in front of me on this paragraph. Yes,
2 it was four milliliters, yes, milliliters per
3 second flow rate of water was reported in the
4 literature and that is with water which has a
5 dynamic viscosity of 1, and we were -- I did the
6 calculations to figure out what the flow rate
7 would be in that catheter assuming that blood is
8 flowing through the catheter which has a different
9 dynamic viscosity, a viscosity of 4, so basically
10 a ratio of 4 to 1 and taking kind of the reverse
11 of that from water being 4 milliliters per second
12 down to 1 milliliter per second flow of blood.

13 Q For the catheter with a 0.088-inch inner
14 diameter, you calculated the blood prorated to be
15 per milliliters per second, right?

16 A That sounds correct, but I haven't found
17 it yet to confirm.

18 Q Paragraph 218 might be helpful.

19 A Yes, I did calculate that to be four
20 milliliters per second.

21 Q Now I want to talk about the cycles
22 themselves. I think the relevant paragraph is

1 214, but, you know, feel free to look elsewhere if
2 it's helpful.

3 To calculate the percentage of time in
4 each cycle where positive pressure was being a
5 played and negative pressure was being applied,
6 you use the ratios from Mullins of .01, and .99,
7 .1 and .9, and .4 and .9, right?

8 A I used the infuse to aspirate cycles that
9 you listed, yes, from Mullins.

10 Q I'm curious. Did you think the .4 and .9
11 was a typo since they did not add up to 1?

12 A I did not.

13 Q For that infused aspirate cycle, you
14 computed the percentages of the total of 1.3 that
15 the .4 and .9 constituted to get 31 percent and
16 69 percent, right?

17 A That is correct.

18 Q I want to make sure I understand how your
19 calculations work. Let's turn to Page 124 where
20 you have one of your charts.

21 A I am there.

22 Q And let's take the cycle frequency of .1

1 first and the infusion 31 percent of the time.

2 You report an exit flow of 3.1 milliliters
3 based on your calculations, right?

4 A That is correct.

5 Q Is it correct that you arrive at the 3.1
6 milliliters by multiplying the blood flow rate of
7 one milliliter per second by a cycle duration 10
8 seconds and the percentage of that cycle that
9 infusion is being applied, 31 percent?

10 A That is correct.

11 Q And your calculations assume free flow of
12 blood through the catheter, right?

13 A Correct.

14 Q Your calculations assume blood is always
15 flowing in one direction or the other direction
16 through the catheter, right?

17 A The calculations, yes, are based on that.
18 That is what was taught in Mullins as far as these
19 ratios of infuse and aspiration.

20 Q Your calculations assume that blood flows
21 through the catheter at the same rate during the
22 infusion portion of the cycle as during the

1 aspiration portion of the cycle, right?

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A These calculations are based on a constant
5 flow rate through the catheter.

6 BY MR. SANDERS:

7 Q Just to be clear, that constant flow rate
8 applies for both infusion and aspiration phases of
9 the cycle, right?

10 MR. ODA: Objection. Form.

11 BY THE WITNESS:

12 A They do.

13 BY MR. SANDERS:

14 Q I'm going to go back to Paragraph 210, the
15 blood flow rates that you calculated were based on
16 a reference that disclosed water flow rates under
17 a constant pressure of 600 milligrams mercury,
18 right?

19 A It is under a constant pressure of
20 600 millimeters of mercury, yes.

21 Q I think I said milligrams which isn't
22 right. Thanks.

1 So your calculations assume that the same
2 pressure level -- let me start again.

3 Your calculations assume that a pressure
4 level in the catheter is of the same magnitude but
5 in opposite direction for the infusion and
6 aspiration portions of the cycle, right?

7 MR. ODA: Objection. Form.

8 BY THE WITNESS:

9 A Yes. My calculations are based on the
10 same pressures for both directions.

11 BY MR. SANDERS:

12 Q And your calculations assume that the
13 switch between the aspiration phase of the cycle
14 and the infusion phase of the cycle is
15 instantaneous, right?

16 MR. ODA: Objection to form.

17 BY THE WITNESS:

18 A The calculations are based on the
19 assumption that the time between the cycles is
20 insignificant, if you want to call that
21 instantaneous, but the duration between the cycles
22 has not been included within this calculation but

1 it would be extremely small and as I said
2 insignificant.

3 Q Let's turn to the table that's on top of
4 Page 126.

5 MR. ODA: Is this a good point to take
6 another break? It's been about an hour.

7 MR. SANDERS: I'm happy to do it right now
8 before we go into the table.

9 MR. ODA: Sure.

10 (A recess was had.)

11 BY MR. SANDERS:

12 Q Before the break, we were on the table at
13 the top of Page 126.

14 Do you have that, Mr. Brown?

15 A I do.

16 Q In that table for a cycle frequency of
17 .1 Hz and an infusion percentage of 31 percent,
18 you calculated an exit flow of 12.4 milliliters,
19 right?

20 A Correct.

21 Q We discussed earlier that there can be
22 different sources of positive pressure within the

1 catheter, right?

2 A Yes, we did discuss that.

3 Q One source of positive pressure within the
4 catheter can be pressure introduced by vent fluid?

5 A Correct.

6 Q Another source of positive pressure in the
7 catheter can be a water hammer, correct?

8 A Correct.

9 Q Your calculations rely on the pressure
10 from the vent fluid by producing the exit flow,
11 correct?

12 MR. ODA: Objection. Form.

13 BY THE WITNESS:

14 A Please reask the question.

15 BY MR. SANDERS:

16 Q Sure. Your calculations rely on the
17 pressure from your vent fluid produce the exit
18 flow that's shown in the tables, right?

19 MR. ODA: Objection. Form.

20 BY THE WITNESS:

21 A My calculations aren't specific to whether
22 it's the vent fluid or the water hammer pressure

1 wave. It's based on 600 milliliters of mercury
2 pressure. Now, 600 milliliters of mercury
3 pressure is just shy of one atmosphere. And so
4 when you think about what you would potentially be
5 aspirating at, it would be one atmosphere and many
6 times when you think about what pressure you may
7 be infusing at, it may be around one atmosphere.
8 Now, the values that are in these calculations
9 aren't necessarily stating that this is what a
10 catheter that would be used in any of these
11 systems would be operating at, but what we're
12 saying is those pressures that were the pressure
13 that was used in these calculations of
14 600 milliliters of mercury is a very, very good
15 starting point. It's very realistic amount of
16 pressure that you would use for both infusion and
17 aspiration and, therefore, the numbers, the values
18 are very realistic for someone as a starting
19 point.

20 BY MR. SANDERS:

21 Q Arterial pressure is higher than
22 600 milliliters of mercury, right?

1 A No. So, for instance, your arterial
2 pressure is typically let's say 120 over 80?

3 Q So 600 milligrams of mercury that you used
4 for calculation, that's 600 milligrams of mercury
5 above atmospheric pressure; is that correct?

6 A This would be 600 milliliters of mercury
7 pressure differential from one side of the
8 catheter or one end of the catheter to the other
9 end of the catheter. Now, it just so happens that
10 the distal end of the catheter in the experiment
11 that was run by Professor Long was at atmospheric
12 pressure or within the room and so he applied 600
13 millimeters of mercury to the proximal end of the
14 catheter and then measured the flow rate.

15 Q We discussed earlier the water hammer that
16 can result in the closing of the vacuum valve,
17 right?

18 A Correct.

19 Q But there can be a water hammer effect
20 without infusion into the catheter, right?

21 MR. ODA: Objection to form.

22 BY THE WITNESS:

1 A There can be a water hammer effect without
2 opening up the vent valve if that's what you're
3 asking.

4 BY MR. SANDERS:

5 Q Your calculations are based on the
6 percentage of the cycle that the vent valve is
7 open for infusion, right?

8 MR. ODA: Objection. Form.

9 BY THE WITNESS:

10 A My calculations are based on the
11 percentage of time within each cycle that you have
12 infusion versus aspiration so the ratios that were
13 predefined by Mullins whether the pressure that's
14 being generated during the infusion percentage
15 came from the opening of the vent valve or whether
16 it came from the water hammer effect is somewhat
17 irrelevant for these calculations. As an example,
18 one of the percentages here is between .01 and .99
19 being the ratio. Now, if a water hammer could
20 provide that pressure for the .01, then it could
21 be produced by the water hammer. It would not
22 require the use of vent pressure.

1 BY MR. SANDERS:

2 Q The water hammer effect exists
3 independently of the time of time in the cycle
4 that's used for infusion, right?

5 MR. ODA: Objection. Form.

6 BY THE WITNESS:

7 A That's calculations are flow volumes.
8 They're not infusion ratios meaning when you say
9 infusion I'm assuming you meaning opening of the
10 vent valve when you said infusion.

11 BY MR. SANDERS:

12 Q Let's put it this way.

13 If you could have infusion for zero
14 percent of the cycle and still have the water
15 hammer effect present due to closing the vent
16 valve, right?

17 MR. ODA: Objection. Form.

18 BY THE WITNESS:

19 A That is correct.

20 BY MR. SANDERS:

21 Q That same water hammer effect from closing
22 the vent valve would be present regardless of the

1 amount of time in the cycle that's set aside for
2 infusion, right?

3 MR. ODA: Objection. Form.

4 BY THE WITNESS:

5 A Sorry. I'm not sure whether you've said
6 this backwards in the previous question or not but
7 in this question you mentioned the water hammer
8 effect from closing the vent valve.

9 BY MR. SANDERS:

10 Q No. Sorry. I apologize. That wasn't
11 what I meant to say.

12 The water hammer effect on closing the
13 vacuum valve focusing on that water hammer effect,
14 that water hammer effect exists regardless of how
15 much of the cycle is set aside for infusion,
16 right?

17 MR. ODA: Objection. Form.

18 BY THE WITNESS:

19 A Correct. The water hammer effect is
20 independent of the infusion ratio.

21 BY MR. SANDERS:

22 Q Therefore, you can have a water hammer

1 effect with zero percent infusion, right?

2 MR. ODA: Objection. Form.

3 BY THE WITNESS:

4 A You can. This all goes back to the timing
5 of your cycle and so if you have your cycle set up
6 in such a way that your vacuum valve reopens
7 before that water hammer effect or pressure wave
8 reaches the distal end, you can stop or quell the
9 water hammer effect from having any flow out the
10 distal end or if the water hammer effect or we
11 refer to as the pressure wave is low enough that
12 the pressure that it generates is below the blood
13 pressure, then you would not have flow out.

14 BY MR. SANDERS:

15 Q Yang does not disclose the magnitude of
16 the water hammer effect in its system, right?

17 MR. ODA: Objection. Form.

18 BY THE WITNESS:

19 A I do not recall Yang quantifying the
20 effect of the water hammer as far as what
21 magnitude of pressure it may generate.

22 BY MR. SANDERS:

1 Q You believe that the magnitude of the
2 water hammer effect in Yang would be a pressure
3 higher than arterial pressure?

4 MR. ODA: Objection. Form.

5 BY THE WITNESS:

6 A It can be. That's one of the things that
7 was known and is known is that the water hammer
8 effect can create high pressure. Now, whether
9 Yang's system is capable of it, yes. So it's
10 always yes. Whether a specific design that he had
11 in front of him did or did not is a little bit of
12 an unknown but he doesn't necessarily teach the
13 exact design meaning the dimensions, meaning the
14 length, the diameter of his catheter so all of
15 those things would factor in.

16 BY MR. SANDERS:

17 Q Is it correct that depending on the
18 particulars of Yang's system, the water hammer
19 effect in Yang may or may not exceed arterial
20 pressure?

21 A Yes. The specifics of the design will
22 influence that and as I mentioned earlier, it

1 could be the catheter design, it could be the
2 actual timing of the cycle. All of those things
3 will play into whether that pressure wave can
4 cause forward flow.

5 Q I want to be clear, I want to just ask
6 about the magnitude of the pressure effect putting
7 aside what you might do with the timing of the
8 cycle.

9 My question is: Is it correct that
10 depending on the particulars of Yang's system the
11 water hammer effect in Yang may or may not exceed
12 arterial pressure?

13 A That is correct.

14 Q I'd like to turn to the -- let me start
15 again.

16 One of the references that you address is
17 the Rubinstein reference, right?

18 A Correct.

19 Q Let's take a look at Rubinstein. It's
20 Exhibit 1011.

21 A I have it in front of me.

22 Q Rubinstein has a Figure 2 that shows it's

1 valves, right?

2 A Something happened here with my do you
3 mean. I only have half of Rubinstein. Let me
4 just double check it didn't get mixed in with one
5 of my other prior arts.

6 MR. ODA: Which half are you missing?

7 THE WITNESS: I have only Figure 1 but I
8 have all of the description.

9 MR. ODA: I think Figure 2 is at the
10 bottom of Figure 1.

11 THE WITNESS: You are correct. Thank you.
12 I did not see it hiding down there.

13 BY MR. SANDERS:

14 Q So I'll ask again. Figure 2 shows
15 Rubinstein specs?

16 A It does, it shows the examples of the
17 valves that are shown in Figure 1.

18 Q I'd like to direct your attention to your
19 discussion of Rubinstein in your declaration and
20 specifically to Page 172?

21 A Okay.

22 Q You have two figures on that page, right?

1 A Correct.

2 Q In the top one you have on the righthand
3 Figure 2 from Rubinstein, right?

4 A Yes, with the added coloring.

5 Q On the lefthand side you have shown what's
6 in the lefthand part of Figure 2 in Rubinstein
7 enlarge, right?

8 A Correct.

9 Q If we go down to the bottom figure, there
10 you have on the righthand again Figure 2 of
11 Rubinstein, right?

12 A Correct.

13 Q And what's on the lefthand is a depiction
14 that does not appear in Rubinstein, correct?

15 MR. ODA: Object to form.

16 BY THE WITNESS:

17 A That is correct as far as the figure
18 itself does not appear in Rubinstein.

19 BY MR. SANDERS:

20 Q If you go forward to Page 176, again,
21 focusing on the top figure on the righthand,
22 you've shown Figure 2 of Rubinstein, right?

1 A Correct.

2 Q And on the lefthand you've shown a
3 depiction that does not appear in Rubinstein,
4 correct?

5 A I've shown a figure that does not appear
6 in Rubinstein.

7 MR. SANDERS: Thank you, Mr. Brown. I
8 have no further questions.

9 MR. ODA: Should we take a break here and
10 reconvene in about 15 minutes. Does that work?

11 THE WITNESS: It does.

12 (A recess was had.)

13 MR. ODA: Petitioner has no redirect so we
14 can go off the record.

15 (Deposition concluded at 2:50 p.m. CST).

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1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

2 I, Theresa A. Vorkapic, Certified
3 Reporter and Notary Public within and for the
4 State of Illinois do hereby certify:

5 That BRIAN J. BROWN, the witness whose
6 deposition is hereinbefore set forth,

7 Was duly sworn by me before the
8 commencement of such deposition and that such
9 deposition was taken before me and is a true
10 record of the testimony given by such witness.

11 I further certify that the adverse
12 party, Patent Owner, was represented by counsel at
13 the deposition.

14 I further certify that the deposition of
15 BRIAN J. BROWN, occurred virtually on Friday, May
16 9, 2025, commencing at 9:59 a.m. to 2:50 p.m.
17 CST.

18 I further certify the inspection,
19 reading and signing of said deposition was
20 waived on the record by agreement of all parties.

21 I further certify that I am not related
22 to any of the parties to this action by blood

1 or marriage, I am not employed by or an attorney
2 to any of the parties to this action, and that I
3 am in no way interested, financially or otherwise,
4 in the outcome of this matter.

5 IN WITNESS WHEREOF, I have hereunto set
6 my hand this 14th day of May, 2025.

7
8 
9 _____

10 Theresa A. Vorkapic

11 My commission expires November 6, 2027.

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Transcript of Brian J. Brown
Conducted on May 9, 2025

123

A			
ability	actually	40:5, 40:18,	49:18, 59:17,
51:16, 91:16	9:21, 67:6,	40:21, 51:6,	59:19, 60:4
able	73:22, 83:7,	55:4, 56:1,	allowing
52:19, 53:5,	91:17, 93:3	59:18, 66:21,	33:15, 33:20,
54:11, 55:9,	actuated	68:5, 72:22,	34:14
82:5, 85:13,	42:21, 43:1	74:8, 76:11,	allows
91:21, 92:2,	add	99:16, 107:2,	59:14
92:8, 93:2,	104:11	117:15, 118:14,	alone
100:20, 101:4,	added	119:10, 119:20	32:14, 33:12
101:17	119:4	agree	already
about	additionally	9:7, 9:12,	64:16, 79:15,
13:1, 14:19,	47:20	9:17, 15:10,	86:3
17:18, 18:5,	address	15:16, 15:22,	also
18:13, 18:19,	6:14, 59:7,	16:11, 17:1,	4:9, 8:22,
24:6, 38:22,	117:16	17:21, 18:22,	35:8, 53:21,
55:5, 57:20,	addresses	23:20, 23:22,	60:12, 61:19,
69:2, 69:19,	21:19	26:18, 26:20,	63:22, 64:15,
71:20, 71:21,	addressing	27:11, 34:12,	64:16, 70:17,
72:3, 73:20,	60:6, 80:7	34:19, 35:2,	93:16
74:4, 74:5,	adhered	35:12, 35:15,	alter
77:5, 77:9,	91:20, 92:9,	36:14, 38:4,	67:18
80:6, 81:12,	95:18, 95:21	38:7, 38:19,	altering
91:15, 93:15,	adhesion	38:22, 39:15,	55:17, 55:22,
93:17, 95:1,	95:22	47:2, 65:4,	56:3, 101:6
103:21, 108:6,	adhesive	65:14, 70:21,	alternately
110:4, 110:6,	96:8	71:9, 72:4,	89:9
117:6, 120:10	adjust	74:11, 83:9,	always
above	59:14	85:1, 86:3,	84:7, 105:14,
9:8, 9:10,	adjusting	86:5, 87:20,	116:10
12:1, 12:6,	101:20	88:6, 93:5	among
14:6, 15:2,	adjusts	agreed	15:6
39:21, 57:20,	65:5, 65:15	85:16	amount
58:1, 58:3,	advance	agreement	8:13, 8:16,
111:5	50:7	121:20	8:18, 8:20,
absence	advanced	air	8:22, 9:3, 9:7,
83:9, 83:22,	19:16, 19:19	32:2	9:8, 9:9, 9:12,
84:15	adverse	alan	9:17, 10:5,
accurately	121:11	4:10	10:13, 11:4,
6:17	affect	algorithm	11:13, 11:17,
across	22:20, 46:11,	82:4	11:18, 11:22,
97:13	90:17, 91:10	algorithms	12:1, 12:5,
action	after	101:16	12:9, 12:18,
121:22, 122:2	20:21, 28:10,	all	13:4, 13:6,
activated	33:18, 37:17,	9:2, 15:16,	13:18, 13:21,
28:17	58:21, 76:8,	64:5, 115:4,	14:2, 14:4,
actual	97:14, 100:14	116:14, 117:2,	14:5, 14:20,
117:2	again	118:8, 121:20	14:22, 15:3,
	29:21, 35:21,	allow	90:12, 90:16,
		49:6, 49:9,	

Transcript of Brian J. Brown
Conducted on May 9, 2025

124

91:9, 91:18, 110:15, 114:1 amounts 9:3, 51:19, 51:21, 52:20, 53:6, 62:18, 62:19 analogy 92:21 another 38:13, 42:17, 43:3, 43:4, 63:18, 73:11, 74:17, 76:7, 77:5, 88:8, 108:6, 109:6 answer 21:10, 24:15, 39:4, 48:13, 48:18, 48:20 answered 90:21 any 6:16, 6:20, 7:3, 7:15, 9:22, 25:1, 31:12, 41:2, 45:9, 45:11, 51:2, 57:11, 58:5, 72:11, 72:19, 73:6, 74:1, 75:15, 79:8, 81:11, 84:8, 110:10, 115:9, 121:22, 122:2 anywhere 77:8 apologize 66:7, 114:10 appeal 1:3 appear 82:11, 119:14, 119:18, 120:3, 120:5 appears 33:4, 36:3, 45:5, 61:14	application 88:19, 89:1, 89:8 applications 82:7 applied 12:11, 13:8, 20:3, 20:7, 20:14, 24:3, 37:21, 38:1, 38:6, 83:19, 84:17, 94:1, 104:5, 105:9, 111:12 applies 106:8 appropriate 67:11 areas 82:5 aren't 109:21, 110:9 around 110:7 arrive 105:5 art 7:14 arterial 19:18, 19:22, 20:2, 110:21, 111:1, 116:3, 116:19, 117:12 artery 32:14 arts 118:5 aside 17:18, 94:19, 114:1, 114:15, 117:7 asked 36:19, 50:3, 71:5 asking 14:17, 14:19, 24:20, 24:22, 66:8, 71:17,	71:20, 71:21, 72:2, 73:20, 73:21, 74:4, 74:5, 84:1, 112:3 aspect 73:12 aspire 33:16, 33:22, 34:11, 34:15, 35:13, 67:19, 67:20, 98:20, 104:8, 104:13 aspiring 46:6, 54:22, 98:21, 110:5 aspiration 15:10, 16:1, 16:11, 17:1, 17:19, 17:20, 17:21, 18:6, 18:12, 18:17, 19:1, 19:8, 19:12, 19:15, 19:18, 19:20, 19:22, 20:2, 20:3, 21:18, 28:14, 48:2, 49:8, 49:9, 50:10, 54:2, 54:3, 54:9, 54:21, 60:15, 60:16, 61:22, 62:21, 65:7, 65:17, 96:22, 97:4, 98:2, 98:9, 105:19, 106:1, 106:8, 107:6, 107:13, 110:17, 112:12 assist 25:15 associated 24:7, 47:8, 85:7 assume 80:18, 81:7, 105:11, 105:14,	105:20, 107:1, 107:3, 107:12 assuming 103:7, 113:9 assumption 101:16, 107:19 atmosphere 110:3, 110:5, 110:7 atmospheric 26:12, 27:3, 27:9, 32:2, 32:3, 32:5, 32:7, 32:14, 32:16, 32:17, 33:20, 35:10, 35:13, 111:5, 111:11 attention 8:9, 32:21, 35:17, 45:6, 53:15, 56:16, 57:1, 58:15, 64:22, 68:3, 99:15, 118:18 attorney 122:1 attorneys 44:16 available 67:10 avenue 6:15 avoiding 80:8 aware 6:18, 41:9 away 56:10 B back 24:8, 27:21, 43:13, 43:21, 55:4, 60:8, 75:20, 82:6, 82:11, 94:20, 99:15, 106:14,
---	--	--	---

Transcript of Brian J. Brown
Conducted on May 9, 2025

125

115:4 backwards 114:6 baker 3:4, 3:11 based 29:19, 29:22, 30:6, 31:11, 65:6, 65:16, 69:7, 73:12, 73:15, 77:6, 85:22, 105:3, 105:17, 106:4, 106:15, 107:9, 107:18, 110:1, 112:5, 112:10 baseline 72:1 basically 16:20, 29:5, 79:16, 92:17, 93:13, 94:8, 95:3, 103:9 basing 39:20 because 24:20, 31:6, 37:18, 48:12, 64:15, 85:6, 92:16 become 19:20, 85:13, 89:3, 89:10, 91:17 becomes 95:20 becoming 89:20 been 6:6, 7:7, 9:1, 9:5, 20:12, 30:16, 43:17, 50:3, 59:5, 61:21, 78:3, 79:14, 83:2, 87:1, 91:21, 107:22, 108:6 before 1:3, 2:3,	33:21, 34:14, 41:17, 43:3, 43:4, 59:20, 59:21, 78:9, 87:14, 108:8, 108:12, 115:7, 121:7, 121:9 beginning 91:8 begins 38:14, 57:3, 58:16 behalf 3:2, 3:16, 4:2 being 6:19, 11:17, 13:22, 18:9, 20:3, 20:14, 24:3, 27:6, 32:3, 32:4, 32:12, 32:13, 39:21, 59:15, 63:14, 65:10, 69:20, 70:9, 70:11, 71:14, 80:11, 81:6, 82:4, 83:19, 84:17, 94:1, 97:4, 97:9, 101:3, 101:13, 103:11, 104:4, 104:5, 105:9, 112:14, 112:19 believe 21:21, 24:5, 25:5, 29:3, 30:4, 31:19, 33:14, 34:7, 35:3, 40:2, 41:20, 42:1, 42:10, 50:16, 53:12, 54:6, 56:21, 57:21, 59:14, 60:3, 62:3, 62:13, 64:1, 65:10, 66:3, 66:11, 72:11, 73:6,	74:17, 74:21, 78:12, 78:16, 79:6, 90:21, 100:4, 102:21, 116:1 below 11:17, 115:12 benefit 54:15, 60:19, 61:4, 61:16 benefits 61:11, 80:6 besides 31:14 best 24:13 better 47:10, 101:18 better-performing 62:12 between 10:18, 50:10, 58:20, 67:20, 67:21, 67:22, 70:22, 71:10, 72:5, 72:13, 72:20, 73:7, 74:3, 74:12, 107:13, 107:19, 107:21, 112:18 bit 15:20, 53:16, 92:3, 116:11 blocking 92:17 blood 19:17, 19:19, 93:13, 95:13, 96:4, 102:17, 103:7, 103:12, 103:14, 105:6, 105:12, 105:14, 105:20, 106:15, 115:12, 121:22 bloodstream 48:6, 51:13 board 1:3	boston 3:20 both 26:7, 27:1, 36:15, 36:20, 36:22, 38:5, 45:9, 45:13, 45:18, 45:21, 46:1, 46:4, 46:12, 47:3, 89:1, 101:21, 106:8, 107:10, 110:16 bottom 47:14, 47:18, 51:7, 53:16, 58:17, 98:5, 118:10, 119:9 botts 3:4, 3:11 brain 18:13 break 43:17, 43:22, 44:18, 76:7, 77:11, 78:9, 96:3, 96:8, 98:18, 108:6, 108:12, 120:9 brian 1:15, 2:2, 5:2, 6:5, 6:13, 78:2, 121:5, 121:15 brown 1:15, 2:2, 5:2, 6:5, 6:13, 78:2, 108:14, 120:7, 121:5, 121:15 build 56:8, 92:16 builds 55:16, 55:22, 56:3, 56:5, 93:7 C calculate 103:19, 104:3 calculated 102:17, 103:14,
---	---	---	--

106:15, 108:18 calculation 107:22, 111:4 calculations 102:3, 102:9, 103:6, 104:19, 105:3, 105:11, 105:14, 105:17, 105:20, 106:4, 107:1, 107:3, 107:9, 107:12, 107:18, 109:9, 109:16, 109:21, 110:8, 110:13, 112:5, 112:10, 112:17, 113:7 california 3:5, 3:6 call 47:7, 107:20 called 6:6, 66:4, 66:12, 78:3 came 112:15, 112:16 canister 27:8 cannot 6:16, 77:8 capable 92:14, 93:22, 97:13, 101:22, 116:9 capacity 91:3, 92:16 carry 95:2 case 1:11, 7:4, 7:19, 22:11, 94:6 categorize 7:11 catheters 18:14, 18:17, 19:12, 19:18, 19:22, 48:3, 51:11, 86:10	cause 22:6, 23:14, 53:9, 70:6, 85:2, 93:18, 93:19, 117:4 causes 21:22, 75:8, 89:2, 89:10 centimeters 18:20 cerebral 18:19 certainly 15:20, 48:19 certificate 121:1 certified 2:4, 2:5, 121:2 certify 121:4, 121:11, 121:14, 121:18, 121:21 challenges 98:20, 98:21 chamber 26:2, 26:12, 26:13, 27:8, 27:9 chance 87:16, 96:13 change 17:10, 31:10, 31:13, 32:18, 34:10, 49:1, 54:1, 60:14, 63:14, 81:13, 89:18 changes 41:8, 48:1, 48:11, 49:4, 49:13, 70:1 changing 34:8, 46:18, 46:20, 49:16, 49:17, 49:20, 70:7 characteristics 17:19, 64:14,	96:1 charles 3:17, 3:22 charts 104:20 chat 8:1 check 118:4 circulation 98:3, 98:10 claim 8:12, 8:13, 8:15, 8:16, 8:18, 8:20, 11:4, 12:10, 12:21, 13:3, 13:7, 13:17, 13:21, 14:15, 14:16, 14:19, 15:4, 15:5, 15:11, 15:22, 16:12, 17:2 claimed 13:22, 14:1 claims 8:10, 8:11, 9:2, 13:1 clarendon 3:19 clarify 74:4 clarity 37:4 clause 15:5 clean 74:9 clear 68:18, 72:2, 80:2, 106:7, 117:5 clinical 55:7, 99:6, 99:9, 99:11, 100:2 clog 53:9	clogged 19:20, 20:1, 20:3, 48:3, 51:11, 52:8, 53:8, 85:18, 90:8, 90:13, 90:17, 91:10 clogging 52:10, 55:6, 55:11, 80:7, 86:5 close 16:14, 17:4, 26:1 closed 28:21, 29:13, 30:2, 30:8, 31:1, 37:9, 37:11, 37:13, 43:2, 45:9, 45:13, 45:18, 45:22, 46:1, 46:4, 46:7, 46:8, 46:9, 46:13, 47:3 closes 21:22, 22:12, 26:11, 28:15, 29:7, 29:17, 58:22 closing 16:7, 17:10, 22:5, 22:21, 24:2, 24:10, 25:1, 25:6, 27:11, 29:10, 30:15, 31:6, 38:14, 38:20, 39:1, 39:7, 39:12, 39:16, 39:22, 41:7, 41:11, 41:12, 41:16, 42:6, 42:11, 42:16, 42:19, 43:4, 59:3, 59:8, 59:19, 59:21, 111:16, 113:15,
--	--	---	--

113:21, 114:8, 114:12 clot 18:13, 19:21, 20:1, 33:7, 33:15, 33:21, 33:22, 34:11, 34:14, 34:15, 35:14, 85:1, 86:5, 88:20, 89:2, 89:10, 89:16, 89:20, 91:16, 91:17, 91:20, 92:1, 92:7, 92:8, 93:1, 93:21, 94:6, 95:18, 95:20, 97:11, 99:21, 100:2 clots 95:1, 95:2, 95:5, 95:8, 95:11, 95:16, 96:3, 96:7, 96:11, 96:20, 97:1, 97:5, 97:17 cohesive 95:8 cohesiveness 95:5, 95:12 collection 27:8 coloring 119:4 column 57:2, 58:16, 65:1, 67:3, 68:4, 68:5, 70:16, 70:19, 73:3, 73:4, 73:11, 73:17, 74:21, 75:7, 75:14, 75:15, 75:20, 76:20, 78:10, 80:13, 82:20, 84:13, 88:12	columns 74:11 com 3:8, 3:15, 3:22, 4:8 combination 47:11, 54:16, 60:7, 60:20, 60:21, 61:6, 61:7, 64:6 combined 57:7, 93:18 combining 54:22, 62:11 come 100:14 coming 27:7 comma 29:4 commencement 121:8 commencing 121:16 commission 122:11 communicating 6:20 communication 37:20 completely 33:19, 34:13, 88:6, 88:8 completeness 37:7 complication 52:14 complications 48:2, 51:10, 52:4, 52:7, 52:9, 52:12, 52:21, 53:7, 55:7, 55:10 composition 95:4 computed 104:14 computer 8:2	concept 55:22, 56:3, 56:5 concepts 55:17 concerns 99:6, 99:9, 99:11, 100:3 concluded 120:15 conducted 1:16, 2:2 configured 15:6, 16:2, 16:13, 17:3 confine 76:19 confirm 103:17 connected 21:14, 27:7, 32:2 connecting 27:1, 27:2, 27:7 consider 21:18 considerable 72:22 considerations 17:17 constant 70:9, 85:13, 106:4, 106:7, 106:17, 106:19 constituted 104:15 construct 50:3 contemplated 54:2, 60:15 contemplates 54:8 content 101:2 context 61:19 continue 48:12	continued 4:1 continues 90:4, 102:5 continuously 80:19, 80:20, 81:10 control 15:6, 15:12, 15:17, 16:2, 17:11, 50:9, 50:16, 62:4, 62:6, 62:9, 79:8, 79:10, 101:4 controlled 63:7 controller 15:5, 15:12, 15:17, 16:2, 16:6, 16:13, 17:3, 17:9, 49:6, 49:12, 49:19, 55:15, 79:17 controlling 16:6, 16:8, 61:16, 79:1, 79:17, 80:11, 100:6, 100:16, 101:8, 101:15 controls 16:15, 17:5 convenient 7:21 convinced 35:16 copies 7:12, 7:13, 7:22 cork 33:16, 94:8 corked 19:21, 20:1, 20:8, 20:14, 21:17, 33:22, 34:11, 34:15, 35:13, 88:9,
--	--	--	--

94:8 correct 8:17, 9:6, 9:11, 15:9, 20:1, 23:21, 33:4, 36:3, 40:8, 40:9, 42:3, 43:5, 43:9, 44:11, 44:12, 45:5, 45:11, 50:17, 57:20, 85:4, 88:18, 88:22, 90:6, 95:10, 97:3, 102:12, 103:16, 104:17, 105:4, 105:5, 105:10, 105:13, 108:20, 109:5, 109:7, 109:8, 109:11, 111:5, 111:18, 113:19, 114:19, 116:17, 117:9, 117:13, 117:18, 118:11, 119:1, 119:8, 119:12, 119:14, 119:17, 120:1, 120:4 correctly 78:11 could 7:11, 10:3, 10:10, 10:17, 15:1, 23:14, 24:13, 43:16, 44:4, 54:22, 61:10, 64:2, 64:10, 64:15, 64:16, 82:13, 91:4, 91:17, 91:22, 94:12, 97:15, 112:19, 112:20, 113:13, 117:1 counsel 7:8, 76:6, 121:12	couple 50:1, 65:20 create 22:22, 29:17, 31:7, 31:12, 32:15, 32:18, 41:8, 44:15, 44:16, 46:16, 52:9, 52:14, 93:14, 116:8 creates 49:8 creating 31:9, 98:22 criteria 75:16 crr 1:22 csr 1:22 cst 1:17, 77:14, 120:15, 121:17 curious 104:10 cycle 38:13, 49:7, 49:8, 49:19, 50:1, 50:9, 50:10, 50:16, 67:14, 67:15, 67:20, 70:12, 78:13, 78:17, 101:6, 101:7, 104:4, 104:13, 104:22, 105:7, 105:8, 105:22, 106:1, 106:9, 107:6, 107:13, 107:14, 108:16, 112:6, 112:11, 113:3, 113:14, 114:1, 114:15, 115:5, 117:2, 117:8 cycles 67:5, 68:1, 75:22, 76:14,	77:1, 100:7, 100:16, 101:1, 101:9, 103:21, 104:8, 107:19, 107:21 cycling 34:10, 73:13, 73:18 D day 122:6 dc 4:6, 44:8 death 99:14 debris 98:3, 98:10 december 82:12 decisions 17:12 declaration 7:19, 43:11, 44:3, 44:17, 44:21, 56:11, 60:8, 67:8, 67:10, 94:20, 97:19, 99:2, 102:3, 118:19 declarations 7:13 decrease 85:10 defined 32:4, 68:10, 68:20, 95:17 defines 78:16 defining 28:7, 70:12, 79:7, 84:6 definition 12:6, 15:2, 50:5 definitive 27:17 degree 87:22, 98:16	delta 85:7 density 95:2, 95:3, 95:11 depend 87:21, 90:8 depending 19:5, 46:20, 83:1, 84:6, 85:17, 116:17, 117:10 depends 18:9, 45:22, 46:3, 50:11, 70:1 depiction 119:13, 120:3 depos 4:10 deposition 1:15, 2:2, 7:17, 120:15, 121:6, 121:8, 121:9, 121:13, 121:14, 121:19 describe 28:4, 28:7, 41:21, 52:4 described 39:21, 59:15, 60:4, 71:14, 85:22, 100:3 describes 36:14, 36:20, 42:2, 42:6, 71:21, 86:17, 88:15 describing 39:12, 42:16, 51:3, 52:7, 57:10, 70:22, 71:9, 72:4, 72:19, 73:18, 74:12, 80:16, 82:22 description 27:17, 36:5,
--	---	---	---

71:22, 118:8 design 116:10, 116:13, 116:21, 117:1 determination 69:5 determine 52:19, 53:6 determines 86:22 determining 69:15 device 47:22, 48:10, 48:22, 51:10, 62:12, 97:15 devices 98:2, 98:9 diameter 20:9, 20:13, 102:17, 102:19, 102:20, 103:14, 116:14 diameters 102:10 dictate 90:14, 91:1 differ 41:13 different 15:21, 25:8, 62:18, 62:19, 73:21, 91:18, 93:4, 102:2, 103:8, 108:22 differential 111:7 differently 40:3 difficult 33:13, 76:5, 98:19 dimensions 116:13 direct 8:9, 32:21, 35:17, 45:6, 53:15, 56:16,	57:1, 58:15, 60:9, 64:22, 68:3, 99:1, 99:15, 118:18 direction 23:1, 23:2, 23:4, 23:8, 105:15, 107:5 directions 107:10 directly 37:20 disclose 22:5, 24:9, 25:1, 26:20, 31:12, 40:15, 41:2, 41:16, 69:14, 75:8, 75:15, 76:12, 76:21, 115:15 disclosed 56:6, 61:18, 75:3, 106:16 discloses 23:20, 25:18, 26:18, 26:22, 31:20, 38:4, 39:16, 40:7, 40:10, 42:10, 45:14, 55:14, 56:19, 64:1, 64:16, 72:11, 73:6, 78:12, 88:19 disclosing 29:12, 29:15, 39:8, 58:3, 69:18 disclosure 40:20, 40:22, 73:5, 74:1 discuss 8:22, 45:16, 84:10, 109:2 discussed 14:21, 24:18, 45:14, 46:5, 71:1, 71:16,	108:21, 111:15 discusses 36:1, 66:3, 66:12 discussing 14:16, 33:3, 35:20, 35:22, 45:3, 50:21, 57:3, 70:18, 78:9, 79:14, 86:11, 90:1, 97:18 discussion 57:22, 76:19, 118:19 disk's 40:22 dislodge 96:12 displacement 65:5, 65:15, 67:18, 88:16, 89:2, 89:9, 89:16 distal 15:7, 15:13, 15:18, 16:3, 16:15, 17:5, 17:11, 20:8, 20:15, 23:4, 23:11, 23:15, 31:9, 31:10, 31:13, 32:9, 32:15, 32:18, 34:8, 41:8, 46:18, 46:19, 48:5, 51:12, 52:13, 52:16, 53:9, 54:1, 60:14, 61:18, 62:7, 62:8, 63:6, 63:15, 79:18, 80:9, 80:12, 85:10, 85:15, 93:6, 94:2, 94:10, 96:13, 99:12, 99:13, 99:21,	100:2, 111:10, 115:8, 115:10 distally 52:15 documents 7:7, 7:9 doing 35:4, 38:19, 43:15, 73:2, 101:5, 101:21, 101:22 done 40:1, 40:3, 62:3 double 46:9, 118:4 down 20:4, 103:12, 118:12, 119:9 downstream 98:3, 98:10, 98:17 dr 7:1 drop 8:1 dropping 37:22, 38:9 drops 38:5 due 20:13, 76:7, 113:15 duly 6:4, 6:6, 78:4, 121:7 duration 105:7, 107:21 during 7:17, 43:22, 52:9, 80:22, 84:20, 105:21, 105:22, 112:14 dynamic 49:8, 54:21, 103:5, 103:9 E each 40:1, 42:21,
--	--	---	--

43:2, 58:20, 68:2, 104:4, 112:11 earlier 42:18, 46:5, 80:6, 97:20, 100:21, 108:21, 111:15, 116:22 early 94:20 easier 67:6, 96:3, 96:8, 96:11, 96:18 effect 20:22, 22:1, 22:6, 22:8, 22:18, 22:19, 23:21, 24:2, 24:7, 24:18, 27:12, 28:4, 29:14, 29:18, 30:3, 30:9, 30:15, 31:2, 31:14, 45:15, 45:17, 45:21, 46:6, 46:10, 46:11, 46:16, 47:3, 70:7, 111:19, 112:1, 112:16, 113:2, 113:15, 113:21, 114:8, 114:12, 114:13, 114:14, 114:19, 115:1, 115:7, 115:9, 115:10, 115:16, 115:20, 116:2, 116:8, 116:19, 117:6, 117:11 efficiency 65:7, 65:17 efficient 34:9, 34:10, 35:4, 35:9, 47:22, 48:11, 49:1, 49:8, 49:13, 49:17	efficiently 33:16, 34:1, 34:16, 34:20, 34:21, 35:2, 35:14 either 10:3, 37:20, 51:16, 59:17, 83:18, 84:2, 93:17 eleventh 4:5 eliot 3:10, 3:15 elsewhere 41:12, 104:1 embodiment 41:7, 50:15, 50:20, 51:3, 63:12, 67:3, 67:17, 67:19, 72:19, 74:17, 74:20, 75:6, 75:21, 77:5, 77:10, 78:18 embodiments 38:9, 50:18, 53:13, 64:3, 64:13, 65:20, 65:21, 72:9, 72:12, 73:6, 74:16, 79:7, 89:14 emboli 95:20, 98:22 embolic 52:14, 99:12 embolization 98:2, 98:9 employed 122:1 enable 52:20, 53:6 encounter 97:1 end 15:7, 15:13, 15:18, 16:3,	16:15, 17:5, 17:12, 20:9, 20:15, 23:4, 23:11, 23:15, 31:9, 31:10, 31:13, 32:9, 32:15, 32:18, 34:8, 41:8, 43:16, 46:18, 46:19, 48:5, 51:7, 51:12, 52:13, 54:1, 57:2, 57:4, 60:14, 61:13, 62:7, 62:8, 63:15, 79:18, 80:9, 80:12, 85:8, 85:11, 85:15, 93:6, 94:2, 94:10, 111:8, 111:9, 111:10, 111:13, 115:8, 115:10 ended 58:22 enlarge 119:7 enough 115:11 entering 88:9 entire 27:18, 101:2 entirety 71:22 envision 91:19 esquire 3:3, 3:10, 3:17, 4:3 even 45:18 ever 12:4 evolution 101:20 exact 102:22, 116:13	examination 5:2, 5:3, 6:8, 78:6 examined 6:7, 78:4 example 24:18, 67:2, 112:17 examples 67:13, 118:16 exceed 116:19, 117:11 excessive 48:4, 51:11, 52:12, 53:8, 55:6 exclusive 24:19 excuse 29:20, 33:17, 34:9, 35:21, 71:16 exhibit 8:7, 17:18, 23:18, 43:11, 56:14, 60:8, 64:19, 117:20 exhibits 5:8, 7:20 exists 113:2, 114:14 exit 8:13, 8:16, 8:19, 8:20, 9:1, 9:3, 9:8, 9:10, 9:13, 9:18, 10:5, 10:14, 11:4, 11:5, 11:9, 11:12, 11:13, 11:17, 11:18, 11:22, 12:1, 12:5, 12:7, 12:10, 12:18, 13:4, 13:7, 13:17, 13:18, 13:21, 14:2, 14:5, 14:6, 14:20,
--	--	--	--

14:22, 15:3, 99:20, 100:1, 105:2, 108:18, 109:10, 109:17 exiting 51:21 expand 20:16 expansion 20:21 experience 18:5, 61:10 experiment 111:10 expires 122:11 explain 55:3, 98:13 explanation 48:16 explicitly 48:6 extremely 108:1	figure 25:16, 26:3, 29:8, 32:1, 32:4, 36:1, 36:4, 36:8, 36:9, 36:16, 36:22, 37:1, 38:5, 38:8, 38:14, 41:9, 43:7, 44:8, 44:11, 44:15, 44:17, 56:16, 56:21, 56:22, 57:3, 57:7, 67:14, 68:3, 68:10, 68:17, 68:20, 69:2, 70:17, 71:2, 71:6, 76:2, 103:6, 117:22, 118:7, 118:9, 118:10, 118:14, 118:17, 119:3, 119:6, 119:9, 119:10, 119:17, 119:21, 119:22, 120:5 figures 33:3, 35:21, 36:1, 37:8, 37:10, 41:6, 41:13, 42:20, 67:14, 118:22 filed 82:7 final 40:2 financially 122:3 find 53:21, 60:12, 66:21, 77:8, 100:21 finding 67:13 fine 24:21, 67:1, 67:12, 76:9	finish 43:18, 76:8 firm 95:8 firmer 95:16 first 6:6, 8:6, 53:19, 58:19, 60:11, 68:2, 77:10, 80:15, 89:22, 97:22, 98:7, 99:5, 99:19, 100:5, 100:14, 105:1 fixed 70:11, 101:19 flew 22:19 flexibility 19:8, 19:13, 19:16 floor 55:6 flowing 23:3, 84:11, 99:12, 103:8, 105:15 flows 105:20 fluid 15:6, 18:22, 21:1, 21:4, 22:12, 22:13, 22:17, 22:20, 23:2, 23:3, 23:14, 28:16, 29:7, 32:2, 37:19, 46:12, 46:20, 47:4, 47:6, 51:19, 51:21, 61:17, 62:5, 62:7, 62:8, 62:10, 63:5, 65:5, 65:15, 67:18, 83:11, 84:15, 88:16, 88:20,	89:2, 89:9, 89:16, 109:4, 109:10, 109:17, 109:22 fluids 21:15 focus 36:4, 53:19, 55:12, 70:17, 73:3, 80:15, 86:13, 88:11 focusing 51:6, 68:3, 114:13, 119:21 following 28:3, 42:18, 48:13 follows 6:7, 78:5 force 92:20 forth 121:6 forward 48:4, 51:11, 52:12, 53:8, 53:15, 55:6, 55:11, 99:1, 100:9, 100:17, 101:10, 117:4, 119:20 found 33:15, 33:22, 34:15, 35:13, 54:6, 67:2, 103:16 four 103:2, 103:19 fragment 96:18 fragmentation 96:13 fragments 96:14 francisco 3:6 free 7:20, 83:11,
F			
factor 116:15 factors 88:4 familiar 24:6 family 12:22, 27:18, 27:19 far 12:6, 16:19, 39:21, 40:15, 45:11, 59:13, 63:14, 75:12, 79:7, 105:18, 115:20, 119:17 feedback 65:6, 65:16 feel 7:20, 104:1 few 44:22, 58:19			

84:1, 84:7, 84:14, 84:20, 85:18, 89:3, 89:10, 89:21, 104:1, 105:11 free-est 84:10 frequencies 100:7, 100:16, 101:1, 101:9 frequency 104:22, 108:16 friday 1:17, 121:15 front 8:8, 23:19, 44:3, 56:15, 64:21, 72:18, 103:1, 116:11, 117:21 full 6:12 fully 91:21, 92:1, 92:7, 92:9, 92:13, 93:2, 93:21, 94:7 function 82:5 further 78:5, 120:8, 121:11, 121:14, 121:18, 121:21	generates 115:12 generator 28:17 give 24:15, 43:12, 68:5, 99:2, 99:16 given 9:22, 10:20, 15:1, 121:10 gives 81:18 go 7:10, 26:15, 27:21, 44:22, 60:7, 67:1, 67:7, 67:10, 68:2, 80:13, 82:11, 85:10, 94:19, 106:14, 108:8, 119:9, 119:20, 120:14 goes 47:18, 55:4, 77:5, 115:4 going 9:15, 36:16, 48:13, 51:16, 51:20, 66:13, 75:20, 91:2, 91:14, 91:16, 91:22, 97:10, 97:14, 98:18, 102:12, 106:14 good 6:10, 6:11, 8:5, 76:6, 77:12, 87:16, 98:6, 108:5, 110:14 great 44:4 greater 93:12, 98:17 guess 10:3, 21:9, 24:6, 102:14	H half 118:3, 118:6 hammer 22:1, 22:6, 22:8, 22:9, 22:10, 22:14, 22:15, 22:17, 22:19, 22:22, 23:21, 24:2, 24:7, 24:10, 24:17, 25:2, 27:12, 28:1, 28:4, 28:8, 28:21, 29:14, 29:16, 29:17, 30:2, 30:8, 30:15, 31:2, 31:14, 45:15, 45:17, 45:21, 46:5, 46:9, 46:11, 46:16, 47:2, 93:17, 109:7, 109:22, 111:15, 111:19, 112:1, 112:16, 112:19, 112:21, 113:2, 113:15, 113:21, 114:7, 114:12, 114:13, 114:14, 114:19, 114:22, 115:7, 115:9, 115:10, 115:16, 115:20, 116:2, 116:7, 116:18, 117:11 hand 6:3, 122:6 hanover 6:15 happen 85:5 happened 118:2 happens 111:9 happy 108:7	hard 10:19 harder 92:19 head 82:18, 84:8 help 47:22, 48:10, 48:22, 51:22 helpful 103:18, 104:2 helps 67:11 here 29:2, 29:3, 29:9, 29:15, 32:17, 34:7, 35:15, 39:2, 41:13, 43:12, 52:7, 55:8, 57:10, 59:15, 60:3, 65:11, 66:22, 67:2, 68:14, 71:5, 75:4, 77:4, 78:22, 80:2, 86:11, 87:5, 87:17, 101:3, 101:13, 101:22, 103:1, 112:18, 118:2, 120:9 hereby 121:4 herein 6:6, 78:3 hereinbefore 121:6 hereunto 122:5 hiding 118:12 high 16:19, 27:15, 31:9, 31:12, 90:5, 90:7, 90:14, 90:18, 91:2, 91:4, 91:11, 92:4,
G gate 57:18, 58:3, 58:8, 58:12 general 17:16, 24:22, 29:16, 40:15 generally 24:20, 25:5, 65:13, 71:20 generate 115:21 generated 28:14, 112:14			

92:6, 116:8 higher 37:11, 95:11, 110:21, 116:3 hit 69:12, 69:15, 69:20, 70:1, 90:14, 90:17, 91:2 horizontal 37:4 hour 43:17, 108:6 however 48:19 hz 108:17	improved 49:9, 54:20, 62:10, 63:2, 63:4 improving 54:18, 55:2 impulse 58:21 impulses 58:21 inc 1:5, 1:8 inch 102:20, 103:13 inches 102:10, 102:11, 102:17 include 9:13, 9:18, 10:5, 10:14, 52:8, 64:16, 71:19 included 11:12, 107:22 includes 11:5, 61:20, 63:22 including 48:3, 51:10 incorporate 64:2, 79:8 incorporation 73:12 increase 85:3, 90:3, 93:19 increased 96:12 increasing 85:14, 88:17, 92:21 independent 42:21, 43:2, 114:20 independently 40:1, 113:3 indicate 37:11	indicative 77:7 influence 91:15, 116:22 information 49:5, 49:11, 50:8, 63:7, 69:7, 81:11 infuse 67:18, 104:8, 105:19 infused 67:20, 104:13 infusing 110:7 infusion 50:11, 105:1, 105:9, 105:22, 106:8, 107:5, 107:14, 108:17, 110:16, 111:20, 112:7, 112:12, 112:14, 113:4, 113:8, 113:9, 113:10, 113:13, 114:2, 114:15, 114:20, 115:1 inherent 99:20, 100:1 initial 23:2 initiated 67:4, 75:22, 76:22, 77:6, 77:9 initiates 76:13 inner 103:13 inserted 83:17 inside 28:14, 54:11, 85:3, 85:16, 86:18, 93:12 insignificant 107:20, 108:2 inspection 121:18	instance 21:15, 93:15, 111:1 instantaneous 107:15, 107:21 intending 24:19 interested 122:3 internal 102:10, 102:16 interpret 14:15 interpretation 11:3, 11:21, 39:20 interrupted 86:7 introduced 109:4 invention 65:4, 65:14 involve 78:18 involves 68:10, 68:20 ipr 1:11, 7:19, 30:17, 31:3 iprs 7:12 irrelevant 112:17 issue 79:3 issues 97:18 it'd 54:13 items 79:14 itself 73:19, 74:5, 91:16, 119:18
I			J
idea 55:7 ideal 97:12 identified 26:16, 74:10 identify 67:11, 72:21, 81:14 illinois 2:8, 121:4, 122:12 impact 21:4 implement 47:22, 48:11, 48:22, 53:22, 54:7, 54:13, 60:13, 61:21, 62:4, 62:14, 64:12, 101:14 implementing 63:1 implied 11:3, 11:21 improve 54:12, 55:1, 62:20, 62:22, 65:7, 65:17			jandel 6:15

job 1:19	19:1, 19:5, 85:13, 116:14	limitations 98:1, 98:8	located 18:18, 81:3, 81:12, 81:15, 82:5
K	less 19:6, 24:6, 96:4, 96:7, 96:8, 96:11	limited 8:19, 9:1, 9:4, 9:5, 14:1, 14:4, 14:5, 32:5	location 81:19, 95:19, 96:9, 96:12
kind 10:11, 22:9, 29:5, 70:6, 92:18, 101:15, 103:10	let's 15:4, 21:18, 23:17, 24:1, 24:8, 26:3, 43:18, 47:14, 64:19, 68:2, 68:17, 70:17, 73:3, 77:11, 91:19, 104:19, 104:22, 108:3, 111:2, 113:12, 117:19	limits 68:11, 68:14, 68:21, 69:3, 69:19, 70:1, 70:13, 71:1, 71:11, 72:6, 72:13, 72:21, 73:8, 74:4, 74:7, 74:13, 83:2, 87:7	long 18:5, 18:14, 111:11
know 7:21, 8:3, 34:19, 35:1, 50:4, 72:2, 87:9, 91:3, 97:14, 104:1	level 16:19, 17:10, 27:15, 37:11, 53:22, 54:7, 54:16, 60:13, 60:19, 61:5, 86:21, 91:22, 92:3, 92:15, 107:2, 107:4	line 37:8, 37:10, 37:12, 37:13, 37:19, 37:22, 43:16, 57:15, 58:17, 67:3, 67:17, 70:19, 73:4, 73:11, 75:14, 75:15, 75:20, 76:20, 82:21, 84:14, 88:12	longer 70:8, 92:4, 92:6, 95:21
known 116:7	levels 55:17, 56:4, 61:17, 62:4, 63:5	lines 37:4, 57:4, 58:19, 65:1, 68:4, 68:8, 73:3, 73:17, 74:21, 75:7, 78:10, 80:13, 90:1	look 7:18, 7:21, 15:4, 23:17, 25:15, 26:3, 43:10, 64:19, 67:9, 68:17, 71:5, 104:1, 117:19
L	limit 11:8, 11:12, 11:17, 12:9, 12:15, 12:16, 13:6, 13:12, 14:1, 50:12, 69:6, 70:9, 75:17, 86:19, 86:21, 87:1, 87:10, 87:21, 88:16, 90:5, 90:8, 90:14, 90:18, 91:2, 91:4, 91:11, 92:4, 92:7	list 7:9	looking 24:15, 38:8, 48:16, 50:4, 57:7, 82:21
labeled 44:8	limitation 13:17	listed 104:9	loosen 33:7
large 98:11, 98:14		literature 102:20, 103:4	loss 84:8
largely 39:21		little 73:21, 83:7, 92:3, 116:11	lost 98:4
larger 98:17, 98:19		llp 3:4, 3:11, 3:18, 4:4	lot 74:8
last 15:4, 38:11, 41:21, 42:1, 45:7, 45:8, 61:15, 63:21, 89:21			low 86:19, 86:20, 86:21, 86:22, 87:10, 87:21, 88:15, 115:11
latham 3:18, 4:4			lower 11:12, 12:9, 12:15, 12:16, 13:6, 13:12, 44:22, 68:11, 68:21, 69:2, 69:6
lead 55:7, 96:13, 98:21			lumen 20:7, 28:14, 31:8, 55:15,
leading 99:14			
least 32:3, 37:20, 56:11			
lefthand 119:5, 119:6, 119:13, 120:2			
length 17:22, 18:20,			

Transcript of Brian J. Brown
Conducted on May 9, 2025

135

80:21 lumens 27:7, 29:9 lunch 77:13 luxury 73:1	122:4 maybe 25:15, 47:8, 68:8, 82:3, 102:6 mean 14:5, 14:9, 14:11, 14:14, 14:16, 14:22, 50:3, 50:5, 55:3, 55:21, 56:2, 63:11, 79:10, 79:20, 98:13, 100:22, 118:3 meaning 29:6, 42:20, 50:6, 51:19, 85:12, 113:8, 113:9, 116:13 means 37:12 meant 35:16, 102:14, 114:11 measure 80:21, 81:11 measured 111:14 measuring 80:19 mechanisms 79:8, 79:11 medical 32:13, 52:9 meet 13:17 mention 57:11, 57:15, 58:2, 58:5 mentioned 53:7, 74:2, 75:6, 114:7, 116:22 mentions 57:6 mercury 106:17, 106:20,	110:1, 110:2, 110:14, 110:22, 111:3, 111:4, 111:6, 111:13 merely 33:6 merit 2:5 midpoint 10:18 might 24:20, 76:7, 103:18, 117:7 migration 53:9, 96:14, 99:21, 100:2 milligrams 106:17, 106:21, 111:3, 111:4 milliliter 102:21, 103:12, 105:7 milliliters 102:18, 103:2, 103:11, 103:15, 103:20, 105:2, 105:6, 108:18, 110:1, 110:2, 110:14, 110:22, 111:6 millimeters 106:20, 111:13 mind 35:5 minimize 100:8, 100:17, 101:9 minnesota 6:15 minute 43:12, 102:21 minutes 120:10 missing 29:4, 118:6 misspoke 56:1 mixed 118:4	modifications 62:13 moment 56:11 monitor 55:16, 101:4 monitoring 49:17, 49:18, 51:15, 52:18, 53:4, 53:22, 54:7, 54:10, 54:15, 56:7, 60:13, 60:19, 61:4, 69:12, 87:2, 87:10, 100:6, 100:15, 101:1, 101:8, 101:14, 101:20 more 17:16, 19:6, 24:20, 33:16, 34:9, 34:10, 34:21, 35:4, 35:9, 65:13, 67:22, 71:20, 83:7, 89:3, 89:10, 89:20, 95:8, 95:12, 95:17, 95:18, 95:20, 97:12, 97:15, 98:19 morning 6:10, 6:11 most 7:21, 33:22, 34:15, 34:19, 34:21, 35:2, 35:14, 47:22, 48:11, 48:22, 49:13, 49:16 move 91:17, 92:2, 92:8, 93:3 moving 22:12, 22:13, 92:14, 92:15, 92:18, 93:22, 94:7, 94:9,
M			
made 21:16 magnitude 46:21, 107:4, 115:15, 115:21, 116:1, 117:6 mainly 37:22 major 98:1, 98:8 make 62:14, 74:9, 86:4, 104:18 makeup 95:4 making 17:12, 80:2, 101:15 mandatory 63:13, 64:11 many 50:18, 110:5 mark 3:3, 3:8 marked 5:8 marriage 122:1 massachusetts 3:20 material 48:4, 51:12, 52:13, 52:15, 99:12 materials 7:3, 7:18, 21:16 matter 81:21, 82:3,			

Transcript of Brian J. Brown
Conducted on May 9, 2025

136

94:13 much 10:20, 67:6, 80:8, 114:15 mullins 5:13, 47:12, 47:21, 48:6, 48:10, 48:21, 50:8, 50:15, 50:18, 51:3, 51:9, 52:19, 53:5, 53:12, 54:2, 54:8, 54:10, 54:17, 54:19, 55:14, 55:21, 56:2, 60:7, 60:15, 60:20, 60:21, 61:5, 61:6, 61:19, 62:4, 62:6, 62:11, 62:14, 62:18, 62:22, 63:14, 64:7, 64:12, 64:13, 64:15, 64:19, 64:21, 65:4, 65:14, 66:3, 66:11, 66:14, 67:12, 67:16, 69:5, 69:14, 70:18, 70:21, 71:9, 71:21, 72:4, 72:11, 72:18, 72:19, 73:6, 74:2, 74:11, 75:7, 75:15, 76:12, 76:21, 78:8, 79:6, 79:10, 81:14, 82:6, 82:9, 82:21, 84:13, 84:14, 86:11, 86:14, 86:17, 86:22, 87:14, 88:12, 88:15, 88:19, 89:1, 89:8, 89:15,	89:20, 90:3, 94:19, 104:6, 104:9, 105:18, 112:13 multiple 82:5, 93:14 multiplying 105:6 must 12:6, 17:9, 93:12 N name 6:12 native 95:19, 96:9 natural 101:19 nature 95:1, 97:17 ne 6:15 necessarily 63:11, 110:9, 116:12 necessary 100:8, 100:17, 101:9 need 7:10 needle 82:18 needs 15:12, 16:1, 16:13, 17:3, 19:16, 97:5 negative 10:2, 10:10, 10:18, 10:20, 67:18, 73:13, 104:5 neurovascular 19:12 neutral 10:11 next 33:18, 61:14,	86:13, 88:11 non-corked 21:17 notary 2:7, 121:1, 121:3, 122:12 nothing 39:15 notice 2:3 november 122:11 number 67:5, 75:22, 76:14, 77:1, 91:5 numbers 68:5, 102:22, 110:17 nw 4:5 O object 22:10, 44:13, 79:4, 119:15 objection 9:19, 10:7, 10:15, 11:6, 11:14, 12:2, 12:13, 12:19, 13:10, 13:19, 14:7, 14:12, 15:14, 16:4, 16:17, 17:7, 18:1, 18:7, 18:15, 19:2, 19:10, 20:5, 20:17, 21:2, 21:7, 22:2, 23:5, 23:12, 24:11, 25:3, 25:10, 26:9, 27:4, 27:13, 28:5, 28:22, 30:10, 30:18, 31:15, 31:21, 32:10, 34:17,	35:6, 39:9, 39:18, 40:12, 41:4, 41:18, 42:4, 42:13, 45:19, 46:14, 49:2, 49:14, 50:13, 50:22, 52:5, 52:22, 53:10, 57:13, 58:10, 59:10, 60:1, 60:22, 61:8, 62:16, 63:9, 64:8, 65:8, 65:18, 66:5, 68:12, 68:22, 69:9, 69:16, 70:3, 71:3, 71:12, 72:7, 72:14, 73:9, 74:14, 75:1, 75:10, 75:18, 76:3, 76:15, 77:2, 78:14, 78:20, 79:12, 79:22, 81:4, 81:16, 82:1, 82:15, 83:3, 83:13, 83:20, 84:18, 85:20, 86:8, 87:3, 87:12, 88:1, 89:4, 89:12, 90:10, 90:19, 91:12, 92:11, 93:9, 94:4, 94:15, 95:14, 96:5, 96:15, 97:7, 101:11, 106:2, 106:10, 107:7, 107:16, 109:12, 109:19, 111:21, 112:8, 113:5, 113:17, 114:3, 114:17, 115:2, 115:17, 116:4 observation 34:12
--	--	--	--

Transcript of Brian J. Brown
Conducted on May 9, 2025

137

obvious 53:22, 54:7, 60:13 obviously 19:5 occlude 92:9 occluded 88:7, 88:8, 91:21, 92:1, 92:14, 93:2, 94:8 occludes 85:1, 85:2, 92:7, 93:21 occluding 52:15, 99:13 occlusion 77:7, 77:8, 83:10, 83:22, 84:16, 87:22, 91:19, 94:14 occur 23:10, 45:21, 46:10, 94:12 occurred 121:15 occurring 16:21 occurs 46:6 oda@bakerbotts 3:8 ofek 5:11, 56:13, 56:19, 57:2, 57:6, 57:9, 57:11, 58:5, 59:17, 59:19, 60:7, 60:20, 61:5, 61:19, 62:11, 63:1, 63:22, 64:1, 64:7, 64:12, 64:15, 64:16 ofek's 60:16, 61:21, 62:5, 62:14	office 1:1 oh 98:5 okay 7:6, 8:4, 8:8, 13:5, 26:4, 35:19, 37:16, 44:2, 44:6, 45:2, 47:12, 47:16, 56:12, 56:15, 58:18, 65:3, 67:2, 68:9, 68:17, 68:19, 70:20, 83:5, 88:14, 97:21, 118:21 once 76:6, 85:11 one 7:10, 7:11, 10:3, 13:14, 33:19, 37:17, 38:8, 41:7, 42:17, 43:2, 43:3, 50:17, 51:14, 53:13, 63:12, 64:2, 64:13, 65:20, 67:2, 67:3, 67:19, 69:11, 74:16, 74:17, 75:21, 79:7, 80:11, 80:18, 88:3, 89:14, 90:13, 90:22, 91:18, 93:17, 98:1, 98:8, 102:13, 104:20, 105:7, 105:15, 109:3, 110:3, 110:5, 110:7, 111:7, 111:8, 112:18, 116:6, 117:16, 118:4, 119:2 only 41:9, 94:6,	118:3, 118:7 open 8:2, 16:13, 17:3, 26:1, 36:11, 36:15, 36:21, 36:22, 37:5, 37:14, 38:5, 40:8, 41:2, 46:7, 55:9, 84:3, 112:7 opened 36:10, 43:3 opening 16:6, 17:9, 38:15, 38:20, 39:2, 39:4, 39:7, 39:13, 39:17, 39:22, 40:7, 40:20, 41:1, 41:7, 41:10, 41:11, 41:17, 42:7, 42:12, 42:17, 42:19, 43:3, 59:4, 59:9, 59:18, 59:20, 59:21, 112:2, 112:15, 113:9 opens 26:11, 59:1 operate 49:7 operating 52:3, 66:15, 66:19, 96:22, 110:11 operation 40:6, 40:11, 41:3, 42:3 opinion 10:4, 10:9, 10:13, 12:5, 15:1, 39:11, 79:3, 81:13, 91:14 opinions 11:2, 11:8,	11:11, 11:16, 11:20, 12:12, 13:9, 30:17, 31:2, 81:22 opposite 107:5 optimize 101:7 order 15:11, 15:22, 16:12, 17:2, 17:11, 53:5, 63:13, 64:11, 93:11 ordinary 50:6 organized 95:17, 95:20, 96:7, 96:11, 98:11, 98:14 other 6:19, 6:20, 15:6, 24:21, 28:16, 31:12, 31:19, 35:3, 35:5, 39:22, 40:1, 40:10, 40:16, 40:20, 40:22, 41:3, 42:21, 43:2, 67:13, 69:14, 69:18, 74:6, 75:17, 96:3, 105:15, 111:8, 118:5 others 91:2, 95:9 otherwise 122:3 out 15:7, 16:8, 17:5, 17:11, 17:14, 23:15, 32:8, 32:15, 48:4, 51:12, 51:17, 52:13, 63:20, 80:8, 80:12, 93:6,
---	---	--	--

93:11, 93:19, 94:2, 94:9, 103:6, 115:9, 115:13 outcome 122:4 over 43:17, 62:4, 85:13, 111:2 overcome 93:7 owner 1:9, 3:16, 4:2, 121:12 P page 5:2, 5:8, 44:4, 44:7, 47:15, 47:18, 47:19, 51:8, 53:17, 55:13, 60:9, 61:14, 97:19, 97:20, 98:5, 99:3, 99:16, 104:19, 108:4, 108:13, 118:20, 118:22, 119:20 pages 1:20, 94:20 paragraph 24:18, 27:21, 32:22, 33:2, 33:6, 35:18, 35:20, 35:22, 36:6, 36:20, 37:15, 38:12, 41:20, 42:2, 44:22, 45:3, 47:15, 47:17, 50:21, 51:7, 53:16, 53:20, 55:5, 55:13, 57:3, 57:4, 58:16, 58:20, 60:11, 61:14, 63:21, 66:21, 67:16, 68:15,	70:21, 78:22, 82:20, 84:13, 86:14, 94:21, 97:20, 98:5, 99:2, 99:6, 99:16, 99:20, 100:6, 100:12, 100:13, 102:5, 102:6, 103:1, 103:18, 103:22, 106:14 paragraphs 44:22, 48:13, 48:15, 88:12, 89:22 parallel 37:13 parameters 66:15, 66:17, 66:19, 66:20, 78:17, 79:6, 80:4, 101:6 pardon 33:18 part 6:19, 19:15, 101:5, 119:6 partial 77:8, 83:10, 84:16 partially 85:2 particle 95:21 particular 22:11, 50:12, 57:11, 80:4 particulars 116:18, 117:10 parties 121:20, 121:22, 122:2 parts 24:21, 43:6, 56:17 party 121:12 passage 74:2, 74:10,	75:14, 76:21, 78:10 passages 67:12 passageway 26:2 passageways 26:11 past 91:22 patent 1:1, 1:3, 1:9, 1:12, 3:16, 4:2, 5:10, 5:11, 5:14, 5:16, 8:7, 12:11, 13:8, 17:17, 30:5, 55:8, 66:14, 121:12 patient 83:18 patient's 48:5, 51:13 penumbra 1:5 people 6:21 percent 104:15, 104:16, 105:1, 105:9, 108:17, 113:14, 115:1 percentage 104:3, 105:8, 108:17, 112:6, 112:11, 112:14 percentages 104:14, 112:18 perfect 102:15 perform 52:2, 55:9 performance 54:12, 54:18, 55:1, 55:2, 56:8, 62:10, 62:20, 101:4, 101:7	performed 102:4, 102:9 performing 54:20 performs 101:18 perhaps 43:15 period 82:13, 94:12 perpendicular 37:12 person 59:14 petitioner 1:6, 3:2, 120:13 phase 50:11, 107:13, 107:14 phases 106:8 phrase 50:1, 81:10 physician 97:1 piece 91:20, 92:8 placed 32:14 plain 50:5 planet 4:10 play 117:3 played 104:5 playing 22:9 please 6:3, 6:12, 9:16, 13:5, 36:18, 44:5, 53:2, 61:2, 68:5, 72:21, 83:5, 89:6, 109:14
--	--	---	--

point 63:20, 102:19, 108:5, 110:15, 110:19 portion 8:15, 37:21, 102:2, 105:22, 106:1 portions 107:6 posa 53:21, 54:6, 60:12, 61:15, 62:3, 62:13 positive 8:13, 8:16, 8:18, 8:20, 8:22, 9:3, 9:7, 9:9, 9:12, 9:17, 10:2, 10:5, 10:10, 10:13, 10:18, 10:19, 11:4, 11:9, 11:13, 11:18, 11:22, 12:5, 12:7, 12:9, 12:18, 13:4, 13:6, 13:17, 13:21, 14:1, 14:4, 14:20, 14:21, 15:3, 35:9, 67:17, 73:13, 83:1, 83:18, 89:2, 89:9, 94:1, 99:20, 100:1, 104:4, 108:22, 109:3, 109:6 possibly 79:16, 79:20 potential 20:19 potentially 46:19, 99:14, 110:4 predefined 66:15, 66:17, 67:4, 67:5,	67:14, 67:15, 75:22, 112:13 predetermined 49:7, 49:19, 49:22, 50:1, 51:19, 51:20, 66:1, 66:4, 66:12, 68:1, 69:19, 69:22, 70:10, 76:14, 77:1, 78:12, 78:16 preferably 67:21, 67:22 preferenced 70:16 prerogative 48:19 present 4:9, 45:17, 47:3, 113:15, 113:22 pressures 49:20, 52:1, 63:1, 107:10, 110:12 prevent 52:10 previous 7:12, 42:19, 114:6 previously 5:8, 59:5, 78:3 principles 29:16 prior 7:14, 118:5 priority 82:6 probably 50:5, 82:4, 82:17, 84:10, 97:12 problem 43:14, 100:22 procedure 32:13, 52:10, 55:9, 80:22,	96:22 proceeding 11:3, 11:21 produce 24:10, 27:12, 28:21, 29:14, 109:17 produced 112:21 produces 16:14, 17:4, 25:2 producing 109:10 professional 2:6 professor 111:11 programs 66:1, 66:4, 66:12 propagate 46:17 proper 52:1, 101:16 proposed 47:12, 64:6 prorate 103:14 provide 32:7, 49:12, 59:12, 81:11, 112:20 provided 11:8, 11:16, 12:5, 47:21, 48:10, 48:21, 49:12, 51:9 provides 54:20, 62:10 providing 13:12, 13:14, 49:5, 93:16 proximal 85:8, 111:13 public 2:7, 121:1, 121:3, 122:12	pull 36:16 pulse 28:16, 31:7, 46:17, 47:9 pump 67:17, 80:20, 81:10, 86:20, 90:3, 91:3, 92:15 purposes 11:2, 11:11, 11:20, 12:11, 13:8, 81:21 pursuant 2:3 push 88:20, 92:19 put 7:22, 17:17, 42:15, 43:12, 43:21, 44:17, 56:10, 94:19, 113:12 putting 117:6 Q qiushi 4:3 quantifying 115:19 quell 115:8 question 9:16, 13:5, 15:20, 21:10, 24:22, 36:18, 40:15, 48:14, 48:18, 53:2, 61:2, 65:13, 66:8, 66:9, 72:1, 73:5, 74:1, 74:9, 83:5, 89:6, 91:7, 93:4, 109:14, 114:6, 114:7, 117:9
---	--	---	--

Transcript of Brian J. Brown
Conducted on May 9, 2025

140

questioning 43:16 questions 120:8 quotes 89:21	86:18, 115:8 reaching 75:17 read 33:13, 33:19, 36:19, 37:17, 38:7, 39:12, 41:20, 48:12, 58:7, 59:12, 60:3, 63:21, 74:17, 75:12, 77:4, 86:16, 101:2 reading 29:19, 29:22, 30:6, 31:11, 33:12, 48:15, 48:17, 73:1, 75:3, 121:19 reads 33:19 real 101:21 realistic 110:15, 110:18 realize 66:7 really 9:21, 18:9 realtime 2:6 reapplying 33:21, 34:14 reask 9:15, 13:5, 36:18, 83:5, 109:14 reason 6:16, 19:15, 27:15, 40:2 reasonable 54:13 rebound 22:16, 22:17 recall 12:4, 13:12, 13:14, 25:12, 30:12, 30:20,	69:18, 72:16, 81:18, 115:19 recess 44:19, 77:13, 108:10, 120:12 recite 9:2 recites 8:13, 8:16, 8:20 recognize 100:15 recognized 61:16 reconvene 120:10 record 120:14, 121:10, 121:20 redirect 120:13 reduce 48:1, 51:10, 52:3, 52:11 reducing 38:9, 52:20, 53:6 reduction 20:9, 20:13 refer 66:14, 99:5, 99:19, 115:11 reference 5:11, 5:13, 5:15, 5:17, 23:17, 56:13, 106:16, 117:17 referenced 74:20 references 117:16 referencing 71:6 referred 55:2, 63:4, 84:8, 95:19 referring 12:21, 12:22,	13:3, 22:4, 25:5, 32:12, 32:17, 34:2, 37:2, 39:1, 51:2, 56:5, 57:18, 58:2, 66:18, 85:9, 86:10, 87:7, 96:1, 99:10, 99:11, 100:5, 101:3 refers 38:19, 59:3, 84:14, 89:20 regardless 113:22, 114:14 registered 2:5, 2:6 regulate 25:22 regulates 26:7 related 7:3, 55:10, 55:11, 121:21 relative 39:16, 41:3, 42:10, 59:8, 79:15, 82:3 relax 33:15, 33:21, 34:14 release 36:10, 37:18, 37:22, 38:15, 39:7, 39:17, 41:16, 42:7, 42:11 releasing 33:14, 33:17, 33:19, 34:13 relevance 30:20 relevant 21:12, 30:16, 31:2, 31:5, 31:6, 103:22 relieved 20:15, 20:22
R			
raise 6:2 range 8:17, 8:19, 97:1, 97:5, 97:10, 97:13 rapid 22:5 rapidpulse 1:8 rate 73:12, 73:15, 102:18, 102:22, 103:3, 103:6, 105:6, 105:21, 106:5, 106:7, 111:14 rate-based 73:18 rates 106:15, 106:16 ratio 67:20, 67:21, 103:10, 112:19, 114:20 ratios 62:20, 104:6, 105:19, 112:12, 113:8 reach 70:8, 76:6, 90:7, 91:10, 92:4, 92:6 reached 69:3, 69:7, 83:2, 87:1, 87:9, 87:21, 88:16, 90:5 reaches 23:11, 50:12,			

Transcript of Brian J. Brown
Conducted on May 9, 2025

141

rely 24:21, 65:21, 65:22, 66:1, 109:9, 109:16 remains 55:8 remarkable 98:11, 98:14 remember 102:13 remote 4:10 removing 18:13, 18:17 reopens 115:6 rephrase 40:18, 71:8 report 105:2 reported 1:21, 102:20, 103:3 reporter 2:5, 2:6, 2:7, 6:2, 121:1, 121:3 represented 121:12 require 112:22 required 89:17 requirements 51:18 requires 11:22, 15:5 reread 53:2, 61:2, 89:6 resistance 92:3, 92:15 respect 71:2 result 30:2, 30:8, 30:15, 31:1, 111:16	resulting 45:10, 45:11, 45:12 resumed 78:6 return 37:15 reverse 23:1, 86:20, 103:10 reversed 88:17, 88:20, 90:3 reversing 86:17 righthand 119:2, 119:10, 119:21 risk 48:2, 51:10, 52:4, 52:11, 52:20, 53:7, 93:5, 96:17, 98:10, 98:13, 98:16, 98:18 risks 97:18, 99:20, 100:1, 100:8, 100:17, 101:10 rmr 1:22 room 111:12 ross 4:10, 7:1 rotary 58:8, 58:12 rpr 1:22 rubinstein 5:15, 117:17, 117:19, 117:22, 118:3, 118:15, 118:19, 119:3, 119:6, 119:11, 119:14, 119:18, 119:22, 120:3, 120:6	run 49:19, 111:11 S safety 97:18, 99:6, 99:9, 99:11, 100:3 said 35:15, 39:4, 50:17, 65:11, 82:9, 87:14, 90:22, 94:7, 100:11, 101:13, 106:21, 108:1, 113:10, 114:5, 121:19 same 60:21, 61:6, 61:11, 82:20, 105:21, 107:1, 107:4, 107:10, 113:21 san 3:6 sanders@lw 3:22 satisfy 15:11, 15:22, 16:12, 17:2 say 10:19, 13:13, 14:4, 16:7, 27:16, 35:1, 37:1, 46:3, 51:2, 51:18, 55:21, 64:10, 68:14, 78:22, 87:5, 91:19, 102:14, 102:15, 111:2, 113:8, 114:11 saying 10:9, 10:17, 16:20, 29:5, 33:14, 40:10, 56:2, 63:19, 80:2, 80:19,	88:9, 110:12 says 14:15, 29:3, 39:7, 73:11, 75:21, 81:6, 86:20 scenarios 84:9 schedule 74:7 scope 82:15 screen 8:1 searches 73:2 second 33:5, 36:5, 102:13, 102:18, 103:3, 103:11, 103:12, 103:15, 103:20, 105:7 seconds 105:8 section 67:7, 101:3, 102:4 see 21:9, 24:13, 25:18, 25:20, 26:5, 26:15, 26:17, 27:22, 28:10, 28:18, 33:8, 33:9, 36:7, 36:12, 38:2, 38:17, 44:9, 48:7, 54:4, 55:19, 55:20, 56:21, 57:5, 57:22, 60:17, 62:1, 62:2, 71:15, 72:19, 81:1, 81:2, 99:7, 99:8, 100:10, 100:19, 100:20, 118:12 seeing 41:13, 58:7
--	---	---	--

selecting 97:16 sensor 47:21, 48:9, 48:21, 49:12, 50:9, 51:4, 51:9, 52:19, 53:5, 55:15, 55:18, 56:1, 56:4, 63:8, 63:19, 65:6, 65:16, 69:8, 78:19, 80:3, 80:7, 80:10, 80:17, 80:18, 81:3, 81:12, 81:15, 82:14, 87:1, 87:6 sensors 49:5, 50:16, 51:22, 56:7, 63:12, 65:22, 79:15, 79:16, 79:21, 82:17, 87:16, 87:17 sentence 27:22, 28:3, 28:11, 33:5, 33:11, 33:12, 33:18, 34:2, 36:6, 36:19, 37:17, 37:18, 38:11, 39:6, 39:15, 41:21, 42:1, 42:16, 45:7, 45:8, 47:17, 51:6, 53:20, 55:12, 58:19, 60:12, 61:15, 63:21, 73:17, 80:16, 89:22, 99:5, 99:19, 100:5, 100:14 sentences 28:10, 48:17, 97:22, 98:7 sequence 24:5, 39:8,	39:12, 39:22, 40:6, 41:10, 42:2, 42:6, 42:12, 42:18 sequences 40:11, 40:16 series 58:21 serves 25:21, 26:1 set 50:7, 70:9, 72:1, 74:7, 114:1, 114:15, 115:5, 121:6, 122:5 shake 67:4, 70:15, 70:18, 70:22, 71:10, 71:20, 71:22, 72:5, 72:12, 72:20, 73:7, 73:19, 74:3, 74:5, 74:7, 74:12, 74:22, 75:8, 75:16, 75:21, 76:13, 76:22, 77:6 short 43:17 shorter 70:8 shorthand 2:4, 121:1 should 120:9 showing 27:6, 41:6 shown 32:1, 36:9, 38:5, 54:10, 54:19, 70:17, 76:2, 109:18, 118:17, 119:5, 119:22, 120:2, 120:5 shows 41:10, 67:14,	67:15, 117:22, 118:14, 118:16 shy 110:3 side 111:7, 119:5 signal 67:4, 70:15, 70:18, 70:22, 71:10, 71:20, 71:22, 72:5, 72:12, 72:20, 73:7, 73:14, 73:19, 74:3, 74:5, 74:7, 74:12, 74:22, 75:8, 75:16, 75:21, 76:13, 76:22, 77:6 signature-plkal 122:8 signifies 37:9 signify 37:5 signing 121:19 similar 22:14, 22:15 since 104:11 single 57:8 situation 20:12, 24:1, 84:21, 93:1, 93:21, 97:11 situations 84:11 size 96:20 slowed 86:6 small 82:13, 82:18, 108:1 solenoid 25:18, 26:16,	26:18, 26:21, 26:22, 27:6, 27:11, 27:16, 28:15, 28:20, 29:3, 29:4, 29:5, 29:6, 56:19, 56:22 solenoids 27:19 some 7:20, 17:16, 48:17, 65:21, 65:22, 66:13, 72:9, 86:20, 86:21, 91:22, 92:2, 92:15, 95:8, 97:18, 98:18, 98:21, 101:6, 101:14 someone 110:18 something 9:10, 9:21, 10:1, 10:20, 22:11, 50:7, 70:6, 73:21, 92:1, 92:13, 92:17, 118:2 sometimes 79:15 somewhat 112:16 sorry 40:21, 63:18, 82:9, 98:4, 100:20, 102:22, 114:5, 114:10 sounds 8:5, 77:12, 103:16 source 29:13, 30:1, 30:7, 30:16, 31:1, 93:16, 109:3, 109:6 sources 21:15, 108:22 spans 51:7, 74:5,
--	--	---	--

86:14 speak 67:8 speaks 41:11 specific 8:17, 9:2, 12:21, 51:18, 77:7, 81:18, 97:15, 109:21, 116:10 specifically 8:12, 13:3, 24:14, 57:2, 60:11, 65:1, 78:9, 97:14, 118:20 specification 24:14, 41:12 specifics 21:9, 21:12, 59:13, 116:21 specifies 25:12 specifying 29:9 specs 118:15 speed 91:3 spend 66:13, 72:22 spoke 80:10 spoken 7:1 spot 76:7 start 29:21, 35:21, 40:5, 40:21, 47:14, 48:14, 56:1, 59:18, 76:11, 91:7, 94:13, 97:19, 102:7, 107:2, 117:14 starting 17:20, 67:3,	67:16, 75:16, 82:21, 110:15, 110:18 starts 28:1, 28:11, 36:5, 47:18, 53:16, 70:18, 102:4 state 2:7, 6:12, 36:14, 36:20, 45:8, 46:9, 47:20, 53:21, 55:14, 60:12, 61:15, 97:22, 98:7, 100:7, 100:15, 121:4 stated 9:9, 42:18, 86:3 statement 34:6, 38:19, 59:7, 63:20 states 1:1, 8:18, 28:13, 33:6, 35:12, 36:9, 37:18, 38:13, 58:20, 80:20 static 91:20, 92:8 stating 110:9 stay 44:21 stays 36:11, 40:8, 41:2 step 24:8, 40:3, 83:7 steps 39:1, 39:12 stick 95:12, 96:4 still 35:20, 35:22, 47:4, 47:6,	58:15, 92:2, 92:14, 92:18, 92:20, 113:14 stop 29:7, 75:9, 88:7, 88:10, 115:8 stopping 33:6, 33:17, 75:16 stops 28:16, 85:11 street 3:5, 3:12, 3:19, 4:5 strictly 91:15 strike 93:3 strikes 22:13, 22:15 striking 22:10, 22:14 style 58:13 subset 7:18 suck 20:4 sudden 29:7 suddenly 21:22, 28:16 sufficient 32:8, 33:7, 94:13 suite 3:5, 4:5 supplied 7:8 sure 34:20, 36:17, 40:14, 43:18, 47:14, 53:4, 61:4, 66:11, 76:17, 86:4, 89:16, 104:18, 108:9, 109:16,	114:5 surface 22:13, 22:15, 22:16 surge 28:11, 28:13 switch 107:13 switches 50:10 switching 82:22 sworn 6:4, 6:7, 78:4, 121:7 system 13:16, 15:11, 16:1, 16:12, 17:2, 17:20, 21:10, 21:19, 54:3, 54:9, 54:21, 54:22, 55:16, 56:8, 60:16, 61:22, 62:5, 62:14, 63:2, 63:4, 64:1, 86:22, 101:5, 101:15, 101:17, 101:18, 115:16, 116:9, 116:18, 117:10 systems 15:17, 110:11 T table 108:3, 108:8, 108:12, 108:16 tables 109:18 take 15:4, 19:5, 23:17, 24:1, 24:8, 25:15, 26:3, 43:10, 43:17, 44:18, 64:19, 67:9, 68:17, 70:8,
---	--	--	---

Transcript of Brian J. Brown
Conducted on May 9, 2025

144

77:11, 83:7, 92:3, 92:6, 104:22, 108:5, 117:19, 120:9 taken 121:9 takes 18:22, 19:4, 87:20, 90:7, 90:14, 90:17, 91:1, 91:10, 92:20 taking 7:17, 62:21, 103:10 talk 17:18, 69:2, 77:5, 95:1, 103:21 talked 80:6, 93:15, 93:17 talking 13:1, 24:6, 38:22, 55:5, 57:20, 69:19, 91:15 talks 77:9 taught 48:6, 63:14, 71:14, 105:18 teach 30:4, 87:14, 116:12 teaches 30:12, 30:14, 35:8, 62:18, 62:19, 64:13, 87:15, 89:15 teaching 28:20, 29:2, 29:20, 30:1, 30:7, 30:22, 34:7, 53:12, 62:6, 62:9 teachings 62:11, 62:15,	62:21, 64:12 tech 4:10 technique 97:4, 97:9 technology 54:20 tell 24:17, 43:21, 76:5 tend 95:12 term 8:13, 11:4, 12:10, 13:4, 13:7, 13:21, 14:19, 50:2, 50:4, 84:20 terms 59:6, 99:8 testified 6:7, 78:4, 78:5 testify 6:16 testimony 121:10 th 122:6 thank 56:10, 118:11, 120:7 thanks 106:22 themselves 103:22 thereby 88:17 therefore 85:14, 92:2, 95:22, 98:20, 99:14, 110:17, 114:22 theresa 1:21, 2:4, 121:2, 122:10 thing 8:6 things 15:6, 38:20,	91:18, 93:14, 116:6, 116:15, 117:2 think 9:22, 14:14, 14:22, 61:10, 76:7, 86:3, 89:14, 91:14, 101:13, 102:12, 103:22, 104:10, 106:21, 110:4, 110:6, 118:9 third 55:12 thought 9:22, 10:21 three 43:6 three-way 57:8, 57:12, 57:21, 58:1, 58:3, 58:5 thrombectomy 15:11, 15:16, 16:1, 16:12, 17:2, 17:19, 48:3, 54:3, 54:9, 61:22 thrombi 98:12, 98:15 thrombus 18:13, 18:18, 49:9, 96:7, 98:1, 98:2, 98:8, 98:9, 98:16, 98:17, 98:19 through 7:10, 19:17, 19:19, 21:1, 22:20, 33:3, 37:22, 41:6, 41:14, 46:12, 47:4, 47:7, 53:13, 57:4, 65:1, 66:14, 68:2, 68:4, 73:3, 73:18,	76:20, 83:11, 84:1, 84:15, 85:18, 86:6, 88:12, 101:19, 102:5, 103:8, 105:12, 105:16, 105:21, 106:5 time 18:22, 19:4, 19:6, 22:21, 42:15, 45:12, 66:13, 73:1, 73:15, 82:13, 87:20, 90:7, 90:14, 90:17, 91:1, 91:10, 94:1, 94:12, 101:21, 104:3, 105:1, 107:19, 112:11, 113:3, 114:1 times 50:1, 110:6 timing 39:16, 41:3, 42:11, 45:22, 46:3, 46:20, 50:9, 51:18, 51:19, 59:8, 59:13, 59:15, 62:22, 69:22, 70:5, 115:4, 117:2, 117:7 tip 61:18, 63:6, 88:21 tissue 99:14 today 6:17 together 43:13, 43:22 top 44:7, 47:19, 51:8, 55:13, 70:16, 71:15, 71:16, 71:19, 108:3, 108:13,
---	---	---	--

Transcript of Brian J. Brown
Conducted on May 9, 2025

145

119:2, 119:21 total 104:14 toward 88:20 towards 85:10 traces 82:6 trademark 1:1 transducer 61:20, 63:17, 63:18, 63:22, 64:2, 64:6, 64:14, 64:17 travel 19:1, 19:4, 23:1 traveling 23:8, 52:15 travels 31:8 trial 1:3 triggers 74:22, 76:22 trivial 61:21 true 121:9 truthfully 6:17 trying 9:22, 14:14, 92:18 turn 8:6, 17:16, 38:11, 44:4, 47:11, 56:13, 60:6, 61:13, 70:15, 78:8, 97:17, 102:2, 104:19, 108:3, 117:14 turning 82:20 two 28:10, 38:20,	56:17, 71:10, 72:5, 72:13, 72:20, 73:7, 74:3, 74:12, 88:11, 89:22, 91:18, 97:22, 98:7, 102:9, 118:22 type 25:9, 25:13, 27:17, 57:11, 57:15, 58:5, 58:8, 84:9, 101:14 types 57:18 typically 18:18, 18:19, 19:19, 58:12, 85:6, 95:16, 95:18, 111:2 typo 104:11 U under 66:16, 106:16, 106:19 understand 24:4, 24:5, 29:12, 33:13, 48:20, 51:15, 52:1, 78:11, 86:4, 104:18 understanding 33:10, 34:5, 37:6, 40:14, 50:2, 57:9, 94:17 united 1:1 unknown 87:18, 97:11, 116:12 until 90:4, 93:6, 94:13 upper 68:11, 68:21,	69:3, 69:6 use 18:12, 32:7, 35:2, 51:3, 63:12, 64:14, 66:3, 67:17, 68:10, 68:20, 74:7, 74:22, 75:8, 76:13, 78:12, 78:19, 79:15, 79:16, 79:20, 80:10, 80:16, 87:15, 87:18, 97:12, 104:6, 110:16, 112:22 using 25:13, 43:1, 47:20, 48:9, 48:21, 50:8, 50:15, 51:8, 52:18, 53:4, 54:19, 55:18, 56:4, 56:6, 56:19, 59:5, 62:22, 63:7, 80:3, 80:7, 84:20, 87:1, 87:6, 87:17 V vacuum 17:10, 20:7, 20:13, 20:15, 20:22, 21:15, 22:6, 24:3, 25:6, 25:9, 25:22, 26:2, 26:7, 26:12, 27:2, 27:8, 29:13, 30:1, 31:1, 31:7, 33:7, 33:15, 33:17, 33:20, 33:21, 34:13, 34:15, 36:10, 36:15, 36:21, 37:19, 37:21,	38:1, 38:6, 38:10, 38:15, 38:21, 39:2, 39:5, 39:8, 39:13, 39:17, 40:8, 40:21, 41:1, 41:17, 42:7, 42:12, 46:7, 46:8, 54:1, 54:8, 54:16, 55:17, 55:22, 56:3, 59:4, 59:6, 60:14, 60:20, 61:5, 61:17, 63:5, 65:5, 65:15, 82:22, 83:18, 84:3, 84:16, 85:2, 85:9, 85:12, 85:14, 89:1, 89:8, 93:8, 111:16, 114:13, 115:6 value 10:1, 10:2, 10:10, 91:4 values 110:8, 110:17 valves 16:7, 16:14, 17:4, 17:10, 24:9, 25:1, 25:13, 26:19, 26:21, 27:16, 27:18, 27:19, 36:15, 36:21, 37:5, 38:5, 40:1, 41:7, 41:10, 41:11, 42:15, 42:19, 42:20, 43:1, 45:9, 45:13, 45:18, 45:22, 46:1, 46:4, 46:12, 47:3, 56:19, 57:6, 57:19, 118:1,
---	---	---	---

Transcript of Brian J. Brown
Conducted on May 9, 2025

146

118:17 variables 90:13, 91:1, 91:5 various 84:9, 84:11 vary 70:5, 85:17, 95:5, 96:20 vasculature 52:16, 99:13 vent 24:2, 25:8, 26:8, 29:20, 30:7, 30:16, 35:8, 36:15, 36:21, 38:20, 39:2, 39:13, 40:7, 41:1, 46:7, 59:3, 59:6, 84:2, 109:4, 109:10, 109:17, 109:22, 112:2, 112:6, 112:15, 112:22, 113:10, 113:15, 113:22, 114:8 venting 32:17, 33:19, 34:13, 35:10, 35:12 versus 85:18, 89:17, 92:8, 112:12 vertical 37:8, 37:10 vessel 19:19, 96:4 vessels 18:19, 19:17, 95:13 via 1:16, 2:3, 37:20 view 13:16, 21:13, 39:6, 41:2, 48:20, 59:17,	59:19, 75:8, 78:18 viewed 10:1 virtually 1:16, 2:3, 121:15 viscosity 103:5, 103:9 volumes 113:7 vorkapic 1:21, 2:4, 121:2, 122:10 W wagon 92:19 waived 121:20 walls 95:12, 96:4 want 7:8, 24:20, 47:7, 48:19, 48:20, 51:20, 51:21, 86:4, 95:1, 102:2, 103:21, 104:18, 107:20, 117:5 wants 17:13, 17:14 washington 3:13, 4:6 water 22:1, 22:6, 22:8, 22:9, 22:17, 22:19, 22:22, 23:10, 23:20, 24:2, 24:7, 24:10, 24:17, 25:2, 27:12, 28:1, 28:4, 28:8, 28:21, 29:14, 29:16, 29:17, 30:2, 30:8, 30:14, 31:2,	31:14, 45:14, 45:17, 45:21, 46:5, 46:9, 46:11, 46:16, 47:2, 93:17, 103:3, 103:4, 103:11, 106:16, 109:7, 109:22, 111:15, 111:19, 112:1, 112:16, 112:19, 112:21, 113:2, 113:14, 113:21, 114:7, 114:12, 114:13, 114:14, 114:19, 114:22, 115:7, 115:9, 115:10, 115:16, 115:20, 116:2, 116:7, 116:18, 117:11 watkins 3:18, 4:4 wave 23:1, 23:7, 23:10, 23:14, 28:13, 110:1, 115:7, 115:11, 117:3 way 6:20, 8:4, 31:12, 31:19, 34:9, 34:11, 49:17, 52:3, 63:19, 88:9, 98:18, 113:12, 115:6, 122:3 ways 35:3, 35:5, 51:14, 69:11, 69:14, 69:18, 80:11 we'll 7:17, 8:3, 70:15 we're 13:1, 14:14, 14:16, 41:13, 49:16, 91:15,	110:11 we've 14:21, 79:14, 93:15, 93:16 welcome 67:9 whatever 8:3 whereof 122:5 whether 9:22, 10:4, 10:19, 17:13, 21:17, 25:12, 30:14, 36:19, 55:10, 69:5, 69:12, 69:15, 80:3, 83:1, 84:1, 85:17, 86:22, 87:5, 87:17, 89:15, 89:17, 101:19, 101:21, 109:21, 112:13, 112:15, 114:5, 116:8, 116:10, 117:3 whole 12:22, 27:18 wide 97:1, 97:5, 97:10, 97:13 william 4:3, 4:8 williams 3:10 williams@bakerbo- tts 3:15 wise 83:8 wish 48:18 within 8:17, 41:12, 45:10, 45:12, 47:8, 54:2, 54:8, 60:15, 61:21, 70:2,
--	--	---	--

Transcript of Brian J. Brown
Conducted on May 9, 2025

147

73:5, 80:21, 81:6, 81:7, 81:14, 89:3, 89:10, 89:21, 107:22, 108:22, 109:3, 111:12, 112:11, 121:3 without 55:9, 87:10, 111:20, 112:1 word 22:10, 34:21, 47:10, 49:22, 56:22, 73:2 words 74:6 work 97:5, 97:10, 104:19, 120:10 worked 44:16 working 97:13 works 8:3 writings 7:15 written 101:22	35:8, 35:12, 38:4, 38:9, 40:6, 40:10, 40:15, 40:22, 41:2, 41:6, 41:16, 42:10, 43:6, 43:12, 44:11, 45:3, 45:14, 47:12, 54:13, 54:17, 54:21, 55:1, 56:6, 56:9, 60:21, 61:6, 115:15, 115:19, 116:2, 116:19, 117:11 yang's 30:22, 32:1, 32:9, 34:12, 35:2, 40:20, 43:1, 47:21, 48:10, 48:22, 51:9, 54:3, 54:9, 116:9, 116:18, 117:10 yao 4:3 yao@lw 4:8 yeah 10:11, 40:18, 87:5, 90:12, 91:14, 102:8	.	1
Y	Z	0	
yang 5:17, 21:19, 22:4, 22:5, 23:17, 23:20, 24:9, 24:21, 25:1, 25:5, 25:8, 25:12, 25:16, 25:18, 26:18, 26:20, 26:22, 28:7, 28:20, 29:12, 29:19, 29:22, 30:4, 30:6, 30:14, 31:11, 31:20, 32:4, 32:22, 33:2, 33:6, 34:7,	zero 9:8, 9:10, 9:13, 10:1, 10:3, 10:10, 10:14, 10:17, 11:5, 11:12, 11:16, 12:1, 12:6, 13:16, 14:6, 15:1, 15:2, 113:13, 115:1 zoom 1:16, 2:3, 6:19	.01 104:6, 112:18, 112:20 .04 67:22 .1 104:7, 104:22, 108:17 .4 104:7, 104:10, 104:15 .9 104:7, 104:10, 104:15 .99 104:6, 112:18 0 0.01 67:21 0.061 102:13 0.088 102:13, 103:13 0.1 67:22 0.61 102:10, 102:17 0.88 102:11 0.9 67:22, 68:1 0.99 67:21 00 77:14 01001 17:18 01261 1:11 02116 3:20 0238953 5:18 061 102:19	1 67:3, 77:14 1.0 102:18 1.3 104:14 10 28:15, 105:7 10,322,230 5:12 100 47:15, 47:17, 50:21, 51:7, 55:5 1000 4:5 1001 5:10, 8:7 1005 43:11, 60:8 1007 5:11, 56:14 1008 5:13, 64:20 101 3:5 1011 5:15, 117:20 1012 5:17, 23:18 102 53:16, 55:13 108 24:18, 27:21 11,197,977 5:14 11,406,402 1:12, 5:10 117 5:15 12 77:13 12.4 108:18 120 111:2

Transcript of Brian J. Brown
Conducted on May 9, 2025

148

122 1:20 124 104:19 125 18:20 126 108:4, 108:13 13 8:20, 25:16 131 26:15, 44:4 1334 3:14 14 9:2, 26:3, 29:8, 32:1, 32:4, 122:6 140 58:22 143 99:17 15 120:10 150 59:1 16 9:2, 76:20 168 32:22, 33:2 17 9:2, 86:15 170 35:18, 35:22, 36:6, 36:20, 37:15, 38:12, 41:20, 42:2 172 118:20 176 119:20 178 6:15 18 88:12 195 60:9 196 61:15	2 2 120:15, 121:16 200 3:19 20001 3:13 20004 4:6 2017 5:18, 82:7, 82:12 2018 82:7 202 3:14, 4:7 2024 1:11 2025 1:17, 121:16, 122:6 2027 122:11 209 102:5, 102:7 210 106:14 214 104:1 218 103:18 219 102:6 220 102:6 23 5:17, 65:1, 97:20, 98:5 234 45:1, 45:3 24 94:20 25 33:3, 36:1, 36:4, 36:8, 36:9, 36:16, 37:2, 37:8,	37:9, 38:5, 38:8, 38:14, 41:6, 41:14, 42:20, 43:7, 44:8, 57:16, 90:1, 94:21 250 99:16, 100:6, 100:11, 100:12, 100:13 2510 37:21 2514 36:10, 37:4, 37:8, 38:15, 39:7, 42:7, 42:11 2516 36:11, 37:5, 37:8, 38:16, 39:8, 42:8, 42:12 2518 37:19, 37:22 2520 37:19 26 57:4, 65:1, 68:4, 68:6, 71:15, 73:4, 75:15, 80:13, 82:20, 84:13, 86:15, 90:1 27 70:19, 73:3, 73:11, 73:17, 74:11, 74:21, 75:7, 75:14, 76:20, 86:15, 88:12 28 67:3, 67:16, 70:16, 71:16, 71:19, 73:4, 74:11, 75:15, 75:20, 76:20, 78:10 291 3:7	293 99:2, 99:4, 99:6 3 3,955,574 5:16 3.1 105:2, 105:5 30 65:2, 77:13, 88:13 31 104:15, 105:1, 105:9, 108:17 314 25:19 3200 3:5 33 57:4 350 4:7 361 60:11, 63:21 3671 61:14 4 40 28:14 402 8:7, 12:11, 13:8, 17:17 414 26:5, 26:15, 28:21, 29:8, 29:10 415 3:7 43 68:8 44 68:4, 68:8 46 67:14, 68:3, 68:10, 68:17, 68:20, 69:2,
---	--	--	--

Transcript of Brian J. Brown
Conducted on May 9, 2025

149

71:2 49 67:14, 68:4, 68:8, 70:17 4a 56:17, 57:3 5	110:14, 110:22, 111:3, 111:4, 111:6, 111:12 6022 3:21 617 3:21 62 73:18, 74:18, 74:21, 75:7 6234 3:7 63 58:17 639 3:14 64 5:13, 78:10, 80:13, 84:14 65 86:15 69 104:16 7	
50 71:6, 76:2, 120:15, 121:16 5374 4:7 54 70:19, 73:3, 75:14, 76:20, 84:14 55 80:13, 82:21, 97:20, 98:5 555 4:5 56 5:11, 47:15, 47:18, 51:8 5695 3:13 57 47:19, 51:8, 53:17, 94:21 58 55:13 5802 3:6 581446 1:19 59 1:17, 67:17, 78:10, 121:16 6	700 3:12 8	
60 73:11, 73:17, 74:18, 74:21, 75:7 600 106:17, 106:20, 110:1, 110:2,	80 111:2 8168 33:6 9	
	9 1:17, 121:16 94111 3:6 948 3:21	