FORD MOTOR COMPANY v. PAICE,LLC, ET AL.

NEIL HANNEMANN

April 30, 2015

Prepared for you by

Bingham Farms/Southfield • Grand Rapids
Ann Arbor • Detroit • Flint • Jackson • Lansing • Mt. Clemens • Saginaw

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

FORD MOTOR COMPANY, :
Petitioner, :
vs. : IPR2014-00884
PAICE LLC & ABELL FOUNDATION, INC., :
Patent Owner. :

Volume 1
Deposition of NEIL HANNEMANN
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Pursuant to Notice, before Janet A. Hamilton, Registered Diplomate Reporter and Notary Public in and for the District of Columbia.

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CONTENTS

EXHIBITS
(Attached to the transcript)

Page 5

PROCEEDINGS

(Hannemann Deposition Exhibit No. 8 was pre-marked for identification and is attached to the transcript.)

NEIL HANNEMANN,

a witness herein, being duly sworn, testified as follows:

EXAMINATION BY COUNSEL FOR PETITIONER

BY MR. RONDINI:

Q Good afternoon, Mr. Hannemann.

A Good afternoon.

Q I'm going to hand you what's been marked Exhibit No. 8, and if it's okay we're just going to continue the numbering from the previous one.

MR. LIVEDALEN: Yeah, sure. Thanks.

Q Mr. Hannemann, what is Exhibit No. 8 that I just handed you?

A That's my declaration in IPR2015-00884 [sic] for patent 7,104,347.

Q And do you recall what references you were reviewing with respect to this declaration?

A It's in the table of contents, but it's reference we call Caraceni, and then there were two, two patents by Tabata.

Page 6

Q The Tabata '201 patent and the '501 patent?

A That's correct.

Q Could you turn to page 60 of your report. Page 60 starts your analysis with respect to the Tabata '201 and Tabata '501 patent; correct?

A Yes.

Q You start off in paragraph 113 talking about Tabata 1, and it calculates demand power; is that correct?

A Yes.

Q Can you explain what demand power means?

A Well, it can be contextual. So I have to remember how Tabata used that, and demand power I refer to it as instantaneous drive power.

Q Paragraph 113 you also talk about how Tabata '201 determines or calculates instantaneous drive power; is that correct?

A Well, I said it can be calculated by the product being torque. I'm not sure that Tabata's doing exactly that way.

(Hannemann Deposition Exhibit No. 9 was marked for identification and is attached to the transcript.)

Q Mr. Hannemann, what's been marked and handed to you as Exhibit No. 9 is US Patent 5,841,201. Do you recognize this patent?

Page 7

A Yes, I do.

Q What is this patent?

A This is the what we refer to as the Tabata '201 patent.

Q Okay. Can you turn to paragraph 121 of your report? Paragraph 121 you continue talking about instantaneous demand power, and then you conclude the paragraph by illustrating figure 5 of Caraceni; is that correct?

A Yes.

Q Why did you insert the figure from Caraceni to your discussion of Tabata '201?

A Well, it's just in the references we had involved six IPRs just one where there was a torque in power curve, and I just picked that as an example.

Q Why did you feel that was important?

A I did it to show that there is, you know, more than one torque curve if you're not at wide open throttle that you could have various torque levels, and then to, just to digitize the, the torque curve to create some of the other graphs that I created in the declaration.

Q Okay. What do you mean by digitize the graphs?

Page 8

A Well, just to pull off the values and get torque and, torque and RPM. I could have used fewer values and just scaled it off, but it's just the way I did it.

Q So you're referring to paragraph 123? Is that what you're looking at where you have a chart with engine speed and torque? Is that what you're talking about --

A Yes.

Q -- with digitizing?

A That's the data from the graph. So that was the purpose for using this graph.

Q So is it fair to say that you extrapolated the data from the graph shown in paragraph 121 to generate the chart shown in 123?

A That's accurate, yes.

Q Okay. And you did that I believe you just testified in order to generate the figures and graphs that you have in paragraphs 124 and 126 of your report; is that correct?

A Yes.

Q What are you showing in paragraph 126 of your report?

A Well, they're all, those few paragraphs are all related, but 126 just shows a control sample of a

Page 9

control strategy that would compare road load to a setpoint.

Q What control strategy is it a sample of?

MR. LIVEDALEN: Objection. Vague.

A Yeah. This would be out of the subject matter.

Q So it's your opinion that paragraph 126, the chart in paragraph 126 is illustrating the control strategy as disclosed by the '347 patent?

A Yes.

Q What are you representing on the y-axis?

A Of the graph in 126?

Q Correct.

A Yeah. That's the 5 Newton meters is 30 percent of the 115 Newton meters of the Caraceni engine.

Q I want to back up and be more general. Just on the y-axis what are you illustrating on the y-axis in general?

A Oh, it's engine torque.

Q Engine torque. And is the x-axis illustrating engine speed?

A Yes.

Q And what does the area shaded in green represent?

Page 10

A That's torque values that are above 30 percent of the maximum torque output.

Q And what is occurring in the area shaded green?

A Well, various things could occur. It's just showing above and below the setpoint.

Q Well, with respect to the control strategy the '347 what would happen above in the green area?

MR. LIVEDALEN: Objection. Vague.

A Well, that's the decision to turn on and operate the engine.

Q And below in the red area, what's happening there?

A In the red area the engine would not be operated and you'd have an electric-only mode.

Q Okay. Sticking with this graph shown in paragraph 126, if we had an engine torque value of 60 Newton meters and engine speed of 2,000 RPM, what would the control strategy of the '347 do?

MR. LIVEDALEN: Objection. Vague. Incomplete hypothetical. Foundation.

A I didn't do this, this graph to illustrate the entire working of the control strategy. So I'd have to probably read through the patent to try to figure that out. That's not something I analyzed.

Page 11

This was done to get a comparison really to lead in to the later graph where I compare the power threshold to the torque threshold.

Q Well, you previously testified this is the control strategy of the '347; correct?

A This is based on the control strategy. It's not a full disclosure of the control strategy.

Q What's missing from it?

A Well, there's other modes of operation that this graph doesn't, doesn't describe.

Q What other modes?

A All this graph is describing is the, the 30 percent MTO setpoint which the engine operates or doesn't operate. That's all it's doing.

Q Okay. So based just on the graph here, if you had an engine torque value of 60 Newton meters and engine speed of 2,000 RPM, what would the operational mode be?

MR. LIVEDALEN: Objection. Vague. Foundation. Incomplete hypothetical.

A Yeah. That's not an analysis that I've done.

Q You previously testified that the green area that's shaded on this graph is where the engine operates; is that correct?

Page 12

A Yes.

Q And red area is where the motor operates; is that correct?

A Yes, and there may be motor operation in the green area. I just didn't go to that level of detail.

Q What do you mean there may be motor operation in the green area?

A If the motor's supplementing the maximum torque of the engine.

Q Where is the maximum torque of the engine illustrated on this graph?

A Well, the maximum I use for the 30 percent is 115 Newton meters which is along in the blue line probably between 4,000 and 5,000 RPM.

Q So the maximum torque output is above every portion that's shaded in green; isn't that correct?

A That's the maximum torque at that particular engine speed.

Q So is it your opinion that control strategy as described in '347 the motor can operate somewhere in the green shaded area?

MR. LIVEDALEN: Objection. Vague.

A I think there's, there's other modes that I didn't put on this graph. So could there be? Yes, it's possible, but I didn't analyze every mode on this

Page 13

graph. Like I said, this was just used to illustrate the 30 percent MTO setpoint.

Q And the 30 percent MTO setpoint, that's the claim setpoint of the '347 patent?

MR. LIVEDALEN: Objection. Vague. Mischaracterizes previous testimony. Calls for legal conclusion.

A It is a setpoint at least as claimed in claim 23.

Q What about claim 1 of the '347 patent?

A I don't have a section in my declaration about claim 1 in particular.

(Hannemann Deposition Exhibit No. 10 was marked for identification and is attached to the transcript.)

Q Mr. Hannemann you've just been handed Exhibit No. 10 which is US Patent 7,104,347. Do you recognize this exhibit?

A Yes, I do.

Q What is this exhibit?

A It's what you just said it was.

Q This is the '347 you were just referring to?

A Yes.

Q Could you turn to column 58 of the '347 patent. Do you see setpoint mentioned within claim 1

Page 14

of the '347 patent?

A Yes, I do.

Q Is the setpoint that is recited in claim 1 of the '347 patent the same setpoint you're illustrating in paragraph 126 of your report?

MR. LIVEDALEN: Objection. Calls for legal conclusion.

A No. It could be, and the setpoints are illustrated values in the patent, and someone of skill in the art would take this patent and then apply it to the calibration of implementing the patent, and they may come up with a slightly different value, and the different vehicles applying this technology may have a different value. So the numbers here are, are illustrative.

Q I realize the numbers are illustrative. I'm wondering, you have a torque value illustrated here as a setpoint; is that correct?

A Yes.

Q And you said that's the setpoint as recited in claim 23 of the '347 patent; is that correct?

MR. LIVEDALEN: Objection. Mischaracterizes previous testimony.

A Yeah. I use 30 percent. 30 percent is in more than one claim, and it also is substantially less

Page 15

than the maximum torque output as claim 1 describes.

Q Can you look at claim 6 of the '347 patent?

A Yes.

Q Does claim 6 recite a setpoint that's at least 30 percent of the maximum torque output of the engine?

A It actually says at least approximately 30 percent of the maximum torque output.

Q So with claim 6 as guidance, is it fair to say that the 35 Newton meter setpoint you have illustrated in paragraph 126 is representative of that setpoint?

A It would also apply to that setpoint, yes.

Q So is it fair to say that since claim 6 depends from claim 1, the 35 Newton meter setpoint you have illustrated in paragraph 126 is illustrative of the setpoint claimed in or recited in claim 1?

A Well, I'm not sure that I was doing that kind of analysis when I picked the number for the graph. So if we're still talking in context to the graph, I would say that I wouldn't apply that kind of statement.

Q But this setpoint you have illustrated in paragraph 126, the graph in 126 of your report, it is representative of the setpoint as recited in claim 6

Page 16

of the '347 patent; is that correct?

A It does illustratively represent that, yes, it does.

Q With respect to the setpoint illustrated in paragraph 126, why did you illustrate it as a straight line that's parallel to the engine speed x-axis?

A Well, because it's a fixed value. It's 30 percent of the maximum torque output gives you a constant number.

Q Is it always going to be a straight line?

A You know, I think that's -- as I said before, somebody applying the patent would calibrate the system and, you know, applying the patent there's some, there's some scope to calibrating to a particular car, and that may change the value. It could make it change the character of the line or change the values.

Q Okay. You said it could change the character of the line. Can you please explain what you meant by that?

A Yes. Some -- someone may choose to, to not have it a constant value across the entire RPM range.

Q Well, what example could you provide that would be a nonconstant value across the entire RPM range?

Page 17

A Well, I could imagine somebody might apply the, the torque at that particular RPM.
Q Could you explain that a little bit more. I'm not sure I understand.
A I'm just looking through to see if there's an example.
Q Sure. Mr. Hannemann, let's start with a different question. Could the claim setpoint, the claim setpoint vary as a function of vehicle speed?
MR. LIVEDALEN: Objection. Vague. Calls for a legal conclusion.
A Well, I think there's scope to vary it I think in different claims, and it generally specifies maximum torque output, but it doesn't say, specify if that's the maximum of the engine at any RPM or if it's at the RPM that the engine's operating at. So I think there's some interpretation there.
Q Okay. Well, let's start with my question though. Could -- could the setpoint you've illustrated in paragraph 126 of your report, could that vary as a function of vehicle speed?
MR. LIVEDALEN: Same objection.
A Well, the setpoint and the scope it talks about being, the term here at least approximately 30 percent, and it's not specific as to whether that

Page 18

would always be a fixed value or if you could vary it within a particular control. So I guess there's not -- it's not specific on that issue.
Q So you can't answer whether or not the setpoint you've illustrated in paragraph 126 could vary as a function of vehicle speed?
MR. LIVEDALEN: Same objections. Mischaracterizes previous testimony.
A Yeah. I can't -- I can't say for sure.
Q What about varying the setpoint you have illustrated in paragraph 126 as a function of engine speed?
MR. LIVEDALEN: Objection. Vague. Calls for a legal conclusion.
A Yeah. I think that that's possible, but I can't really say one way or the other if it's, you know, required in the claim or not.
Q Well, could you look at claim 5 of '347?
A Okay. Well, there it is. Thank you.
Q No problem.
A Yes. So it may be varied by the control as a function of engine speed.
Q So how would the setpoints you have illustrated in paragraph 126 vary as a function of engine speed?

Page 19

A Well, again --
MR. LIVEDALEN: Same objections.
A This just says it can be varied. It doesn't say how you would do it. So I can imagine different ways of doing it, but the patent doesn't specify that.
Q I realize that, but as someone skilled in the art who's read these patents and opined on them, in your opinion what examples can you provide of a setpoint that varies as a function of engine speed?
MR. LIVEDALEN: Same objections.
A Well, if you were to apply the 30 percent to the torque at each engine speed, that would vary it by engine speed, and if you chose to increase the percentage over the range of engine speed or decrease it, these are two other ways I could think that it may be varied.
Q Start with the last example you just gave. You said one could choose to increase the percentage over the range of engine speeds. Can you please elaborate how that would look?
A Just on the graph?
Q Sure.
A It would be just a straight line but a sloped line.
Q So it's your opinion that with respect to a

Page 20

varying setpoint it would be a slope line?
MR. LIVEDALEN: Objection. Vague. Mischaracterizes previous testimony.
A I was speaking in the way that a person skilled in the art might vary it. So that was just giving you examples of how somebody might choose to vary it.
Q Would a person of ordinary skill in the art understand that it wouldn't have to be a sloped line?
A I think that's possible also, yes.
Q So would a person of ordinary skill in the art understand that it could be a parabolic line?
MR. LIVEDALEN: Same objections.
A I think what someone of skill in the art would do when applying this patent when they're calibrating the vehicle they would vary the setpoint to determine either for the optimal efficiency or possibly good drivability and see how those different setpoints might affect the vehicle and then make decisions based on what those might be.
Q So a person of ordinary skill in the art performing those calibrations determined that a parabolic line gave them the best efficiency, would that meet the scope of the claims?
MR. LIVEDALEN: Same objections.

Page 21

A You know, if they, if they decided that's the character they wanted and I guess it would have to comply with the rest of the, the claims. If it were less than 30 percent, and then it's a little vague, at least approximately 30 percent. If it's 29 percent, still approximately 30 percent, some people might say yes. So, so unless it was outside of that range I would say it would still comply with the claims.

Q Do all the claims require that the setpoint be 30 percent or approximately 30 percent?

A No.

Q Looking back at -- so let's look back at paragraph 124. You have another graph illustrated there; correct?

A Yes.

Q Again, what does the y-axis represent in this graph?

A Well, y-axis is torque.

Q Engine torque?

A Yes.

Q What does the x-axis represent?

A Engine speed.

Q And again you have an area shaded in red and an area shaded in green. What does the area shaded in green represent?

Page 22

A It is an area where, you know, operating the engine above a certain power level is that becomes in the area where the engine would operate.

Q That's the area where the engine operates to propel the vehicle?

A Yes.

Q And what does the area shaded in red represent?

A That's where the engine is not in operation or not in normal operation to propel the vehicle.

Q What is the black dotted line you have labeled as 20 kilowatts on the graph in 124?

A That's a line of constant power.

Q And what is that used to represent?

A That's used to represent the Tabata strategy.

Q Does this figure illustrate a control strategy that compares road load to a setpoint?

MR. LIVEDALEN: Objection. Vague. Calls for a legal conclusion.

A This compares, is comparing engine power to a power setpoint.

Q But the y-axis is labeled engine torque; is that correct?

A Yes.

Page 23

Q The x-axis is engine speed?

A Yes.

Q So in the area shaded red those are engine torques at a specific engine speed; is that correct?

A Yes.

Q And looking at the graph in paragraph 126 likewise the area shaded red are engine torques and certain engine speeds; is that correct?

A Yeah. The whole graph's torque versus speed.

Q So with respect to the graph shown in 126, is that an illustration of control strategy that compares a road load to a set point?

MR. LIVEDALEN: Objection. Vague. Calls for legal conclusion.

A It's a graph that compares the Tabata setpoint -- or excuse me -- Tabata strategy to the patent strategy, and they're drawn in the same graphs to demonstrate the differences.

Q I realize that. We're -- I'm talking specifically about 126. Let's put 124 back to the side. I'm sorry. Put 124 to the side. I just want to focus on 126, and I just want to know, you said that this is the claim control strategy of the '347 earlier; is that correct?

Page 24

MR. LIVEDALEN: Objection. Vague. Mischaracterizes previous testimony.

A Yeah. It's one example.

Q Example. So is this an example of control strategy where road load's compared to a setpoint?

MR. LIVEDALEN: Objection. Vague. Calls for legal conclusion.

A In this example, yes, there is a comparison of road load to a torque setpoint.

Q And is the road load the engine torque?

MR. LIVEDALEN: Objection. Vague. Calls for legal conclusion.

A No. The road load is the Ford construction instantaneous torque required to propel the vehicle.

Q So with respect to paragraph 124 in the red shaded area why do you say that that is power and then for paragraph 126 you say that's torque?

A Well, the point I'm illustrating here is if power is used as the setpoint that, for example, if you're at a certain speed where the engine speed would be 3,000 RPM, you would be, you would be at 60 Newton meters to propel the vehicle, and that would all come from the electric motor; whereas in the strategy outlined, example outlined in 126, the same example, the engine would have been operated. So each of these

Page 25

strategies has a different, at a different point will operate the engine.

Q So with respect to paragraph 126, at 2,000 RPMs the setpoint is 35 Newton meters; is that correct?

A Yes.

Q And that 35 Newton meters represents an engine setpoint of 35 Newton meters; is that correct?

A Well, that's their load at 35 Newton meters.

Q Now, with respect to paragraph 124 and engine speed of say 5,017, doesn't that correlate to an engine torque of 114 Newton meters?

A Yes, it does.

Q And the torque levels above that 114 Newton meters the engine is operating; is that correct?

MR. LIVEDALEN: Objection. Vague.

A Yeah. I mean if the engine's creating torque output, then it's operating.

Q So again at 5,017 RPM you have a torque value of 114 Newton meters; is that correct?

A That's the -- yeah, according to the graph of the Caraceni engine that's the maximum torque output at wide open throttle at that RPM.

Q And that's a point along the dotted line you have labeled as 20 kilowatts; is that correct?

Page 26

A I don't think -- you're saying the 20 kilowatt line intersects that point?

Q I'm sorry. Paragraph 123, is this the -- what does the chart in paragraph 123 represent?

A That represents the maximum torque output of the Caraceni engine.

Q Okay. So that's the blue line in paragraph 124?

A Yes.

Q Okay. Would any point along the dotted line you've labeled as 20 kilowatt represent a boundary between where the motor is used to propel the vehicle and where the engine is used to propel the vehicle?

MR. LIVEDALEN: Objection. Vague.

A With the -- yes, with the Tabata strategy.

Q So with respect to the graph shown in 124, is that the control strategy disclosed by the '347 patent?

A No, it's not.

Q In your opinion what's the difference between a torque setpoint and a power threshold?

A Well, torque and power are completely different things, and it may be the -- when you look at these two graphs, you can see that, for example, in the Tabata strategy graph you may encounter situations

Page 27

where you need over 80 meters of torque from the electric motor, whereas in the patent strategy 35 Newton meters would be the maximum you require. So each of these strategies would lead you to a different size electric motor. So it would affect the design of the vehicle.

Q Would a person of skill in the art ever consider a power threshold to be a torque setpoint?

MR. LIVEDALEN: Objection. Vague. Calls for a legal conclusion.

A No.

Q At a value of 60 with respect to paragraph 124, at a torque value of 60 Newton meters and engine speed of 2,000 RPM, would that be understood as the torque required to propel the vehicle using the motor?

MR. LIVEDALEN: Objection. Vague.

A Yeah. That's an area where the motor alone would be used.

Q Right. I realize that's the area where the motor alone would be used, but would that be the torque at a given engine speed where -- strike that. Is the 60 Newton meters the torque that the engine must provide to propel the vehicle?

MR. LIVEDALEN: Objection. Vague.

A Well, at some point the engine may provide

Page 28

60 Newton meters and at some, some points it may be the electric motor that's providing 60 Newton meters.

Q Okay. So at 60 Newton meters and engine speed of 2,000 RPM who is, what power source is producing the 60 Newton Meters which would propel the vehicle?

MR. LIVEDALEN: Objection. Vague.

A Using the Tabata strategy it would be the electric motor and using the patent strategy would be the engine.

Q Okay. So let's just stick with 124. So with the graph shown in 124 at a torque level of 60 Newton meters and an engine speed of 2,000 RPM, the motor alone is providing or providing the torque necessary to propel the vehicle; is that correct?

MR. LIVEDALEN: Same objections.

A Yes. At all, at all points less than the 20 kilowatt power, power threshold you'd be using the motor.

Q Okay. And at 60 Newton meters and an engine speed of 5,000 RPM the engine alone is being operated to propel the vehicle; is that correct?

MR. LIVEDALEN: Same objection.

A No. I didn't -- this graph doesn't encompass the entire strategy, so I can say the engine

Page 29

would be operating, but I couldn't rule out whether the motor would also be operating at that point.

Q Fair enough. But the engine would be operating at 60 Newton meters at an engine speed of 5,000 RPM to propel the vehicle; is that correct?

MR. LIVEDALEN: Same objections.

A Yeah. Those two points give you a power greater than 20 kilowatts, so that would be, according to Tabata that would be the strategy for operating the engine.

Q Okay. All right. Why don't we turn to paragraph 128. You have another graph here in paragraph 128. Do you see that?

A Yes.

Q What does this graph represent?

A It's just showing, it's highlighting in yellow the areas of difference between the strategies.

Q What again is the line you've labeled as 20 kilowatts?

A That is a power threshold based on the Tabata patent.

Q And what is the line you have labeled 35 Newton meters?

A That's a torque threshold based on the '347 patent.

Page 30

Q Earlier we were looking at claim 5 of the '347 patent. Do you recall that?

A Yes.

Q Claim 5 discloses that the, quote, "Setpoint SP may be varied by set controller as a function of engine speed," end quotes. Do you see that?

A Yes.

Q Now, the 20 kilowatt line that you have drawn on graph figure 128, does that vary engine, vehicle, engine speed?

A I drew it at one speed and I probably have to go look through the patent to see if there's an allowance for variant, but certainly there is a power threshold.

Q I'm not sure if you answered the question or not. The 20 kilowatt line that's drawn in the graph on paragraph 128, does that 20 kilowatt line vary as a function of engine speed?

A You know, I, I have to I think do a better analysis of the '201 patent. I looked at the patent with respect to, to I guess it was Dr. Davis's report, but I didn't -- I don't think that was part of the analysis.

Q I'm asking a very simple question. All I'm asking is you've generated this chart here and you

Page 31

have a 20 kilowatt line here, and it starts up around 2,000 RPM at a hundred roughly Newton meters at parabolic slope that goes down to 6500 RPM at a roughly 30 Newton meters. And my question's pretty straightforward. I'm just asking does that 20 kilowatt line vary as a function of engine speed?

A And I said I'm not sure, and it's not important to this analysis because at some point it's 20 kilowatts. If it could vary, then that's, you know, a different analysis.

Q Mr. Hannemann, I appreciate your thoughts on it. I'm asking very simply. I mean it's just a visual yes or no question. Does the 20 kilowatt line vary as a function of engine speed?

A I, I don't know if -- I don't recall going through the patent where it does or not.

Q I'm -- I'm not asking anything about the patent. This has nothing to do with the patent. This is a line you've drawn. You've generated this chart; correct?

A Yes.

Q And nowhere in Tabata '201 is this 20 kilowatt curve drawn; is that correct?

A Yeah. Tabata discloses a power threshold. So I have drawn this as a power threshold.

Page 32

Q All right. But the 20 kilowatt line you've drawn in paragraph 128, it's not from Tabata '201; is that correct?

A It's how his strategy works.

Q I realize that your opinion is that's representative of Tabata '201, but it's not from Tabata '201; correct?

A No. He doesn't have a 20 kilowatt line drawn in his patent.

Q He doesn't have this figure drawn at all, does he?

A No. This is my analysis of his strategy.

Q Based on your analysis of the graph you've generated. I'm asking a very straightforward question. All I'm asking is does the 20 kilowatt line vary as a function of engine speed?

A The 20 kilowatt line is a line of constant power. So at every engine speed on this graph that line is, provides 20 kilowatts of power.

Q Does it vary as a function of engine speed?

A No. Every, every 20 kilowatt line -- every -- every point on the 20 kilowatt graph, 20 kilowatts, and that doesn't change based on the engine speed.

Q Every point represents a torque point at a

Page 33

given engine speed; is that correct?
A It's a constant power, and power is a product of torque and speed. So if you take 20 kilowatts at each engine RPM, there's a torque point that relates to that power.
Q Okay. So those torque points that relate to that power, do they vary as a function of engine speed?
A Yeah. There's different amount of torque for different engine speeds.
Q Along the 20 kilowatt power line?
A Yes. To 20 kilowatts of power there's various speed/torque combinations.
Q So with respect to the 20 kilowatt power line, the torque at each given speed along that line vary; is that correct?
A Well, I wouldn't say it varies, but it's a fixed torque for a fixed engine speed.
Q Mr. Hannemann, are you -- do you not want to answer the question because it's your opinion this is a power line?
A Well, it is a power line, and the power line is constructed by pairs of torque and engine speed.
Q I realize that.
A But each engine speed has a given torque

Page 34

that goes with it, but that torque doesn't vary. That specific torque number is paired up with an RPM that gives you that power.
Q Right. And I'm asking for all the torque points along the 20 kilowatt line, if you took them all and you drew a line through them, we can connect the dots all the way through, would that vary as a function of engine speed?
MR. LIVEDALEN: Objection. Vague.
A There are different torques for different engine speeds, so yes, it is -- I wouldn't still say it varies, but there's a different torque for different engine speed.
Q It's your opinion that a power threshold is fundamentally different than a torque setpoint; is that correct?
A Yes.
Q Why?
A Well, as we've already gone through the graphs, it demonstrates how using power versus torque would affect the design of a vehicle.
Q What do you mean it would affect the design of a vehicle?
A Well, using a torque strategy versus a power strategy, the example I gave was you would arrive at a

Page 35

different size electric motor for your vehicle design.
Q Why is that important?
A Pardon me?
Q Why is that important?
A Well, when you're designing a vehicle, you have to choose your components and size them in order to get the performance you desire. So if you -- and it also affects the cost of the vehicle and the weight of the vehicle, so it's a pretty important fundamental design decision.
Q You've had experience designing hybrid vehicles; correct?
A Yes.
Q As a matter of fact, I believe in your report you said you were -- strike that. Let me state what you said here, so let me turn back, that in 2003 you designed architecture for the hybrid configurations for the MP 4/12 C sports car for McLaren Automotive; is that correct?
A Yeah. I have designed a few different architectures for them.
Q And one of the things that you had to consider was the layout, packaging of the major components, motor, batteries, inverter and controller; is that correct?

Page 36

A Yes.
Q How did you select those components?
A We had a, selected those components by power output. We had a given power that we decided we were setting as a target.
Q Why did you use power and not torque?
A We just chose to use power. That's -- that's the -- it's the initial number you go to at a high level when you're designing a vehicle.
Q For the components you guys selected did the hybrid vehicle operate?
A There was never, to my knowledge, and I left McLaren in 2007, to my knowledge they never built a vehicle to that architecture, and if they did, I wasn't there, so I have no information about it.
Q Do you have an opinion whether selecting components based on power as opposed to torque has any beneficial advantages?
MR. LIVEDALEN: Objection. Vague.
A It depends on your criteria. There have been cases where I've been -- see you very rarely draw a car from a clean sheet of paper. Generally you have some components that you're basing it on, and there have been indications where I have a particular transmission that was the only transmission I had

Page 37

available, and that transmission had a torque limit. Therefore, I had to design the power train to meet that torque limit. In the absence of criteria like that, you know, if you're looking for clean sheet, I think you would, a typical person skilled in the art would look at horsepower and then as an overall vehicle target and then determine torque values to design the rest of the vehicle.

Q Were you guys starting from a clean sheet at McLaren?

A McLaren vehicle I would say at the time I was there we were, we had an engine dictated to us by Mercedes, so we actually did not have a clean sheet of paper.

Q So why did you select components based on power if you already had an engine dictated to you?

A Because we had a power goal for the vehicle and we had an engine that generated a certain amount of power. So we had a certain amount of power to achieve the overall power goal.

Q Why didn't you just select the amount of torque that the engine produced and design everything based on torque?

A You could do that, but that's not how we did it.

Page 38

Q So it was just a design choice to go with power?

MR. LIVEDALEN: Objection. Vague. Calls for legal conclusion.

A Like I said, in most projects I've been involved in the vehicle level, you know, power is a criteria, and then for other various criteria, you know, torque is also a consideration. So you will consider both, but for your example of the criteria to select size of the electric motors power was used in that case.

Q Is the reason that power was used because you were selecting the motors a function that battery operates in the power domain?

A No.

Q Why then did you guys choose to evaluate based on power as dictated by the electric motors?

MR. LIVEDALEN: Objection. Asked and answered.

A Because it would -- the power was a vehicle level decision independent or in combination of the two power trains. So since it was a vehicle level power goal we matched the power of the engine with the power of the motor, and then torque was a result of that.

Page 39

Q Paragraph 130 of your report you reference an EPA study. Do you see that?

A Yes.

Q Why did you reference this EPA study?

A It was just one other criteria for how you meet size components.

Q The block pole you have in 130, where does it state that you would use torque to select the components?

A Well, this is -- the selection's all about power.

Q So the prior art recognized that you would use power to select components, not torque; is that correct? Or at least the prior art reference that you have cited here in paragraph 130?

A Yeah. That's what this reference states.

Q So this doesn't support any opinion that you would use torque to select components as opposed to using power; is that correct?

A Well, I gave an example earlier of a situation where you would, would use torque. So you can use torque also.

Q I'm just trying to understand your opinion why it's more advantageous to use torque as opposed to power for selecting components.

Page 40

A Well, I'm not sure that I said that there was, one was better than the other, but if you used the Tabata strategy versus the patent strategy, you'd arrive at a different answer at size of your components. So it's a difference. It's not necessary that one's better than the other.

Q Okay.

MR. LIVEDALEN: We've been going about an hour. Want to take a break?

MR. RONDINI: Sure.

(A recess was taken from 4:13 p.m. until 4:34 p.m.)

BY MR. RONDINI:

Q Mr. Hannemann, before we took a break we've been talking a lot about these graphs, and we were talking about setpoint. Do you recall that?

A Yes.

Q And how claim, claim 5 of the '347 patent specifies that setpoint can vary as a function of engine speed. Do you recall that?

A Yes.

Q Okay. Now, this is pretty crude compared to your drawings, but let's have that marked.

(Hannemann Deposition Exhibit No. 11 was marked for identification and is attached to the

Page 41

transcript.)
Q So I've had marked as Exhibit 11 just a hand drawing that shows a graph with torque along the y-axis, engine speed long the x-axis, and then along the top what I did is I tried as best as I could to trace the same maximum torque output line that you've illustrated in paragraphs 124 and 126 of your report. Do you see that?
A Yes.
Q So if you could, and I'll hand you a -- yeah, here is one --
A The red one.
Q I handed you a red pen. Can you draw some examples of a set point that varies as a function of engine speed according to the claim strategy of the '347 patent?
A Well, I can draw you one that varies with engine speed, but the claim, the patent is just one line that says various engine speed. So my opinion is it would be up to someone of skill in the art to determine how they might want to do it. So I can give you examples of how somebody might want to do that but it's not going to be as the patent specifies. They don't specify how you would vary it.
Q I realize they don't specify how you would

Page 42

do it, but it does specify it could be done; correct?
A Yes.
Q And as a person that's opined as being one of skill in the art according to your report, I'm asking what are some examples that you can think of that would be illustrative of how the setpoint would vary as a function of engine speed according to the claim strategy?
A Okay. And you still said according to claim strategy, and I guess I don't want to tie it to anything more than just the one line in the claim that says it may vary according to engine speed, and I don't think there's any.
Q Okay. So I see the trouble you're having. So let's clarify this. Could you draw me some examples of a setpoint that varies as a function of engine speed as recited in claim 5 of the '347 patent?
MR. LIVEDALEN: Objection. It calls for a legal conclusion.
A Could you read that back again?
Q Sure. Could you draw me some examples of a setpoint that varies as a function of engine speed as recited by claim 5 of the '347 patent?
A Yeah, okay. So an example --
Q Hold on. Before you get started, instead of

Page 43

using a red I'm going to give you a different color pen. Here you go. So blue. Could you number the curves while you're drawing them?
A Sure.
Q Thank you.
(Witness complied.)
Q All right. So you've drawn three examples on this graph: First one that looks like a -- yeah why don't -- why don't you describe the three examples you've provided.
A Okay. Number 1 shows a straight line that's gradually increasing in torque as the engine speed increases. Number 2 isn't very artistic but it's intended to mimic the maximum torque output curve, and then number 3 is a straight line with gradually diminishing torque with engine speed.
Q I've added another line on here labeled number 4. I've drawn it in red. Do you see that?
A Yes.
Q Could this be another example of a setpoint that varies as a function of engine speed as recited by claim 5 of the '347 patent?
MR. LIVEDALEN: Objection. Vague. Calls for a legal conclusion.
A Yeah, and that coincidentally looks like a,

Page 44

a line of constant power. So you would be more emulating the power strategy of Tabata, and yeah, because of the reasons I discussed before about sizing of components that may not be somebody that -- something that somebody's likely to do. I think within a smaller boundary you can vary things to drivability, but I think number 4 is getting to the point of driving changes to design of the vehicle.
Q Don't the illustrative curves you have drawn as 1, 2 and 3, wouldn't the component sizing vary between those three curves?
MR. LIVEDALEN: Objection. Vague.
A You know, within a range -- I mean the scale's not on here, but within the range of maybe 10 or 15 Newton meters is a range that might require a change to the electric motor.
Q So with respect to curve 4 though that I've drawn, does that or does that not meet a setpoint that varies as a function of engine speed as recited by claim 5?
MR. LIVEDALEN: Objection. Vague. Calls for a legal conclusion. Asked and answered.
A So, yeah, I guess it technically meets that, that language.
Q So it does meet the claim?

Page 45

A Right. It's not -- I don't think it's something someone skilled in the art would do, but it's -- it does meet the claim technically.

Q Going back to paragraph 124 where you have drawn a constant power line, would a vehicle that's implementing the control strategy shown, that you've illustrated in paragraph 124 be implementing the '347 control strategy?

MR. LIVEDALEN: Objection. Vague. Calls for legal conclusion.

A Well, this is a -- this is a constant power line, and you know, which happens to be drawn on the torque versus the engine speed graph, and I think it's -- it is possible that it technically might comply with claim 5.

Q So the graph illustrated in 124 that has a constant power line could implement the control strategy of the '347 patent?

MR. LIVEDALEN: Objection. Vague. Calls for legal conclusion. Mischaracterizes previous testimony.

A I think that it's a -- it's a constant power line that the coincidental torque points if you actually built a vehicle that way would possibly comply with claim 5.

Page 46

Q So is that a "yes" then?

MR. LIVEDALEN: Same objections.

A I would say yes, that's yes, as coincidence, yes.

Q If power threshold varied as a function of battery state of charge, would you still consider that to be a power threshold?

MR. LIVEDALEN: Objection. Vague.

A I could conceive a series hybrid strategy where somebody might do that. I'm not sure it would be a power threshold as disclosed in Tabata, but I think feasibly somebody could do that.

Q Could you elaborate on that? What do you mean it could be a power threshold but not that as disclosed by Tabata?

A I thought you said a battery state of charge threshold.

Q No, no. I said -- well, a power value that varies as a function of battery state of charge, would it be still considered a power threshold?

A Okay. Sorry. I misunderstood your first question.

MR. LIVEDALEN: Same objections.

A I don't remember ever discussing that, that possibility. If you can point me to somewhere where that's discussed, I could answer your question.

Page 47

Q Well, let's start just fundamentally. What is your understanding of a power threshold?

A I mean I -- in the context of Tabata I understand that as he's using power threshold as a setpoint.

Q Did you have any understanding outside of Tabata what a power threshold might be?

A Not that I've studied for this case, no.

Q Just as a person that's skilled in the art who's worked on hybrids before do you have any understanding?

A I think I would understand the concept, yes.

Q Okay. Based on your understanding of the concept what is a power threshold?

A Well, it could be used as a -- it could be used in a hybrid strategy, talking in context of a hybrid strategy.

Q Correct.

A Is that correct? I think that power, speed and torque are all values that could be used as some kind of threshold for managing engine strategy.

Q So the only fundamental difference you see between a power threshold and a torque threshold is you may have to select components differently; is that

Page 48

correct?

MR. LIVEDALEN: Objection. Vague. Mischaracterizes previous testimony.

A No. I wouldn't say that's the only difference. That's an example that I gave earlier.

Q What other examples are there?

A I have -- I really haven't studied all the differences for everything. That's just, you know, one thing that I thought of, but it could affect your thermal engine size. It could affect the size of your battery. There's, you know, a number of things that could possibly be affected by your strategy.

Q Those are still all component related to sizing that you just mentioned in that aspect; is that correct?

A Yes.

Q So aside from component sizing, what would be the differences in choosing a power threshold versus a torque threshold?

A I think another example may be the, you know, how the engine, how the power train operates and the drivability of the power train which would relate to customer satisfaction with the vehicle.

Q And would you use a power threshold or a torque threshold in order to determine customer

Page 49

satisfaction of the vehicle?
A I just gave you that as an example of something that could be affected by the strategy. I haven't studied how it would affect it.
Q Going back to paragraph 124, the 20 kilowatt power line that you've illustrated there. If the 20 kilowatt power line varies as a function of vehicle speed, would it still be a power threshold?
MR. LIVEDALEN: Objection. Vague.
A Well, I think the definition of the power threshold is it's the same power. So I don't -- I don't see how you'd have a power threshold that would vary with engine speed.
Q I'm sorry. I said vehicle speed.
A Or vehicle speed. Well, I think even, even vehicle speed.
Q So if a 20 kilowatt power line varied with vehicle speed, you wouldn't consider that to be a power threshold?
A Well, okay. It wouldn't be a 20 kilowatt power threshold any longer. So you're saying take a power threshold and vary it with speed. I suppose that's, that's a technically feasible concept.
Q All right. So if you have different power thresholds at different vehicle speeds, could those

Page 50

still be considered power thresholds?
MR. LIVEDALEN: Objection. Vague.
Q Strike that. Let me re-ask it. If you had different lines of constant power at different vehicle speeds, could each of those different lines of constant power be considered a power threshold?
MR. LIVEDALEN: Objection. Vague.
A I guess it would have to be considered in the context of a patent or a reference.
Q Okay. We've been talking about a power threshold. Can you please explain to me in the context of your report here what you meant by power threshold?
A Well, power threshold is the strategy that Tabata's used in his patent.
Q Can you elaborate a little bit more? How about with respect to paragraph 124, can you elaborate with respect to that figure?
A Well, I think that figure is what it is. If you want me to elaborate, I'm going to look elsewhere in my declaration.
Yes. So I've got a description of the patent in my disclosure that has some more information about it.
Q What paragraph are you looking at right now?

Page 51

A I'm looking at paragraph 112.
Q So with respect to paragraph 112 that you're looking at could you please explain what you mean by a power threshold?
A Well, if Tabata patent's calculating power based on pedal position and it's comparing that to that threshold to determine whether to use the engine motor or combination.
Q Okay. And looking back at 124, and actually if you look at 125 you have a more succinct definition starting at the top of page 69 where you state, and quote, that "a power threshold would only turn on and operate the engine in area colored green," parentheses, "(i.e., above the 20 kilowatt threshold)," end parentheses, period. Do you see that?
A Right.
Q So am I correct to understand that your definition of a power threshold is a threshold, a power threshold above which the engine operates and below which the motor is operated?
A For that particular mode. There's other modes, but like I said before, this graph was just looking at that, that one mode switching.
Q Okay. Mr. Hannemann, what is running

Page 52

resistance?
A You said running resistance?
Q Correct, running resistance.
A I would equate that -- we talked earlier about a number of terms: Running resistance, rolling resistance, you know, mechanical resistance. There's -- so I would put that in that category of elements of road load.
Q So you classify running resistance as an element of road load?
A I guess it depends on the context. If, if somebody said, you know, total running resistance of the vehicle including other factors, then, then I would have a different view on it. So if you want to maybe point me to a context that you're looking at.
Q I've handed you the '201 patent; correct?
A Sure.
Q Why don't you look at column 30 starting at line 40. Tell me when you're there.
A Okay.
Q Line 40 says "the currently required output PD is an output of the hybrid drive system, 210, required to drive the vehicle against a running resistance," period, end quotes. Do you see that?
A Yes.

Page 53

Q How was Tabata '201 using running resistance in your opinion?
A Well, this one looks like it -- I mean it's a little vague. Like I say, running resistance to me is more of the rolling resistance, but this one could include more than that. It's a little vague.
Q Is running resistance ever synonymous with textbook road load?
A There's probably could have a context where it may compare to textbook road load, yes.
Q Now, your opinion you said that Tabata '201 calculates the required output PD based just on accelerator pedal; is that correct?
A Tabata states I believe a couple of ways of doing that. It says accelerator pedal position or that you can calculate it by the product of engine speed and torque.
Q In paragraph 119 you state and I quote, "In my opinion, Tabata '201 discloses a fundamentally different control strategy that determine the demand power, as calibrated by the pedal position, compares that demand power to power thresholds to determine whether to use the motor or the engine to propel the vehicle," period, end quotes. Do you see that?
A Yes.

Page 54

Q Why do you say it's just based on pedal position in paragraph 119?
A Well, that's one way that he states that it can be determined, power can be determined.
Q That's just one example that he gave, isn't it?
A He -- I believe he gives two examples.
Q What are the two examples?
A The pedal position and the calculation of torque and speed to get power.
Q So one of the ways that he discloses that it could be based on torque and speed; is that correct?
A Well, he bases his strategy on power. He says you could get power from either the pedal or from measuring torque and speed.
Q So why isn't the torque and speed, why isn't the torque as multiplied by speed to get the, to get the demand power, not the torque that's required to propel the vehicle?
MR. LIVEDALEN: Objection. Vague.
A Well, it's not what Tabata's using in his strategy. He's using power in his strategy.
Q Fair enough. I realize he's using power in his strategy, but I'm specifically talking about you have stated that in order to get the demand power that

Page 55

Tabata '201 talks about, one solution that he offers is to multiply torque times speed; is that correct?
A Yeah. He's using -- he's using power, and you can -- you can calculate torque from power. He's not using that to compare to a predetermined torque value.
Q I realize that. I realize ultimately he's using a power value, but he's deriving that value from a torque and speed value; is that correct? Or at least that's one solution that he offers for getting the power value; is that correct?
MR. LIVEDALEN: Objection. Vague. Compound.
Q Strike that. The demand power Tabata '201 uses in his control strategy is derived from torque and speed pair; is that correct?
A He says you can calculate it. Let me see if that's actually how he suggests to do it.
The word in the patent in my column 13, line 10, you can determine it on the basis of engine speed and torque or motor speed and torque or the amount or rate of change of the amount of operation of the accelerator pedal. So he has a number of ways of coming up with his instantaneous drive power.
Q And at least one of those ways is based on a

Page 56

torque speed pair; is that correct?
A Right, and that's -- theoretically that's how -- that's the relationship between power, speed and torque.
Q And would the torque value he's been, he's describing as being used in conjunction with the speed to get to the ultimate power, would that torque value be the torque that's required to propel the vehicle?
MR. LIVEDALEN: Objection. Vague.
A Well, he references -- it says further down the line other data necessary to calculate the required drive power are also stored in the memory means. So it's hard to say if he's using some other factors. He talks about other data, but he doesn't specify it.
Q Is the required instantaneous drive power the power that's required to drive the vehicle?
MR. LIVEDALEN: Objection. Vague.
A Well, that's defined by Tabata as the instantaneous drive power includes components for overcoming the air resistance of the vehicle and a rolling distance of the tires of the vehicle wheels. So that's another -- we've talked about a number of different ways of talking about the different elements of road load, and this one doesn't, isn't really

complete.

Q What's missing?

A Well, what's missing is any grade resistance and the other rolling resistance of the vehicle. He just has rolling distance of the tires. So if you compare this, this specific textbook road load, then the instantaneous drive power would not be the power required to propel the vehicle.

Q Looking back at paragraph 119 again, you said that it was fundamentally -- '201 discloses a fundamental different control strategy. Fundamentally different from what?

A Than what's disclosed in the patent. The fundamental difference is using power versus torque.

MR. RONDINI: Brian, we're just a little past 5:00. Do you want to stop for the night? I don't have much more.

MR. LIVEDALEN: Yeah. We can do it.

(Whereupon, the deposition was recessed at 5:11 p.m.)

ACKNOWLEDGMENT OF DEPONENT

I, NEIL HANNEMANN, do hereby acknowledge that I have read and examined the foregoing testimony, and the same is a true, correct and complete transcription of the testimony given by me and any corrections appear on the attached Errata sheet signed by me.

_____ _____

(DATE) (SIGNATURE)

CERTIFICATE OF SHORTHAND REPORTER-NOTARY PUBLIC

I, JANET A. HAMILTON, RDR, Certified Reporter and Notary Public within and for the District of Columbia, do hereby certify:

That NEIL HANNEMANN, the witness whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such deposition was taken before me and is a true record of the testimony by such witness.

I further certify that the adverse party was represented by counsel at the deposition.

I further certify that the deposition of NEIL HANNEMANN occurred at the offices of Fish & Richardson, PC, 1425 K Street, NW, 11th Floor, Washington, DC, 20005, on Thursday, April 30, 2015, at 3:07 p.m. to 5:11 p.m.

I further certify that I am not related to any of the parties to this action by blood or marriage, I am not employed by or an attorney to any of the parties to this action, and that I am in no way interested, financially or otherwise, in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 7th day of May, 2015.

_____

Registered Diplomate Reporter
My commission expires
March 14, 2018.