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Paper 12
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner,

v.

PAICE LLC and THE ABELL FOUNDATION, INC.,
Patent Owner.

Case IPR2015-00794
Patent 7,104,347 B2

Before SALLY C. MEDLEY, KALYAN K. DESHPANDE, and CARL M. DEFRANCO, *Administrative Patent Judges.*

DESHPANDE, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Ford Motor Company ("Petitioner") filed a Petition requesting an *inter partes* review of claims 23–30, 32, and 39–41 of U.S. Patent No. 7,104,347 B2 (Ex. 1401, "the '347 patent"). Paper 1 ("Pet."). Paice LLC and The Abell Foundation, Inc. (collectively, "Patent Owner") filed a Preliminary Response in both unredacted and redacted forms. Papers 9, 10 ("Prelim. Resp.").[1] Patent Owner also filed a Motion to Seal. Paper 11 ("Motion to Seal"). We have jurisdiction under 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." After considering the Petition, the Preliminary Response, and associated evidence, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing unpatentability of all the challenged claims, except claim 24. Thus, we authorize institution of an *inter partes* review of claims 23, 25–30, 32, and 39–41 of the '347 patent and we do not institute *inter partes* review of claim 24 of the '347 patent.

A. Related Proceedings

Petitioner indicates that the '347 patent is the subject of *Paice, LLC and The Abell Foundation, Inc. v. Ford Motor Company*, Case No. 1-14-cv-00492 and *Paice LLC and The Abell Foundation, Inc. v. Hyundai Motor America et. al.*, Case No. 1:2012-cv-00499. Pet. 1; Paper 5, 2. Petitioner also indicates that the '347 patent is the subject of IPR2014-00571, IPR2014-00579, and IPR2014-00884. *Id.*; Paper 5, 3. Petitioner further

[1] Citations are to the redacted version of Patent Owner's Preliminary Response (Paper 10, "Prelim. Resp.").

indicates that patents related to the '347 patent are the subject matter of IPR2014-00570, IPR2014-01415, IPR2014-00568, IPR2014-00852, IPR2014-00875, IPR2014-00904, IPR2014-01416, IPR2015-00606, IPR2015-00767, IPR2015-00722, IPR2015-00758, IPR2015-00784, IPR2015-00785, IPR2015-00791, IPR2015-00787, IPR2015-00790, IPR2015-00795, and IPR2015-00792. *Id.* at 1–2; Paper 5, 3.

B. The '347 Patent (Ex. 1401)

The '347 patent describes a hybrid vehicle with an internal combustion engine, two electric motors (a starter motor and a traction motor), and a battery bank, all controlled by a microprocessor that directs the transfer of torque from the engine and traction motor to the drive wheels of the vehicle. Ex. 1401, 17:5–45, Fig. 4. The microprocessor features a control strategy that runs the engine only under conditions of high efficiency, typically when the vehicle's instantaneous torque requirements (i.e., the amount of torque required to propel the vehicle, or "road load") is at least equal to 30% of the engine's maximum torque output ("MTO") capability. *Id.* at 20:52–60, 35:5–14; *see also id.* at 13:47–61 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently").

Running the engine only when it is efficient to do so leads to improved fuel economy and reduced emissions. *Id.* at 13:47–52. To achieve such efficiency, the hybrid vehicle includes various operating modes that depend on the vehicle's torque requirements, the battery's state of charge, and other operating parameters. *Id.* at 19:53–55. For example, the hybrid vehicle may operate in: (1) an all-electric mode, where only the traction motor provides the torque to propel the vehicle and operation of the engine

would be inefficient (i.e., stop-and-go city driving); (2) an engine-only mode, where only the engine provides the torque to propel the vehicle and the engine would run at an efficient level (i.e., highway cruising); (3) a dual-operation mode, where the traction motor provides additional torque to propel the vehicle beyond that already provided by the engine and the torque required to propel the vehicle exceeds the maximum torque output of the engine (i.e., while accelerating, passing, and climbing hills); and (4) a battery recharge mode where the engine operates a generator to recharge the battery while the traction motor drives the vehicle. *Id.* at 35:66–36:58, 37:26–38:55.

C. Illustrative Claim

Petitioner challenges claims 23–30, 32, and 39–41 of the '347 patent. Pet. 4–60. Claim 23 is illustrative of the claims at issue and is reproduced below:

> 23. A method of control of a hybrid vehicle, said vehicle comprising an internal combustion engine capable of efficiently producing torque at loads between a lower level SP and a maximum torque output MTO, a battery, and one or more electric motors being capable of providing output torque responsive to supplied current, and of generating electrical current responsive to applied torque, said engine being controllably connected to wheels of said vehicle for applying propulsive torque thereto and to said at least one motor for applying torque thereto, said method comprising the steps of:
>
> determining the instantaneous torque RL required to propel said vehicle responsive to an operator command;
>
> monitoring the state of charge of said battery;
>
> employing said at least one electric motor to propel said vehicle when the torque RL required to do so is less than said lower level SP;

> employing said engine to propel said vehicle when the torque RL required to do so is between said lower level SP and MTO;
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> employing both said at least one electric motor and said engine to propel said vehicle when the torque RL required to do so is more than MTO; and
>
> employing said engine to propel said vehicle when the torque RL required to do so is less than said lower level SP and using the torque between RL and SP to drive said at least one electric motor to charge said battery when the state of charge of said battery indicates the desirability of doing so; and
>
> wherein the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine.

Ex. 1001, 60:22–54.

D. The Alleged Grounds of Unpatentability

The information presented in the Petition sets forth proposed grounds of unpatentability of claims 23–30, 32, and 39–41 of the '347 patent under 35 U.S.C. § 103(a) as follows (*see* Pet. 6–60):[23]

References	Claims Challenged
Ibaraki '882[4]	23, 24, 28, 30, and 32
Ibaraki '882 and Admitted Prior Art ("APA")[5]	29

[2] Petitioner supports its challenge with the Declaration of Dr. Gregory W. Davis. Ex. 1408.

[3] Although Petitioner adds the general knowledge of one with ordinary skill in the art to the express statement of each alleged ground of unpatentability (Pet. 3–4), that is not necessary. Obviousness is determined from the perspective of one with ordinary skill in the art. We leave out the express inclusion of the general knowledge of one with ordinary skill.

[4] U.S. Patent No. 5,789,882, issued Aug. 4, 1998 (Ex. 1403)("Ibaraki '882").

[5] Petitioner relies on Figures 1 and 2 of the '347 patent, reproduced from the '970 patent, and the Masding/Bumby disclosures from the '634 patent

References	Claims Challenged
Ibaraki '882 and Vittone[6]	39
Ibaraki '882 and Yamaguchi[7]	40
Ibaraki '882 and Ibaraki '626[8]	41
Ibaraki '882 and Lateur[9]	27
Ibaraki '882 and Frank[10]	25 and 26

II. ANALYSIS

A. Patent Owner's Discretionary Dismissal Arguments

Patent Owner first argues that we should exercise our discretion under 35 U.S.C. § 325(d) and reject the Petition because "it relies on substantially the same arguments that [Petitioner] Ford has already presented to the Board in three separate proceedings." Prelim. Resp. 14–27. We have considered Patent Owner's argument, but exercise our discretion and consider the Petition and institute trial on the grounds summarized below, based in part on Ibaraki '882, a reference not previously relied on. We also have considered Patent Owner's arguments regarding multiple attacks on independent claim 23. *Id.* at 21–23. Where a dependent claim is challenged, we see no reason not to consider a challenge of the independent claim from

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(Ex. 1433).

[6] Oreste Vittone, *Fiat Conceptual Approach to Hybrid Cars Design*, 12TH INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM (1994) (Ex. 1420) ("Vittone").

[7] U.S. Patent No. 5,865,263, issued Feb. 2, 1999 (Ex. 1421) ("Yamaguchi").

[8] U.S. Patent No. 6,003,626, issued Dec. 21, 1999 (Ex. 1422) ("Ibaraki '626").

[9] U.S. Patent No. 5,823,280, issued Oct. 20, 1998 (Ex. 1407) ("Lateur").

[10] U.S. Patent No. 6,116,363, issued Sept. 12, 2000 (Ex. 1418) ("Frank").

which it depends over the same prior art, even if the independent claim already has been challenged elsewhere. Whatever renders obvious the dependent claim necessarily renders obvious the independent claim.

We also have considered Patent Owner's argument that multiple challenges should not be allowed because, under 35 U.S.C. § 315(e)(1), once a final written decision is issued in one proceeding with respect to a claim, Petitioner would be barred from requesting or maintaining a proceeding on that claim on any ground that the Petitioner raised or could have raised in the proceeding which yielded the final written decision. Prelim. Resp. 27–30. The contention is misplaced, because that provision applies only to the Petitioner, not the Board. *See Progressive Cas. Ins. Co. v. Liberty Mut. Ins. Co.*, Nos. 2014-1586, 2014-1466, 2014-1639, 2014-1538, 2014-1638, 2014-1636, 2014-1656, 2014-1549, 2014-1637, 2015 WL 5004949, at *2 (Fed. Cir. Aug. 24, 2015). Even if it applies to the Board, it is not burdensome simply to terminate the second proceeding with respect to certain claims.

B. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48766 (Aug. 14, 2012). Under the broadest reasonable construction standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. "Road Load" or "RL"

The term "road load" or "RL" is recited in independent claim 23. The

Specification of the '347 patent defines "road load" as "the vehicle's instantaneous torque demands, i.e., that amount of torque required to propel the vehicle at a desired speed," and further notes that it "can be positive or negative, i.e., when decelerating or descending a hill, in which case the negative road load . . . is usually employed to charge the battery." Ex. 1401, 12:38–58. Accordingly, we construe "road load" and "RL" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative."[11]

2. "Set Point" or "SP"

The term "setpoint" or "SP" is recited in independent claim 23 and dependent claims 24–30, 32, and 39–41. Petitioner proposes that "setpoint" or "SP" be construed, in the context of these claims, as "predetermined torque value." Pet. 5–6. In that regard, Petitioner correctly notes that the claims compare the setpoint either to an engine torque value or a torque based "road load" value. *Id.* Independent claim 23 recites a condition "when the torque RL required to do so is less than said lower level [setpoint] SP." Ex. 1401, 60:37–39. Independent claim 23 further recites a range established by the setpoint at one end, and the maximum torque output of the engine at the other end, by the language "when the torque RL required to do so is between said lower level SP and [maximum torque output] MTO." *Id.* at 60:40–42. Although Patent Owner correctly notes that the Specification outside of the claims refers to two items being measurable against respective setpoints, i.e., the vehicle's instantaneous torque requirement and the state of

[11] This construction is the same as that proposed by Petitioner. Pet. 4–5. Patent Owner does not propose a different construction.

charge of the battery bank (Prelim. Resp. 11–12), the setpoint in these claims relates to torque and not battery charge.

Patent Owner asserts that "setpoint" or "SP" is not simply a numerical value divorced from the context of the rest of the vehicle's control system, and that a "setpoint" serves the crucial function of marking the transition from one claimed mode to another, and in particular, the transition from propelling the vehicle with the motor to propelling the vehicle with the engine. Prelim. Resp. 8–11. Citing the Specification, Patent Owner further states that the Specification uses "setpoint" synonymously with "transition point." *Id* at 9–10. Accordingly, Patent Owner urges that the construction of "setpoint" or "SP" must include an indication that it is a point at which a transition between different operating modes may occur. *Id.* at 9–11.

Patent Owner's arguments are misplaced. The Specification outside of the claims sometimes uses "setpoint" interchangeably with "transition point," because the disclosure describes the particular transitions between operative modes, at the setpoints. If the multiple transitions between modes are not described, it would be without meaning to refer to a "setpoint" as a transition point between modes. A transition does not spring solely from the term "setpoint" or "SP." It would be improper to read into a claim all of the disclosed operational modes and all disclosed transitions between modes simply because the claim recites the "setpoint" or "SP."

Patent Owner does not urge that "setpoint" or "SP" requires any particular transition from mode to mode. Instead, Patent Owner merely desires to add that a "setpoint" is where a transition between operating modes "may occur." *Id.* Nothing of significance is added by that proposed construction. If a transition is specified by other limitations in the claim, at

the setpoint, then a transition is required at the setpoint. If no transition is specified by other limitations in the claim, then no transition is required at a setpoint. A transition may or may not occur at a setpoint, depending on what else is recited in the claim. It is not necessary to include such "may occur" language in the construction of "setpoint" and "SP." A multitude of events "may occur" at a setpoint, but they are not necessary for setting forth the meaning of "setpoint" or "SP" in a claim. The rest of the claim sets forth what is required to occur at a setpoint.

Nevertheless, we do regard as meaningful to note that nothing in the Specification precludes a setpoint from being reset, after it has been set. A setpoint for however short a period of time still is a setpoint.

We construe "setpoint" and "SP" as "predetermined torque value that may or may not be reset."

3. "monitor patterns of vehicle operation over time"

Dependent claim 24 recites "*monitor[ing] patterns of vehicle operation over time* and vary[ing] said setpoint SP accordingly." Ex. 1401, 60:55–57. Patent Owner argues that we should construe the italicized phrase to mean "track and record the driver's repeated driving operations over time." Prelim. Resp. 12. Petitioner does not provide an explicit construction for the phrase.

Patent Owner argues that the Specification of the '347 patent's description of monitoring patterns of vehicle operation over time refers to how the operator actually drives the car over some period of time, as opposed to monitoring an internal data point of the vehicle. *Id.* at 12–16. In support of its construction, Patent Owner directs attention to the following descriptions in the Specification:

> Examples of this practice—amounting in many circumstances to modifying certain specific values depending on other data items not discussed in detail, *or by monitoring the vehicle's actual usage patterns over time*—are given below.

Prelim. Resp. 13 (citing Ex. 1401, 35:47–58).

> It is also within the scope of the invention for the microprocessor to monitor the vehicle's operation over a period of days or weeks and reset this important setpoint *in response to a repetitive driving pattern.* For example, suppose the operator drives the same route from a congested suburban development to a workplace about the same time every morning; typically the road load might remain under 20% of MTO for the first few minutes of each day, then vary between 0 and 50% of MTO for another few minutes as the operator passes through a few traffic lights, and then suddenly increase to 150% of MTO as the operator accelerates onto a highway. *It is within the skill [in] the art to program a microprocessor to record and analyze such daily patterns, and to adapt the control strategy accordingly.* For example, *in response to recognition of a regular pattern as above, the transition point might be adjusted to 60% of MTO*; this would prevent repetitive engine starts as the road load exceeded 30% of MTO for a few hundred yards at a time, as might often occur in suburban traffic. Similarly, the engine starting routine might be initiated after the same total distance had been covered each day.

Ex. 1401, 40:56–41:9 (emphasis added).

In addition, Patent Owner, directing attention to external evidence, argues that the word "pattern" means a regular and repeated course of conduct or behavior. Prelim. Resp. 16; Ex. 1428; Ex. 2403.

Although Petitioner does not provide an explicit construction for the phrase "monitor[ing] patterns of vehicle operation over time," Patent Owner argues that Petitioner implicitly construes the phrase to encompass monitoring the battery state of charge or "regenerative charging amount"

and adjusting the alleged "setpoint" based on the stored regenerative charging amount. *Id.* at 13–14 (citing Pet. 28–31).

We agree with Patent Owner that Petitioner's implicit construction is not in light of the written description of the Specification of the '347 patent which describes changing a setpoint in response to monitored vehicle operation *patterns*. In particular, the description in the Specification regarding patterns describes clearly that the patterns are in connection with the driving patterns of the operator of the vehicle. Ex. 1401, 40:56–41:9. The Specification does not describe monitoring "patterns" of a battery state of charge, for example. Moreover, the plain words of the phrase require monitoring patterns over time. It is not enough to monitor a single value of a vehicle component, for instance. Rather the plain meaning of the words require monitoring patterns, where a pattern is defined as a regular or logical form, order, etc. Ex. 2403. Thus, we agree with Patent Owner that a pattern is a regular and repeated course of conduct or behavior and that the phrase "monitoring patterns of vehicle operation over time" requires monitoring a driver's repeated driving operations over time.

Accordingly, for purposes of this decision, we interpret "monitoring patterns of vehicle operation over time" to require monitoring a driver's repeated driving operations over time.

C. Claims 23, 24, 28, 30, and 32– Obviousness over Ibaraki '882

Petitioner contends that claims 23, 24, 28, 30, and 32 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882. Pet. 6–36.

1. Ibaraki '882 (Ex. 1403)

Ibaraki '882 discloses a drive control apparatus for a "hybrid vehicle" equipped with an electric motor and an internal combustion engine.

Ex. 1403, 1:10–15. The electric motor provides electric energy and operates as a first drive power source, and the internal combustion engine combusts fuel to provide a second drive power source. *Id.* at 2:57–64. The drive control apparatus includes (1) an engine drive mode where the vehicle is driven by the engine, (2) a motor drive mode where the vehicle is driven by the electric motor, and (3) an electricity generating mode where an electric generator is operated by the engine to charge an electric energy storage device. *Id.* at 2:64–3:2. Depending on the running condition of the vehicle, the drive control apparatus selects the drive mode. *Id.* at 3:5–14.

2. Analysis

a. Claims 23, 28, 30, and 32

The evidence set forth by Petitioner indicates there is a reasonable likelihood that Petitioner will prevail in showing that claims 23, 28, 30, and 32 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882. Pet. 6–36. Petitioner provides a detailed analysis, supported by evidence, demonstrating that there is a reasonable likelihood that claims 23, 28, 30, and 32 are obvious over Ibaraki '882. *Id.*

For example, claim 23 recites a "method of control of a hybrid vehicle," where the "vehicle comprising an internal combustion engine capable of efficiently producing torque at loads between a lower level [setpoint] SP and a maximum torque output MTO." Claim 23 further recites "the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine." Claim 23 additionally recites "a battery." Petitioner argues that Ibaraki '882 discloses a drive control apparatus for a hybrid vehicle, where the vehicle includes an electric motor and an internal combustion engine. Pet. 6–7

(citing Ex. 1403, 1:9–14, 19:11–54; Ex. 1408 ¶¶ 169–170). Petitioner further argues that Ibaraki '882 discloses an energy efficiency map that includes a threshold and multiple setpoints based on the engine speed. Pet. 8–9 (citing Ex. 1403, 25:46–26:8, Fig. 5; Ex. 1408 ¶¶ 185–187). Petitioner asserts that the setpoints represent the point where the hybrid vehicle transitions from motor drive mode to engine drive mode and the engine efficiently produces torque above the setpoint. *Id.* Petitioner argues that Ibaraki '882 similarly discloses a drive source selecting data map that includes a boundary line, along which are setpoints. *Id.* at 9–10 (citing Ex. 1403, 20:49–21:20, 24:6–26, Fig. 11; Ex. 1408 ¶¶185, 188–190, 193). Petitioner argues that these setpoints also represent the point where the hybrid vehicle transitions from motor drive mode to engine drive mode and the engine efficiently produces torque above the setpoint. *Id.* Petitioner explains that although the language "substantially less than" is not "mathematically precise," 70% of the MTO is "substantially less than" the MTO and Ibaraki '882 discloses threshold or setpoint at 70% of the engine's maximum efficiency. *Id.* at 25–26 (citing Ex. 1403, 25:46–56, Fig. 5). Petitioner further argues that Ibaraki '882 discloses an energy storage device, which can be "in the form of a battery or condenser." *Id.* at 11 (citing Ex. 1403, 19:55–57; Ex 1408 ¶¶ 198–199) (emphasis omitted).

Claim 23 further recites "one or more electric motors being capable of providing output torque responsive to supplied current, and of generating electrical current responsive to applied torque." Claim 23 also recites "said engine being controllably connected to wheels of said vehicle for applying propulsive torque thereto and to said at least one motor for applying torque thereto." Petitioner contends that Ibaraki '882 discloses a "dynamo-electric

motor" that receives electric energy, i.e. current, from the energy storage device or battery when in a "DRIVE" state and transfers the power to the wheels ultimately. *Id.* at 11–12 (citing Ex. 1403, 19:24–28, 19:55–63; Ex. 1408 ¶¶ 200–204). Petitioner further contends that Ibaraki '882 discloses a "CHARGING" state, where the motor functions as an electric generator or dynamo, with regenerative braking. *Id.* at 12 (citing Ex. 1403, 19:61–67). Petitioner argues that Ibaraki '882 discloses that the engine is controlled by a "clutch." *Id.* at 12–13 (citing Ex. 1403, 19:50–54, Fig. 8; Ex. 1408 ¶¶ 208–210).

Claim 23 also recites "determining the instantaneous torque RL required to propel said vehicle responsive to an operator command." Petitioner argues that Ibaraki '882 discloses a required drive power for a vehicle that is determined by the vehicle torque and speed. *Id.* at 13–14 (citing Ex. 1403, 20:39–43, 20:58–21:1, 23:66–24:21; Ex. 1408 ¶¶ 221–224). Petitioner further asserts that Ibaraki '882 discloses that the "instantaneous drive power required for running the vehicle, which power includes components for overcoming the air resistance experienced by the vehicle and the rolling resistance of each vehicle wheel." *Id.* at 14–15 (quoting Ex. 1403, 12:50–54)(emphasis omitted).

Claim 23 additionally recites "monitoring the state of charge of said battery." Petitioner contends that Ibaraki '882 discloses that the controller receives a state of charge SOC of the electric energy storage device or battery. *Id.* at 16 (citing Ex. 1403, 20:10–23).

Claim 23 further recites four different modes used to propel the vehicle: (1) "employing said at least one electric motor to propel said vehicle when the torque RL required to do so is less than said lower level SP," (2)

"employing said engine to propel said vehicle when the torque RL required to do so is between said lower level SP and MTO," (3) "employing both said at least one electric motor and said engine to propel said vehicle when the torque RL required to do so is more than MTO," and (4) "employing said engine to propel said vehicle when the torque RL required to do so is less than said lower level SP and using the torque between RL and SP to drive said at least one electric motor to charge said battery when the state of charge of said battery indicates the desirability of doing so." Petitioner contends that Ibaraki '882 discloses (1) a "MOTOR DRIVE mode," (2) an "ENGINE DRIVE mode," (3) an "ENGINE-MOTOR DRIVE mode," and (4) an "ELECTRICITY GENERATING DRIVE mode." *Id.* at 16–25 (citing Ex. 1403, 15:37–50, 19:18–27, 19:55–20:9, 20:18–63, 20:43–53, 20:55–21:1, 23:6–19, 23:66–24:30, 26:18–21, 26:28–33, Figs. 5, 7, 10, 11; Ex. 1408 ¶¶ 242-250, 253–262, 266–281, 287–294). Petitioner further argues that Ibaraki '882 discloses (1) the vehicle operates in "MOTOR DRIVE mode" when the required torque at a given speed is below boundary line B, (2) the vehicle operates in "ENGINE DRIVE mode" when the required torque at a given speed is between boundary line B and boundary line C, and (3) the vehicle operates in "ENGINE-MOTOR DRIVE mode" when the required torque at a given speed is above boundary line C. *Id.* Accordingly, Petitioner asserts that boundary line B is the same as setpoint SP and boundary line C must be at least equal to the maximum torque output MTO. *Id.* Petitioner further argues that Ibaraki '882 discloses that during "ELECTRICITY GENERATING DRIVE mode" the engine speed is held constant at a value greater than the required torque and the surplus torque is used to drive the motor for charging the battery. *Id.*

Accordingly, the present record supports that Petitioner has established a reasonable likelihood it will prevail in demonstrating that claim 23 is obvious over Ibaraki '882. We are similarly persuaded that Petitioner has established a reasonable likelihood it will prevail in demonstrating claims 28, 30, and 32 are obvious over Ibaraki '882.

We have considered Patent Owner's argument that the Petition improperly incorporates arguments and evidence from the Declaration of Dr. Davis into the Petition. Prelim. Resp. 30–35. We agree that, in general, arguments must not be incorporated by reference from one document into another document (37 C.F.R. § 42.6(a)(3)). Here, however, Patent Owner's arguments are unpersuasive. Petitioner relies on Ibaraki and the knowledge of POSA in challenging claims 23, 28, 30, and 32. In doing so, Petitioner relies on Dr. Davis' testimony as evidence of what a POSA would have known at the time of the invention. We have reviewed those portions of Dr. Davis' Declaration, to which we are directed, with respect to the grounds upon which we institute, and, have determined that there is nothing unusual about his declaration or the way in which Petitioner relies on the declaration insofar as improper incorporation is concerned, at least not to the extent that we would disregard the Petition in its entirety. Moreover, we will not disregard the Petition because of an alleged "voluminous record." *Id.* at 34–35.

Patent Owner also argues that Petitioner has failed to identify "what claim elements are missing from Ibaraki '882" and, therefore, Patent Owner argues that Petitioner "fails to provide the requisite *Graham v. John Deere* analysis." Prelim. Resp. 36–38. Patent Owner argues that it is unclear whether Petitioner is asserting that Ibaraki '882 discloses the claim element

or simple renders obvious the claim element. *Id.* We are not persuaded by Patent Owner's argument. Whatever disclosure from each prior art reference, listed in Petitioner's claim charts in a corresponding location opposite a reproduced claim limitation, is a representation that that disclosure meets the associated claim limitation. We have reviewed the proposed ground of obviousness over Ibaraki '882 against claims 23, 28, 30, and 32, and are persuaded, at this juncture of the proceeding, that Petitioner has established a reasonable likelihood that Petitioner would prevail in its challenge to claims 23, 28, 30, and 32.

Patent Owner also argues that Petitioner relies improperly on two separate embodiments of Ibaraki '882, namely, the disclosures of Figures 5 and 11, and fails to explain why a person of ordinary skill in the art would be motivated to combine these embodiments. *Id.* at 38–39. We disagree with Patent Owner. Petitioner explains that Figures 5 and 11 similarly set forth thresholds based on engine torque and engine speed. *See* Pet. 8–10. Petitioner further sets forth that the thresholds determine the point in which the engine mode will transition. *See id.* Although Patent Owner argues that Figure 5 discloses "thresholds based on engine efficiency" and Figure 11 discloses "thresholds are based on drive power" (Prelim. Resp. 38–39), we are not persuaded that these are two separate embodiments. Rather, both Figures 5 and 11 discloses threshold points for transitioning between engine modes. The mere fact that Figure 5 also discloses engine efficiency based on speed and torque does not render it a separate embodiment. Accordingly, we are not persuaded by Patent Owner that Petitioner has failed to provide an articulated reasoning with a rational underpinning in supporting its conclusion of obviousness.

We are not persuaded by Patent Owner's argument that Petitioner's parallel citations to both embodiments fail to adequately identify the basis for its claim challenges. *Id.* We are able to discern from Petitioner's citations what portions of Ibaraki '882 Petitioner relies upon to disclose which limitation. Furthermore, as discussed above, we are not persuaded that Petitioner relies on two separate embodiments of Ibaraki '882.

Patent Owner further argues that Petitioner has added annotations to Ibaraki '882 Figures 5 and 11, "adding values and threshold lines that are not in the cited reference." *Id.* at 41–42. Patent Owner specifically argues that Petitioner's "annotations are misleading and should not be confused for the actual disclosures of Ibaraki '882, which does not involve transitioning between operating modes based on the 'torque RL required' to propel the vehicle." *Id.* The argument is misplaced as none of the challenged claims require "transitioning between operating modes based on the instantaneous torque required to propel the vehicle." The argument is based on Patent Owner's proposed construction for setpoint, which we have not adopted for the reasons provided above in the claim construction section. Furthermore, we are not confused by Petitioner's annotations and the differences between the annotations and what Ibaraki '882 discloses.

With respect to claim 23, Patent Owner argues that Petitioner effectively reads the words "substantially less" out of the phrase "substantially less than the maximum torque output (MTO) of said engine." *Id.* at 42–43. We disagree. Instead, Petitioner explains that, based on a description in related patent 7,237,634 Patent (claim 15), "substantially less than the MTO" includes a SP which is less than approximately 70% of the MTO. *See* Pet. 25. Moreover, we are not persuaded by Patent Owner's

arguments that Petitioner improperly combines embodiments of Ibaraki '882 to meet the "substantially less than the MTO" phrase. The ground is one of obviousness, not anticipation. In any event, Petitioner provides an explanation of how a single embodiment of Ibaraki '882 describes the substantially less than the MTO limitation (*id.* at 25–26), as even Patent Owner recognizes. We are not persuaded that Petitioner's explanation with respect to Figure 11 in the Petition is based on conclusory statements, attorney argument, and improperly incorporated declaration testimony as asserted. We are similarly not persuaded by Patent Owner's arguments that Petitioner improperly incorporates Dr. Davis' declaration and Petitioner's arguments are conclusory with regard to claims 28, 30, and 32. Prelim. Resp. 46–47.

b. Claim 24

The evidence set forth by Petitioner does not indicate there is a reasonable likelihood that Petitioner will prevail in showing that claim 24 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882. Pet. 28–31. Dependent claim 24, which depends from independent claim 23, recites "employing said controller to monitor patterns of vehicle operation over time and vary said setpoint SP accordingly." Petitioner argues that Ibaraki '882 discloses that the controller stores in memory a regenerative charge amount based on a user's accelerator patterns. Pet. 28–31 (citing Ex. 1403, 22:43–65). As discussed above in our claim construction, we interpret "monitoring patterns of vehicle operation over time" to require monitoring a driver's repeated driving operations over time. As also discussed above in our claim construction, we are not persuaded by Petitioner's implicit construction of "monitoring patterns of vehicle operation over time" to

encompass monitoring the battery state of charge or "regenerative charging amount" and adjusting the alleged "setpoint" based on the stored regenerative charging amount. As such, we are not persuaded that Ibaraki '882's disclosure of storing the regenerative charge amount based on a user's accelerator patterns meet claim 24. Accordingly, we are not persuaded that Petitioner has established it will prevail in demonstrating that claim 24 is obvious over Ibaraki '882.

D. Claims 29 – Obviousness over Ibaraki '882 and APA

The evidence set forth by Petitioner indicates there is a reasonable likelihood that Petitioner will prevail in showing that claim 29 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and APA. Pet. 36–38. Dependent claim 29, which depends from independent claim 23, recites "said setpoint SP is at least approximately 30% of MTO." Petitioner argues that a person with ordinary skill in the art would have understood that Ibaraki '882 included typical engines, such as the ones described by the APA (Masding/Bumby), where Ibaraki '882's 70% fuel efficiency correlates to approximately 33% of MTO. Pet. 37 (citing Ex. 1408 ¶¶ 393–416). Petitioner further contends that such an adjustment is nothing more than an obvious design choice. *Id.*; *See* Ex. 1408 ¶ 392.

Patent Owner argues that Petitioner's argument that "it would have been an obvious design choice to choose engines having similar parameters" is insufficient to establish obviousness. Prelim. Resp. 48–49 (citing Pet. 37). We are not persuaded that Petitioner's design choice argument is conclusory. Petitioner has set forth evidence, supported by Dr. Davis' declaration, in supporting its design choice argument. *See* Ex. 1408 ¶¶ 392–416.

Accordingly, we are not persuaded by Patent Owner that Petitioner's argument is conclusory.

We further reject Patent Owner's general arguments based on improper incorporation by reference, insufficient identification of differences, conclusory arguments, and voluminous record for similar reasons provided above. *See* Prelim. Resp. 47–49. We have reviewed the arguments and evidence presented by Petitioner, and also the opposing contentions of Patent Owner, and we are persuaded, at this juncture of the proceeding, that Petitioner has established a reasonable likelihood that Petitioner would prevail in its challenge to claim 29.

E. Claim 39 – Obviousness over Ibaraki '882 and Vittone

The evidence set forth by Petitioner indicates there is a reasonable likelihood that Petitioner will prevail in showing that claim 39 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Vittone. Pet. 38–43. Dependent claim 39, which depends from independent claim 23, recites "the rate of change of torque output by said engine is limited, such that combustion of fuel within said engine can be controlled to occur substantially at the stoichiometric ratio" and "if said engine is incapable of supplying the instantaneous torque required, the additional torque required is supplied by either or both of said motor(s)." Petitioner argues that Vittone discloses these limitations. *Id.* Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Vittone. *Id.*

We reject Patent Owner's general arguments based on improper incorporation by reference, insufficient identification of differences,

conclusory arguments, and voluminous record for similar reasons provided above. *See* Prelim. Resp. 50–52. We have reviewed the arguments and evidence presented by Petitioner, and also the opposing contentions of Patent Owner, and we are persuaded, at this juncture of the proceeding, that Petitioner has established a reasonable likelihood that Petitioner would prevail in its challenge to claim 39.

F. Claim 40 – Obviousness over Ibaraki '882 and Yamaguchi

The evidence set forth by Petitioner indicates there is a reasonable likelihood that Petitioner will prevail in showing that claim 40 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Yamaguchi. Pet. 43–45. Dependent claim 40, which depends from independent claim 23, recites "said engine is rotated before starting such that its cylinders are heated by compression of air therein." Petitioner argues that Yamaguchi discloses this limitation. *Id.* Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Yamaguchi. *Id.*

We reject Patent Owner's general arguments based on improper incorporation by reference, insufficient identification of differences, conclusory arguments, and voluminous record for similar reasons provided above. *See* Prelim. Resp. 52–53. We have reviewed the arguments and evidence presented by Petitioner, and also the opposing contentions of Patent Owner, and we are persuaded, at this juncture of the proceeding, that Petitioner has established a reasonable likelihood that Petitioner would prevail in its challenge to claim 40.

G. Claim 41 – Obviousness over Ibaraki '882 and Ibaraki '626

The evidence set forth by Petitioner indicates there is a reasonable likelihood that Petitioner will prevail in showing that claim 41 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Ibaraki '626. Pet. 46–51. Dependent claim 41, which depends from independent claim 23, recites "said engine can be operated at torque output levels less than SP under abnormal and transient conditions" and "said conditions comprising starting and stopping of the engine and provision of torque to satisfy drivability or safety consideration." Petitioner argues that Ibaraki '626 discloses these limitations. *Id.* Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Ibaraki '626. *Id.*

We reject Patent Owner's general arguments based on improper incorporation by reference, insufficient identification of differences, conclusory arguments, and voluminous record for similar reasons provided above. *See* Prelim. Resp. 53–54. We have reviewed the arguments and evidence presented by Petitioner, and also the opposing contentions of Patent Owner, and we are persuaded, at this juncture of the proceeding, that Petitioner has established a reasonable likelihood that Petitioner would prevail in its challenge to claim 41.

H. Claim 27 – Obviousness over Ibaraki '882 and Lateur

The evidence set forth by Petitioner indicates there is a reasonable likelihood that Petitioner will prevail in showing that claim 27 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Lateur. Pet. 51–54. Dependent claim 27, which depends from independent claim 23, recites "the further step of operating said controller to accept

operator input of a desired cruising speed" and "said controller thereafter controlling the instantaneous engine torque output and operation of said motor(s) to supply additional torque as needed in accordance with variation in RL to maintain the speed of said vehicle substantially constant." Petitioner argues that Lateur discloses these limitations. *Id.* Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Lateur. *Id.*

We reject Patent Owner's general arguments based on improper incorporation by reference, insufficient identification of differences, conclusory arguments, and voluminous record for similar reasons provided above. *See* Prelim. Resp. 54–55. We have reviewed the arguments and evidence presented by Petitioner, and also the opposing contentions of Patent Owner, and we are persuaded, at this juncture of the proceeding, that Petitioner has established a reasonable likelihood that Petitioner would prevail in its challenge to claim 27.

I. Claims 25 and 26 – Obviousness over Ibaraki '882 and Frank

The evidence set forth by Petitioner indicates there is a reasonable likelihood that Petitioner will prevail in showing that claims 25 and 26 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Frank. Pet. 54–60. Claims 25 and 26 recite "the further step of employing said controller to monitor RL over time, and to control transition between propulsion of said vehicle by said motor(s) to propulsion by said engine such that said transition occurs only when RL>SP for at least a predetermined time, or when R>SP2, wherein SP2 is a larger percentage of MTO than SP" and "the further step of employing said controller to monitor RL over time,

and to control transition between propulsion of said vehicle by said engine to propulsion by said motor(s) such that said transition occurs only when RL<SP for at least a predetermined time" respectively. Petitioner argues that Frank discloses these limitations. *Id.* Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Frank. *Id.*

We reject Patent Owner's general arguments based on improper incorporation by reference, insufficient identification of differences, conclusory arguments, and voluminous record for similar reasons provided above. *See* Prelim. Resp. 55–57. We have reviewed the arguments and evidence presented by Petitioner, and also the opposing contentions of Patent Owner, and we are persuaded, at this juncture of the proceeding, that Petitioner has established a reasonable likelihood that Petitioner would prevail in its challenge to claims 25 and 26.

III. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314, an *inter partes* review hereby is instituted as to the following proposed ground:

1. obviousness of claims 23, 28, 30, and 32 over Ibaraki '882;
2. obviousness of claim 29 over Ibaraki '882 and APA;
3. obviousness of claim 39 over Ibaraki '882 and Vittone;
4. obviousness of claim 40 over Ibaraki '882 and Yamaguchi;
5. obviousness of claim 41 over Ibaraki '882 and Ibaraki '626;
6. obviousness of claim 27 over Ibaraki '882 and Lateur;

7. obviousness of claims 25 and 26 over Ibaraki '882 and Frank.

FURTHER ORDERED that the trial is limited to the grounds identified above and no other grounds are authorized; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial commences on the entry date of this Decision.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner

Case IPR2014-00579
Patent 7,104,347

PATENT OWNER PAICE LLC & THE ABELL FOUNDATION, INC.'S NOTICE OF APPEAL

Notice is hereby given, pursuant to 37 C.F.R § 90.2(a), that Patent Owner Paice LLC & The Abell Foundation, Inc. (collectively, "Paice") hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision entered on September 28, 2015 (Paper 45) and from all underlying orders, decisions, rulings and opinions that are adverse to Patent Owner, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered September 30, 2014 (Paper 12).

In accordance with 37 C.F.R § 90.2(a)(3)(ii), Patent Owner Paice further indicates that the issues on appeal include, but are not limited to, claim construction; determination of unpatentability of claims 1, 7, 8, 18, 21, 23, and 37 of Paice's U.S. Patent No. 7,104,347 B2 ("'347 Patent") under 35 U.S.C § 103; any finding or determination supporting or related to those issues; as well as all other issues decided adversely to Paice in any orders, decisions, rulings and opinions.

Simultaneous with this submission, a copy of this Notice of Appeal is being filed with the Director of the United States Patent and Trademark Office, the Patent Trial and Appeal Board, and the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

Date: November 24, 2015

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(1) and 42.6(e)(4)(iii), the undersigned certifies that on November 24, 2015, a complete and entire copy of this Patent Owner's Notice of Appeal was provided via email, to the Petitioner by serving the email correspondence addresses of record as follows:

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I hereby certify that, in addition to being filed electronically through the Board's PRPS System, the original version of the foregoing, Patent Owner's Notice of Appeal, was served by hand on this 24th day of November, 2015, with the Director of the United States Patent and Trademark Office, at the following address:

Director of the United States Patent and Trademark Office
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I hereby certify that true and correct copies of the foregoing, Patent Owner's Notice of Appeal, were filed via CM/ECF on the 24th day of November, 2015, with the Clerk's Office of the United States Court of Appeals for the Federal Circuit, at the following address:

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner

Case IPR2014-00571
Patent 7,104,347 B2

PATENT OWNER PAICE LLC & THE ABELL FOUNDATION, INC.'S NOTICE OF APPEAL

Notice is hereby given, pursuant to 37 C.F.R § 90.2(a), that Patent Owner Paice LLC & The Abell Foundation, Inc. (collectively, "Paice") hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision entered on September 28, 2015 (Paper 44) and from all underlying orders, decisions, rulings and opinions that are adverse to Patent Owner, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered September 30, 2014 (Paper 12).

In accordance with 37 C.F.R § 90.2(a)(3)(ii), Patent Owner Paice further indicates that the issues on appeal include, but are not limited to, claim construction; determination of unpatentability of claims 1, 6, 7, 9, 15, 21, 23, and 36 of Paice's U.S. Patent No. 7,104,347 B2 ("'347 Patent') under 35 U.S.C § 103; any finding or determination supporting or related to those issues; as well as all other issues decided adversely to Paice in any orders, decisions, rulings and opinions.

Simultaneous with this submission, a copy of this Notice of Appeal is being filed with the Director of the United States Patent and Trademark Office, the Patent Trial and Appeal Board, and the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

Date: November 24, 2015

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(1) and 42.6(e)(4)(iii), the undersigned certifies that on November 24, 2015, a complete and entire copy of this Patent Owner's Notice of Appeal was provided via email, to the Petitioner by serving the email correspondence addresses of record as follows:

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I hereby certify that, in addition to being filed electronically through the Board's PRPS System, the original version of the foregoing, Patent Owner's Notice of Appeal, was served by hand on this 24th day of November, 2015, with the Director of the United States Patent and Trademark Office, at the following address:

Director of the United States Patent and Trademark Office
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I hereby certify that true and correct copies of the foregoing, Patent Owner's Notice of Appeal, were filed via CM/ECF on the 24th day of November, 2015, with the Clerk's Office of the United States Court of Appeals for the Federal Circuit, at the following address:

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Paper 38
Entered: December 10, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner,

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner.

Case IPR2014-00884
Patent 7,104,347 B2

Before SALLY C. MEDLEY, KALYAN K. DESHPANDE, and CARL M. DEFRANCO, *Administrative Patent Judges.*

DEFRANCO, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Ford Motor Company ("Ford") filed a Petition ("Pet.") for *inter partes* review of claims 1, 7, 10, 21, 23, and 24 of U.S. Patent No. 7,104, 347 B2 ("the '347 patent"), which is owned by Paice LLC & The Abell Foundation, Inc. (collectively, "Paice"). In a preliminary proceeding, we decided to institute trial ("Dec. Inst.") because Ford demonstrated a reasonable likelihood that the challenged claims are unpatentable under 35 U.S.C. § 103. In due course, Paice filed a Patent Owner Response ("PO Resp."), and Ford followed with a Reply ("Reply"). Having heard oral argument on this matter,[1] and pursuant to our jurisdiction under 35 U.S.C. § 6(c), we determine Ford has proven that claims 1, 7, and 10 are unpatentable by a preponderance of the evidence, but has not carried its burden with respect to claim 24. Also, pursuant to 35 U.S.C. § 315(e)(1), we determine that Ford is estopped from maintaining its challenge against claims 21 and 23.

II. BACKGROUND

A. Related Proceedings

The instant Petition challenges several claims of the '347 patent that have been adjudicated previously in IPR2014-00571 and IPR2014-00579, but on different grounds. Specifically, those prior proceedings led to final written decisions in which claims 1, 7, 21, and 23 at issue here were determined to be unpatentable, among other claims of the '347 patent. *See* IPR2014-00571, Paper 44, 2015 WL 5782084 (PTAB Sept. 28, 2015); IPR2014-00579, Paper 45, 2015 WL 5782085 (PTAB Sep. 28, 2015).[2] We

[1] A transcript ("Tr.") has been entered into the record. Paper 36.
[2] Paice has filed notices of appeal from our final written decisions in the -571 and -579 proceedings.

granted institution of trial in the instant proceeding back in December 2014, well before our final written decisions in the -571 and -579 proceedings.

The '347 patent is also the subject of co-pending district court actions, including *Paice, LLC v. Ford Motor Co.*, No. 1:14-cv-00492 (D. Md., filed Feb. 19, 2014), and *Paice LLC v. Hyundai Motor Co.*, No. 1:12-cv-00499 (D. Md., filed Feb. 16, 2012). Pet. 1; *see also* PO Resp. 7–8 (referencing the district courts' claim construction). We are informed that, in the latter action, a jury trial was recently completed on October 1, 2015, and the parties are currently engaged in post-trial briefing.

B. The '347 Patent

The '347 patent describes a hybrid vehicle with an internal combustion engine, at least one electric motor, and a battery bank, all controlled by a microprocessor that controls the direction of torque between the engine, motor, and drive wheels of the vehicle. Ex. 1201, 17:5–45, Fig. 4. The microprocessor monitors the vehicle's instantaneous torque requirements, or road load, to determine the source of torque necessary to propel the vehicle, be it the engine, the motor, or both. *Id.* at 11:60–62. Aptly, the '347 patent describes the vehicle's various modes of operation as an engine-only mode, an all-electric mode, or a hybrid mode. *Id.* at 35:66–36:58, 37:26–38:11.

In summarizing the invention, the '347 patent states that the microprocessor selects the appropriate mode of operation "in response to evaluation of the road load, that is, the vehicle's instantaneous torque demands and input commands provided by the operator of the vehicle."[3] *Id.*

[3] The '347 patent contrasts the claimed invention to prior control strategies "based solely on speed," which are "incapable of responding to the

at 17:28–32. More specifically, "the microprocessor can effectively determine the road load by monitoring the response of the vehicle to the operator's command for more power." *Id.* at 37:44–51. "[T]he torque required to propel the vehicle [i.e., road load] varies as indicated by the operator's commands." *Id.* at 38:12–14. For example, the microprocessor "monitors the rate at which the operator depresses pedals [for acceleration and braking] as well as the degree to which [the pedals] are depressed." *Id.* at 27:21–34. These operator input commands are provided to the microprocessor "as an indication that an amount of torque" from the engine "will shortly be required." *Id.* at 27:36–53.

The microprocessor then compares the vehicle's torque requirements against a predefined "setpoint" and uses the results of the comparison to determine the vehicle's mode of operation. *Id.* at 40:20–55. The microprocessor may utilize a control strategy that runs the engine only in a range of high fuel efficiency, such as when the torque required to drive the vehicle, or road load (RL), reaches a setpoint (SP) of approximately 30% of the engine's maximum torque output (MTO). *Id.* at 20:52–60, 37:26–46; *see also id.* at 13:47–61 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently"). The microprocessor may also monitor other operating parameters to control the vehicle's mode of operation, such as the battery's state of charge and the operator's driving history over time. *Id.* at 19:53–60; *see also id.* at 37:23–26 ("according to one aspect of the invention, the microprocessor 48 controls the vehicle's mode of operation at any given time in dependence on 'recent history,' as

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operator's commands, and will ultimately be unsatisfactory." Ex. 1201, 13:35–38.

well as on the instantaneous road load and battery charge state"). According to the '347 patent, this microprocessor control strategy maximizes fuel efficiency and reduces pollutant emissions of the hybrid vehicle. *Id.* at 15:48–50.

B. The Challenged Claims

Of the challenged claims, claims 1 and 23 are independent. Claim 1 requires *two* electric motors, while claim 23 requires simply *one or more* electric motors. Claim 1 is illustrative and recites:

> 1. A hybrid vehicle, comprising:
>
> an internal combustion engine controllably coupled to road wheels of said vehicle;
>
> a first electric motor connected to said engine [a]nd operable to start the engine responsive to a control signal;
>
> a second electric motor connected to road wheels of said vehicle, and operable as a motor, to apply torque to said wheels to propel said vehicle, and as a generator, for accepting torque from at least said wheels for generating current;
>
> a battery, for providing current to said motors and accepting charging current from at least said second motor; and
>
> a controller for controlling the flow of electrical and mechanical power between said engine, first and second motors, and wheels,
>
> wherein said controller starts and operates said engine when torque require[d] to be produced by said engine to propel the vehicle and/or to drive either one or both said electric motor(s) to charge said battery is at least equal to a setpoint (SP) above which said engine torque is efficiently produced, and wherein the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine.

Ex. 1201, 58:13–37.

C. The Decision to Institute

In the preliminary proceeding, we instituted *inter partes* review on two grounds, determining Ford had demonstrated a "reasonable likelihood" that (1) claims 1, 7, 10, and 21 are unpatentable as obvious over Caraceni,[4] and (2) claims 23 and 24 are unpatentable as obvious over Tabata '201[5] and Tabata '541.[6] Dec. Inst. 14–15. We now determine whether Ford has proven the unpatentability of these claims by a "preponderance of the evidence." 35 U.S.C. § 316(e).

III. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b). This standard involves determining the ordinary and customary meaning of the claim terms as understood by one of ordinary skill in the art reading the patent's entire written disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Here, our review centers on the construction of two claim terms—"road load (RL)" and "setpoint (SP)."[7]

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[4] A. Caraceni et al., *Hybrid Power Unit Development for Fiat Multipla Vehicle*, SAE TECHNICAL PAPER 981124, pub. 1998 (Ex. 1203, "Caraceni").
[5] U.S. Patent No. 5,841,201, iss. Nov. 24, 1998 (Ex. 1204, "Tabata '201").
[6] U.S. Patent No. 6,158,541, iss. Dec. 12, 2000 (Ex. 1205, "Tabata '541").
[7] Although Ford also proposes a construction for the terms "low-load mode I," "highway cruising mode IV," and "acceleration mode V" (Pet. 17), those terms are expressly defined by claim 7. Ex. 1201, 58:58–59:8. As such, they do not require further construction.

1. "Road load" or "RL"

The term "road load" or "RL" does not appear in independent claim 1, but is found in independent claim 23, as well as dependent claims 7 and 21. Both Ford and Paice agree that "road load" means the instantaneous torque required to propel the vehicle. Pet. 14–15; PO Resp. 7, 17. That proposed construction comports with the specification, which defines "road load" as "the vehicle's instantaneous torque demands, i.e., that amount of torque required to propel the vehicle at a desired speed." Ex. 1201, 12:38–42.

In further defining road load, the specification notes that "the operator's depressing the accelerator pedal signifies an increase in desired speed, *i.e., an increase in road load*, while reducing the pressure on the accelerator or depressing the brake pedal signifies a desired reduction in vehicle speed, *indicating that the torque being supplied is to be reduced or should be negative*." *Id.* at 12:42–51 (emphases added). As such, the specification states that road load "can be positive or negative." *Id.* at 12:51–54. Thus, consistent with the specification, we construe "road load" or "RL" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative."

2. "Setpoint" or "SP"

The term "setpoint" or "SP" is found in independent claims 1 and 23, as well as dependent claim 7. Ford proposes that "setpoint" be construed, in the context of the claims, as a "predetermined torque value." Pet. 15, 17. In that regard, Ford correctly notes that the claims compare the setpoint against a *torque* value. *Id.* at 16. For example, claim 1 speaks of the "setpoint" or "SP" as being the lower limit at which the engine can produce torque efficiently, i.e., "*when torque require[d]* to be produced by said engine to

propel the vehicle . . . *is at least equal to a setpoint (SP)* above which said engine torque is efficiently produced."[8] Ex. 1201, 58:29–34. Similarly, claim 23 recites "employing said engine to propel said vehicle when the torque RL required to do so is between said lower level SP and MTO," where MTO stands for maximum *torque* output. *Id.* at 60:39–41. This express language suggests that "setpoint" is not just any value, but a value that—per the surrounding claim language—equates to "torque." *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) ("the claims themselves provide substantial guidance as to the meaning of particular claim terms . . . the context in which a term is used in the asserted claim can be highly instructive").

Paice, on the other hand, argues that "setpoint" is synonymous with a "transition" point, not a torque value. PO Resp. 9–12. Citing the specification, Paice urges that "setpoint" must be construed to indicate a point "at which a transition between operating modes may occur." *Id.* at 9. Paice's argument is misplaced. While Paice is correct that *sometimes* the specification describes the setpoint in terms of a "transition point" (*see id.* at 10), the claim language itself makes clear that setpoint relates simply to a torque value, without requiring that it be a transition point. Indeed, the specification acknowledges that the mode of operation does not always transition, or switch, at the setpoint, but instead depends on a number of parameters. For instance,

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[8] Paice's declarant, Mr. Neil Hannemann, agreed that, given the "comparison" being made by this claim language, the "most straightforward" construction is that "setpoint is a torque value." Ex. 1246, 79:16–80:25.

> the values of the sensed parameters in response to which the operating mode is selected may vary . . . , so that the operating mode is *not repetitively switched simply because one of the sensed parameters fluctuates around a defined setpoint.*

Ex. 1201, 19:58–64 (emphasis added). That disclosure suggests that a transition does not spring simply from the recitation of "setpoint." As such, we will not import into the meaning of "setpoint" an extraneous limitation that is supported by neither the claim language nor the specification.

Moreover, that a "setpoint" does not mean a *per se* transition between operating modes is reinforced by the fact that only the dependent claims, for example, claims 3 and 10, describe the "setpoint" in terms of a "transition" between operating modes. *See id.* at 58:41–47, 59:25–29. Where the meaning of a claim term is clear from the context of its use in an independent claim, we will not further limit the meaning of the term by its use in a dependent claim, absent justification for doing so. *See Phillips*, 415 F.3d at 1315 ("the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim"). Thus, we reject Paice's attempt to further limit the meaning of setpoint to a transition between operating modes.

We also regard as meaningful that nothing in the specification precludes a setpoint from being reset, after it has been set. The specification states that the value of a setpoint may be "reset . . . in response to a repetitive driving pattern." Ex. 1201, 40:55–58. But, just because a setpoint may be reset under certain circumstances does not foreclose it from being "set," or

"fixed," at some point in time.[9] A setpoint for however short a period of time still is a setpoint. Thus, we construe "setpoint" as a "predetermined torque value that may or may not be reset."

Finally, Paice argues that any construction limiting the meaning of setpoint to a "torque value" would be "directly at odds with the construction adopted by two district courts" in related litigation.[10] PO Resp. 7–8. Although, generally, we construe claim terms under a different standard than a district court, and thus, are not bound by a district court's prior construction, Paice's emphasis on the district court's construction compels us to address it. *See Power Integrations, Inc. v. Lee*, 797 F.3d 1318, 1327 (Fed. Cir. 2015) ("Given that [patent owner's] principal argument to the board . . . was expressly tied to the district court's claim construction, we think that the board had an obligation, in these circumstances, to evaluate that construction").

In that regard, the district court held:

> there is nothing in the claims or specification that indicate a given setpoint value is actually represented in terms of torque. In fact, the specification clearly indicates that the state of charge of the battery bank, 'expressed as a percentage of its full charge' is compared against setpoints, the result of the comparison being used to control the mode of the vehicle.

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[9] The definition of "set" is "determined . . . premeditated . . . fixed . . . prescribed, specified . . . built-in . . . settled." *Merriam-Webster's Collegiate Dictionary* (10th ed. 2000). Ex. 3001.

[10] *Paice LLC v. Toyota Motor Corp.*, No. 2:07-cv-00180, Dkt. 63 (E.D. Tex. Dec. 5, 2008); *Paice LLC v. Hyundai Motor Co.*, No. 1:12-cv-00499, 2014 WL 3725652 (D. Md. July 24, 2014).

Ex. 1211, 13 (citing the '347 patent, 40:28–31). But, as discussed above, although claims are read in light of the specification, it is the use of the term "setpoint" within the context of the claims themselves that provides a firm basis for our construction. *See Phillips, supra*. Here, the claims instruct us that "setpoint," when read in the context of the surrounding language, is limited to a torque value. As for the district court's statement that the battery's state of the charge is compared to a setpoint, we note that *the claims* actually speak of comparing the "state of charge of the battery" to "a predetermined level," not the "setpoint" or "SP" recited elsewhere in the claims. *See, e.g.*, Ex. 1201, 59:13–16, 61:33–36 (dependent claims 9 and 31, respectively). Thus, in the context of the claims, we decline to read "setpoint" as also encompassing a state of charge of the battery, as the district court did. Instead, we construe "setpoint" as representing a torque-based value.

3. "Monitor Patterns of Vehicle Operation Over Time"

Claim 24 recites that the controller is operable to "monitor patterns of vehicle operation over time." Ford does not explicitly propose a construction for this phrase, other than to argue it should be construed "according to its plain and ordinary meaning." Reply 3. Paice, on the other hand, argues that this phrase should be construed to mean that the controller "tracks and records the driver's repeated driving operations over time." PO Resp. 13.

According to Paice, the specification of the '347 patent supports a construction that monitoring the patterns of vehicle operation over time refers to how the operator actually drives the vehicle over some period of time, as opposed to monitoring an internal data point of the vehicle. PO

Resp. 13–16. Specifically, Paice points to the following descriptions in the specification:

> Examples of this practice—amounting in many circumstances to modifying certain specific values depending on other data items not discussed in detail, *or by monitoring the vehicle's actual usage patterns over time*—are given below.

Ex. 1201, 35:47–58 (emphasis added).

> It is also within the scope of the invention for the microprocessor to monitor the vehicle's operation over a period of days or weeks and reset this important setpoint *in response to a repetitive driving pattern*. For example, suppose the operator drives the same route from a congested suburban development to a workplace about the same time every morning; typically the road load might remain under 20% of MTO for the first few minutes of each day, then vary between 0 and 50% of MTO for another few minutes as the operator passes through a few traffic lights, and then suddenly increase to 150% of MTO as the operator accelerates onto a highway. *It is within the skill [in] the art to program a microprocessor to record and analyze such daily patterns, and to adapt the control strategy accordingly*. For example, *in response to recognition of a regular pattern as above, the transition point might be adjusted to 60% of MTO*; this would prevent repetitive engine starts as the road load exceeded 30% of MTO for a few hundred yards at a time, as might often occur in suburban traffic. Similarly, the engine starting routine might be initiated after the same total distance had been covered each day.

Id. at 40:56–41:9 (emphasis added).

Although Ford does not provide an explicit construction for the phrase "monitor patterns of vehicle operation over time," Ford implicitly construes the phrase to encompass monitoring the battery state of charge and adjusting the control strategy based on that state of charge. Pet. 55–56 (citing Ex. 1215 ¶¶ 468–471). As shown above, however, the specification makes clear

that the "patterns" recited by claim 24 are the repetitive and regular driving patterns *of the vehicle's operator*, not some internal data point of the vehicle itself (such as battery state of charge). Ex. 1201, 40:56–41:9. Indeed, the specification draws a clear distinction between changing the control strategy in response to monitored battery state of charge ("BSC") and changing it in in response to monitored driving patterns. *See, e.g.*, Ex. 1201, 44:23–39 ("it may be desirable to vary the operation of the system insofar as responsive to BSC in accordance with monitored variables indicative of battery temperature, ambient temperature, and the like"). Notably, the specification makes no mention of monitoring "patterns" of a battery state of charge.

Moreover, the plain words of claim 24 require monitoring patterns over time. It is not enough to monitor a single variable of a vehicle component, such as battery state of charge. Rather, the plain meaning of the words require monitoring *patterns*, particularly where the specification speaks of patterns in terms of regular and repetitive usage *by the operator* of the vehicle, not a component of the vehicle. Thus, we agree with Paice that the phrase "monitoring patterns of vehicle operation over time" means monitoring a driver's repeated driving operations over time.

B. The Instituted Grounds

1. Estoppel—Claims 21 and 23

Ford is estopped from maintaining its challenge against claims 21 and 23 in the instant proceeding because the asserted grounds are based on prior art that Ford was aware of, and could have raised, in prior proceedings challenging the same claims. Specifically, claims 21 and 23 were the subject of the related -571 and -579 proceedings discussed above (*see* section II.A.), in which final written decisions were entered. In those prior

proceedings, claims 21 and 23 were adjudged to be unpatentable on grounds that differ from the Caraceni-based and Tabata-based grounds asserted against claims 21 and 23, respectively, in the instant proceeding.

Under 35 U.S.C. § 315(e)(1), once a petitioner has obtained a final written decision on a patent claim in an *inter partes* review, that petitioner may not maintain a subsequent proceeding with respect to that same claim on a ground that it "reasonably could have raised" in the original proceeding. Specifically, section 315(e)(1) provides:

> (e) Estoppel.—
>
> (1) Proceedings before the office.—The petitioner in an inter partes review of a claim in a patent under this chapter that results in a final written decision under section 318(a) . . . may not request or maintain a proceeding before the Office with respect to that claim on any ground that the petitioner raised or reasonably could have raised during that inter partes review.

The prerequisites for applying estoppel are satisfied here because: (1) Ford is the petitioner in the instant proceeding and in the prior -571 and -579 proceedings; and (2) the -571 and -579 proceedings resulted in final written decisions. With those prerequisites in place, our determination of whether to apply estoppel turns on whether Ford could have raised the prior art asserted here—Caraceni against claim 21, and Tabata '201 and Tabata '541 against claim 23—in the -571 and/or -579 proceedings.

What a petitioner "reasonably could have raised" includes prior art that a skilled advocate would have been expected to discover and proffer in the course of conducting due diligence on the patent at issue. Here, we need not speculate about what reasonably could have been discovered and proffered, because the record demonstrates that Ford must have known of Caraceni, Tabata '201, and Tabata '541 at the time of the -571 and -579

Petitions, and if not, such knowledge should be imputed to it. More specifically, with respect to the Tabata references, they were cited during prosecution that led to the '347 patent and are listed on the face of the patent. Ex. 1201, 3, 4. As such, Ford was on notice of the existence of the Tabata references as potential prior art to the '347 patent before it filed the -571 and -579 Petitions.

In addition, Ford could have raised the Caraceni reference against claim 21 in the -571 and -579 proceedings because it was asserted in a related petition, IPR2014-00570, that Ford filed on the very same day as the -571 and -579 Petitions. Thus, Ford must have known, or should have known, of Caraceni's potential application to claim 21 before it filed the -571 and -579 Petitions. Under these circumstances, we determine that the Caraceni and Tabata references constitute grounds that Ford reasonably could have asserted against claims 21 and 23 in the original -571 and -579 Petitions. Accordingly, Ford is estopped under 35 U.S.C. § 315(e)(1) from now maintaining those grounds against claims 21 and 23 in the instant proceeding.

2. Claims 1, 7, and 10—Obviousness over Caraceni

Ford challenges independent claim 1, and dependent claims 7 and 10, on the ground that the claimed invention would have been obvious over the teachings of Caraceni.[11] Pet. 18–42. In support of this ground, Ford

[11] This is the first instance in which Ford challenges dependent claim 10. Thus, unlike claim 21, which Ford is estopped from pursuing (as discussed above), claim 10 was not the subject of the prior -571 and -579 proceedings that resulted in final written decisions. And, although claims 1 and 7 were the subject of final written decisions in the -571 and -579 Petitions, we exercise our discretion to maintain the instant proceeding against claims 1

provides a detailed analysis of how Caraceni meets each limitation of the challenged claims and why a skilled artisan would have found the claimed invention obvious over Caraceni and the general state of the art. *Id.* at 21–42.

a. Claim 1

At the outset, we find that Caraceni teaches the essential components of a hybrid vehicle, which like claim 1, include: (1) an internal combustion engine that provides propulsive torque to the wheels of the vehicle, (2) an electric motor that is also capable of providing propulsive torque to the wheels, (3) a battery that provides electrical current to the motor, and (4) a controller, or "Vehicle Management Unit" (VMU), that controls operation of the engine and motor in a "hybrid mode" and a "recharge mode." *Compare* Figs. 2, 10 of Ex. 1003 (Caraceni) *with* Fig. 4 of Ex. 1201 (the '347 patent); *see also* Ex. 1215 ¶ 201 (depicting Caraceni's Figs. 2, 10 as annotated by Ford's declarant, Dr. Davis). Also, with respect to a separate starter motor for the engine (i.e., the "first electric motor" of claim 1), Caraceni teaches an "engine starter." Ex. 1203, Fig. 10. Although Caraceni does not disclose that the engine starter is an electric motor *per se*, we are persuaded that a

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and 7 because they are incorporated within the body of claim 10 as a matter of dependency. *See* 35 U.S.C. § 315(e)(1) (neither the plain terms of this provision, nor chapter 31 more generally, prohibits the Board from entering final decisions where it sees fit); *see also* 35 U.S.C. § 325(d) (conferring authority on the Board to decide how to deal with multiple proceedings). In any event, whatever renders obvious a dependent claim necessarily renders obvious the claims from which it depends.

skilled artisan would have understood Caraceni's "engine starter" to be an electric motor.[12] *See* Ex. 1215 ¶¶ 210–215.

In an attempt to distinguish the claimed invention from the hybrid configuration taught by Caraceni, Paice raises a number of arguments directed to certain functional aspects of the controller of claim 1. PO Resp. 18–43.

"Engine . . . to Propel the Vehicle"

First, Paice contends that Caraceni fails to teach or suggest starting and operating the engine to propel the vehicle in response to a "setpoint," as required by claim 1. PO Resp. 19–32. In particular, Paice argues that, instead of a setpoint, Caraceni "relies on the driver to decide when to turn the engine on." *Id.* at 19. According to Paice, Caraceni discloses that the driver manually selects when to operate the engine, whereas, in the claimed invention, the controller automatically determines when to operate the engine. *Id.* at 20 (citing Ex. 1203, 5–6); *see also id.* at 23 ("the user in Caraceni" selects when to operate the engine, "not the control system").

We are not persuaded that Caraceni controls operation of the engine on *manual* basis. Our review of Caraceni supports a contrary finding. Although Paice is correct that Caraceni permits the driver to manually select whether the vehicle will be operated as an all-electric vehicle, an engine-only vehicle, or a hybrid vehicle, it is only the vehicle's operation in a hybrid mode that Ford relies on to satisfy the "controller" and "setpoint" limitations of claim 1. In that regard, Caraceni states that "a proper combination of thermal engine operation for cruising, and electric motor for

[12] Paice does not dispute that Caraceni meets the "first electric motor" limitation of claim 1.

acceleration can be used to minimize fuel consumption and emissions." Ex. 1203, 6. In other words, Caraceni splits the power between the engine (one drive train) and the electric motor (another drive train) in order to maximize fuel efficiency.

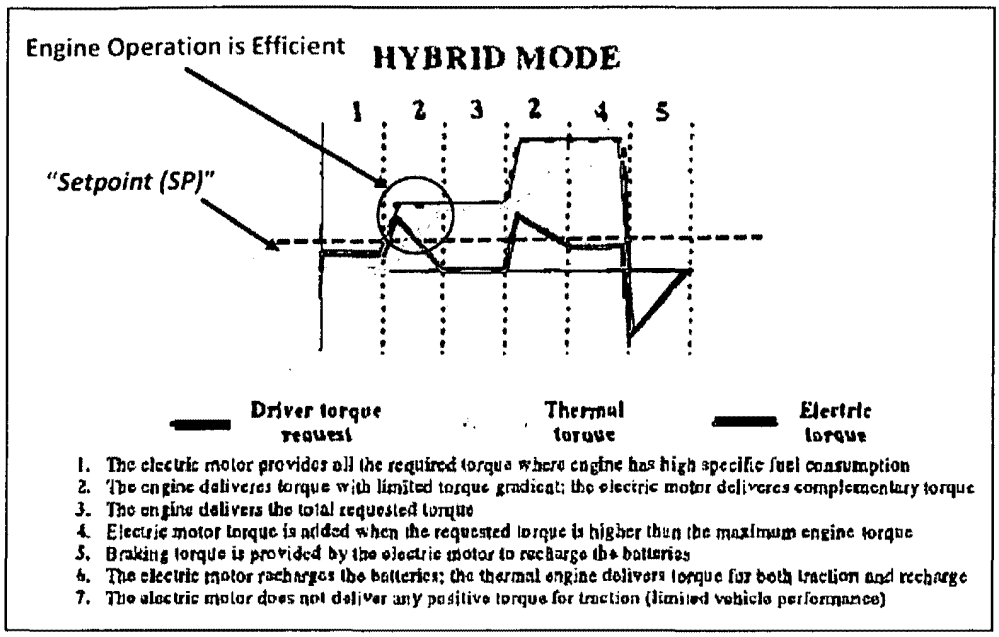
Caraceni then makes clear that, while operating in the "hybrid mode," activation of the engine is controlled *automatically* by a Vehicle Management Unit (VMU), not manually by the driver.

> The hybrid system is managed by a Vehicle Management Unit (VMU) which implements the working strategies of the vehicle and *activates the two drive trains* through the inverter for the electric motor and the engine electronic control unit respectively.

Ex. 1203, 6 (emphasis added). Ford's declarant, Dr. Davis, explains that the VMU is a controller that receives and transmits commands to an "electromagnetic clutch switch" connected to the engine's transmission for controlling activation and operation of the engine. Ex. 1215 ¶¶ 205–209, 251–252 (citing Ex. 1203, Fig. 10). Dr. Davis further explains that, in the hybrid mode, the VMU controls operation of the electric motor through an "inverter interface" to act as either a traction motor or a generator. *Id.* ¶¶ 218–220, 230–237, 269. Based on Dr. Davis's testimony of a skilled artisan's understanding of Caraceni, we find that Caraceni teaches a controller that automatically starts and operates the engine in a hybrid mode, as required by claim 1.

With respect to the controller's use of a "setpoint" as a basis for starting and operating the engine, we credit Dr. Davis' testimony that Figure 9 of Caraceni illustrates that the engine is not started until the torque

demand exceeds a predetermined torque value. Ex. 1215 ¶¶ 259–287. Figure 9, as annotated by Dr. Davis, is reproduced below.



Ex. 1203, Caraceni, Fig. 9 (annotated)

Figure 9 depicts the torque provided by the thermal engine (yellow line) and the electric motor (blue line) in the hybrid mode in response to various phases of torque demand (red line). In region 1, Dr. Davis explains, the engine is off (horizontal black line) and the motor alone is activated to propel the vehicle because the engine operates inefficiently at low torque demands. Ex. 1215 ¶¶ 275–279, Ex. 1248 ¶¶ 8–12, 16–17. However, as driver torque demand increases in the transition from region 1 to region 2, the engine is started and operated to propel the vehicle because the engine can operate more efficiently at higher torque levels. *Id.* According to Dr. Davis, a skilled artisan would have understood that the point at which the engine takes over for the motor occurs at a predetermined torque level, or

"setpoint," which Dr. Davis indicates with a green line in annotated Figure 9. *Id.*

We credit Dr. Davis's testimony that the VMU, or controller, in Caraceni does not activate the engine until the torque demand reaches a predetermined torque level. Even Paice's declarant, Mr. Hannemann, acknowledges that the point at which the engine is started in Caraceni's Figure 9 "is something that the engineer developing and calibrating the vehicle has to program in to the vehicle . . . [i]t's something that's just built in to the calibration of the vehicle." Ex. 1243, 116:16–117:19. Dr. Davis confirmed this as well. Ex. 1248 ¶¶ 16–17. That the operational point for the efficient production of torque by the engine would have been programmed into the vehicle as part of the calibration process suggests that is predetermined. As such, we conclude that a skilled artisan would have understood Caraceni's Figure 9 as depicting a "hybrid mode" that starts and operates the engine based on a "setpoint," as required by claim 1.

Paice responds by arguing that Ford and Dr. Davis are relying on "inherency" to prove Caraceni's disclosure of a "setpoint." PO Resp. 24–30. Paice's argument is misplaced. Ford never relies on the doctrine of inherency in making its obviousness case. Pet. 29–32. Rather, Ford utilizes the testimony of Dr. Davis to explain what a skilled artisan would have understood from Caraceni's Figure 9, that is, the point at which the engine takes over for the motor in Figure 9's "hybrid mode" is a predetermined torque value, or setpoint, for the engine (as discussed above). *See* Ex. 1215 ¶¶ 262–279, Ex. 1248 ¶¶ 6–8. As such, we reject Paice's attempt to inject the heightened standard for inherency into the obviousness analysis.

"Engine . . . to Charge Said Battery"

Second, Paice argues that Caraceni's controller, or VMU, does not "start and operate" the engine to drive the electric motor to charge the battery, as required by claim 1. PO Resp. 38–40. Importantly, it should be noted that this limitation of starting and operating the engine to charge the battery is recited as an alternative to the limitation of starting and operating the engine to propel the vehicle, the latter which we discuss above. *See* Ex. 1201, 58:29–32 (claim 1 using the disjunctive "and/or"). As such, Caraceni need only satisfy one of these limitations. Nonetheless, we determine that Caraceni teaches this second, alternative use of the engine for powering the motor to recharge the battery.

According to Paice, "the driver, not the controller, starts and operates the engine to charge the battery" during Caraceni's "recharge mode." *Id.* at 38–39. But Caraceni expressly illustrates the "recharge mode" within the purview of Figure 9, which depicts the "torque management" strategy *of the controller, or VMU.* Ex. 1203, 6 ("Figure 9 shows a typical torque management"). And Figure 9 states that, when the electric motor recharges the battery, "the thermal engine delivers torque for both traction *and recharge*." Ex. 1203, Fig. 9 (passage 6). And as Dr. Davis testifies, when the VMU determines that recharging is needed, the engine operates above a setpoint to power the motor to charge the battery, as required by claim 1. Ex. 1215 ¶¶ 283–286; *see also* Ex. 1248 ¶¶ 24–27 (regarding Caraceni's disclosure of the VMU "automatically switching" to recharge mode if the battery falls "below a certain threshold"). Given that Figure 9 speaks of the "recharge mode" in connection with the VMU, as well as Dr. Davis's testimony as to the "setpoint" in Figure 9, we find that Caraceni teaches that

the controller, not the driver, starts and operates the engine for purposes of recharging the battery. As such, we find that Caraceni teaches both of the functional limitations of the controller of claim 1.

"Battery, for Providing Current to Said Motors"

Claim 1 requires "a battery" that provides current "to said motors," with the motors being the "first electric motor" that starts the engine and the "second electric motor" that propels the vehicle. Paice argues that Caraceni's "engine starter" is incapable of accepting current from a "hybrid battery." PO Resp. 41. According to Paice, the "first electric motor" of claim 1 is "more powerful," as compared to Caraceni's "engine starter," because the claimed motor can "spin the engine at higher speed" and accept "at least about 30% of the engine's maximum torque output." *Id.* at 40–41. We are not persuaded by Paice's attempt to read limitations into the claim that are not there.

At the outset, we note the claim does not require a "hybrid" battery, but simply "a battery." In any event, with respect to the "first electric motor," Paice relies on aspects not found in the language of claim 1, but rather in embodiments described by the specification. In other words, Paice improperly imports limitations into the "first electric motor" that are not part of the claim. *See Phillips v. AWH Corp.*, 415 F. 3d 1303, 1323 (Fed. Cir. 2005). Under a proper lens, Caraceni's starter motor satisfies the "first electric motor" limitation of claim 1.

We also reject Paice's assumption that Caraceni's engine starter depends on a standard "12V or 24V" battery, separate from the hybrid "traction battery" taught by Caraceni. PO Resp. 41–44. Nowhere does Caraceni disclose that the "engine starter" is connected to a standard battery.

Ex. 1203, Figure 10. Instead, Caraceni consistently refers only to the "traction battery." *Id.* Even so, as a matter of common sense, a skilled artisan would have readily understood that the "engine starter" needed to be connected, directly or indirectly, to one of the battery packs that make up the "traction battery" in order to be recharged. Ex. 1215 ¶¶ 210–215, 246, 248. As such, we find that a skilled artisan would have understood that Caraceni's traction battery provides current to the engine starter, i.e., first electric motor, as required by claim 1.

b. Claim 7—"Road Load"

Paice also argues that Caraceni does not operate the vehicle in response to "road load," as required by claim 7. PO Resp. 32–37. According to Paice, Caraceni's reliance on "accelerator pedal position" to indicate the "required traction torque" is not determinative of "road load." *Id.* at 34–36 (citing Ex. 2215 ¶¶ 88–95). But Paice fails to explain how Caraceni's disclosure of using "required traction torque," as set by the accelerator pedal position, differs from our construction of "road load" as the "instantaneous torque required to propel the vehicle." *See id.* at 32–37. In our view, Caraceni's use of the "required traction torque" to select operation of the engine and/or motor in the hybrid mode, as shown by each of the regions in figure 9 of Caraceni, is no different than the use of "road load" as recited by claim 7. *See* Ex. 1215 ¶¶ 297–317. Moreover, Paice's argument that pedal position does not indicate road load is belied by the '347 patent itself, which states that depressing the accelerator pedal "signifies . . . an increase in road load." Ex. 1201, 12:42–51. As such, we are not persuaded by Paice's attempt to draw a distinction from Caraceni on the basis of our construction of "road load."

c. Claim 10

Paice does not raise arguments for dependent claim 10 that are separate and distinct from those for claims 1 and 7. Absent any rebuttal to Ford's evidence and arguments in that regard, we are not obligated to roam the record in an attempt to locate evidence supporting patentability of claim 10. Perfunctory or undeveloped arguments are waived. Here, we have considered the evidence and arguments presented by Ford in challenging the patentability of claim 10. Pet. 41–42. Left unrebutted, Ford's evidence and arguments persuade us that claim 10 would have been obvious over the teachings of Caraceni. *Cf. Texas Dept. of Community Affairs v. Burdine*, 450 U.S. 248, 254 (1981) (holding that "[i]f the trier of fact believes the plaintiff's evidence, and if the [defendant] is silent in the face of the presumption, the court must enter judgment for the plaintiff because no issue of fact remains in the case").

2. Claim 24—Obviousness Over Tabata '201 and Tabata '541

Claim 24, which depends from claim 23, recites the additional step of "employing said controller to monitor patterns of vehicle operation over time and vary said setpoint SP accordingly."[13] Ford acknowledges that Tabata '201 does not disclose the step of claim 24, but argues that Tabata '541 does. Pet. 55–56; Ex. 1215 ¶ 464. According to Ford, Tabata '541

[13] Unlike claim 23, which Ford is estopped from pursuing (as discussed above), claim 24 was not the subject of the prior -571 and -579 proceedings that resulted in final written decisions. The instant Petition is the first in which Ford challenges claim 24 and the first in which the Board instituted *inter partes* review of claim 24. Although another Petition, IPR2015-00794, followed this one and also challenged claim 24, our denial of institution in that proceeding has no estoppel effect under 35 U.S.C. § 315(e)(1) because a denial of institution is not a final written decision of the Board.

discloses varying a setpoint in response to "monitored and stored battery parameters" that include "battery charging efficiency, battery voltage, and battery temperature." Pet. 55–56 (citing Ex. 1205, 36:40–59, Ex. 1215 ¶¶ 468–471).

As discussed above in our claim construction, we construe "monitoring patterns of vehicle operation over time" to require monitoring *a driver's* repeated driving operations over time. Also, as discussed above, we reject any construction that encompasses monitoring the vehicle's internal variables, such as battery state of charge. Given that clear construction, we are not persuaded that Tabata '541's disclosure of monitoring the vehicle's battery state of charge (or "SOC") equates to claim 24's requirement of monitoring a driver's driving patterns over time. Accordingly, we determine that Ford has not demonstrated a prima facie case of obviousness with respect to claim 24.

IV. CONCLUSION

In sum, after considering the arguments and evidence presented by the parties' submissions, we conclude that Ford has demonstrated, by a preponderance of the evidence, that claims 1, 7, and 10 would have been obvious over the teachings of Caraceni. Also, we deny the challenge against claim 24 because Ford failed to carry its burden. Finally, we dismiss the challenge against claims 21 and 23 under the estoppel provision of 35 U.S.C. § 315(e)(1).

V. ORDER

Accordingly, it is hereby:

ORDERED that the challenge against claims 21 and 23 of the '347 patent is *dismissed*;

FURTHER ORDERED that claims 1, 7, and 10 of the '347 patent are held unpatentable and should be *cancelled*;

FURTHER ORDERED that the challenge against claim 24 of the '347 patent is *denied*; and

FURTHER ORDERED that any party seeking judicial review of this Final Written Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HYUNDAI MOTOR AMERICA, INC., HYUNDAI MOTOR COMPANY, KAI MOTORS CORPORATION and KIA MOTORS AMERICA, INC.,
Petitioner,

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner.

IPR2016-00246 (Patent 7,237,634 B2)
IPR2016-00247 (Patent 7,237,634 B2)
IPR2016-00248 (Patent 7,237,634 B2)
IPR2016-00249 (Patent 7,237,634 B2)
IPR2016-00251 (Patent 7,237,634 B2)
IPR2016-00250 (Patent 8,214,097 B2)
IPR2016-00272 (Patent 7,104,347 B2) [1]

Before SALLY C. MEDLEY, KALYAN K. DESHPANDE, and CARL M. DEFRANCO, *Administrative Patent Judges.*

MEDLEY, *Administrative Patent Judge.*

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[1] This Order applies to each of the above-listed cases. Although we issue one order to be docketed in each case, the parties are not authorized to use this caption for any subsequent papers.

JUDGMENT
Termination of the Proceeding
37 C.F.R. § 42.73

On December 14, 2015, the parties informed the Board that the parties had settled the above-identified proceedings and that the parties sought authorization to file a joint motion to terminate each proceeding. On December 22, 2015, and pursuant to 35 U.S.C. § 317 and 37 C.F.R. § 42.74, the parties filed a joint motion to terminate each of the above-identified proceedings. Paper 11.[2] The parties also filed, in each proceeding, a joint request to have their settlement agreement treated as confidential business information under 35 U.S.C. § 317(b) and 37 C.F.R. § 42.74(c). Paper 12. In each joint motion, the parties represent that the settlement agreement filed is a true copy and resolves all disputes between the parties.

Each of these proceedings is in an early stage and no decision whether to institute *inter partes* review has been made. Based on the facts of these cases, it is appropriate to terminate the proceedings. Therefore, the joint motions to terminate the proceedings are *granted*.

Accordingly, it is

ORDERED that the joint motions to terminate the proceedings are *granted*;

FURTHER ORDERED that the parties' joint requests that the settlement agreements be treated as business confidential information, to be kept separate from the patent file are *granted*; and

FURTHER ORDERED that Petitioner's Motions for Joinder filed in each of the proceedings are *dismissed*.

[2] Citations are to IPR2016-00246.

IPR2016-00246 (Patent 7,237,634 B2); IPR2016-00247 (Patent 7,237,634 B2);
IPR2016-00248 (Patent 7,237,634 B2); IPR2016-00249 (Patent 7,237,634 B2)
IPR2016-00251 (Patent 7,237,634 B2); IPR2016-00250 (Patent 8,214,097 B2);
IPR2016-00272 (Patent 7,104,347 B2)

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner

Case IPR2014-00884
Patent 7,104,347 B2

PATENT OWNER PAICE LLC & THE ABELL FOUNDATION, INC.'S NOTICE OF APPEAL

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
Madison Building East, 10B20
600 Dulany Street
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Notice is hereby given, pursuant to 37 C.F.R § 90.2(a), that Patent Owner Paice LLC & the Abell Foundation, Inc. (collectively, "Paice") hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision entered on December 10, 2015 (Paper 38) and from all underlying orders, decisions, rulings and opinions that are adverse to Patent Owner, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered December 11, 2014 (Paper 11).

In accordance with 37 C.F.R § 90.2(a)(3)(ii), Patent Owner Paice further indicates that the issues on appeal include, but are not limited to, estoppel under 35 U.S.C. § 315(e)(1); claim construction; determination of unpatentability of claims 1, 7, and 10 of Paice's U.S. Patent No. 7,104,347 B2 ("'347 Patent") under 35 U.S.C § 103; any finding or determination supporting or related to those issues; as well as all other issues decided adversely to Paice in any orders, decisions, rulings and opinions.

Simultaneous with this submission, a copy of the Notice of Appeal is being filed with the Patent Trial and Appeal Board. In addition, a copy of this Notice of

Appeal, along with the required docketing fees, are being electronically filed with the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

Date: February 8, 2016

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CERTIFICATE OF SERVICE

I hereby certify that, in addition to being filed electronically through the Board's PRPS System, the original version of the foregoing, PATENT OWNER PAICE LLC & THE ABELL FOUNDATION, INC.'S NOTICE OF APPEAL, was served by hand on February 8, 2016, with the Director of the United States Patent and Trademark Office, at the following address:

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
Madison Building East, 10B20
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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing, PATENT OWNER PAICE LLC & THE ABELL FOUNDATION, INC.'S NOTICE OF APPEAL, was filed by hand on February 8, 2016, with the Clerk's Office of the United States Court of Appeals for the Federal Circuit, at the following address:

United States Court of Appeals for the Federal Circuit
717 Madison Place, N.W., Suite 401
Washington, DC 20005

CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e)(1), the undersigned certifies that on February 8, 2016, a complete and entire copy of this NOTICE OF APPEAL TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT BY PAICE LLC & THE ABELL FOUNDATION, INC. was provided via email, to the Petitioner by serving the email correspondence addresses of record as follows:

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Paper 31
Entered: November 1, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner,

v.

PAICE LLC and THE ABELL FOUNDATION, INC.,
Patent Owner.

Case IPR2015-00795
Patent 7,104,347 B2

Before SALLY C. MEDLEY, KALYAN K. DESHPANDE, and CARL M. DEFRANCO, *Administrative Patent Judges*.

DESHPANDE, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Ford Motor Company ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–5, 14, 16, 19, 20, and 22 of U.S. Patent No. 7,104,347 B2 (Ex. 1301, "the '347 patent"). Paper 1 ("Pet."). Paice LLC and The Abell Foundation, Inc. (collectively, "Patent Owner") filed a Preliminary Response in unredacted and redacted forms. Papers 9, 10 ("Prelim. Resp."). Patent Owner also filed a Motion to Seal. Paper 11 ("Motion to Seal").

Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review of the '347 patent, on November 2, 2015, under 35 U.S.C. § 103(a), as to claims 1 and 5 as obvious over Ibaraki '882[1] and Koide;[2] claims 3 and 4 as obvious over Ibaraki '882, Koide, and Frank;[3] claim 16 as obvious over Ibaraki '882, Koide, and Kawakatsu;[4] claim 20 as obvious over Ibaraki '882, Koide, and Vittone;[5] claim 19 as obvious over Ibaraki '882, Koide, and Yamaguchi;[6]

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[1] U.S. Patent No. 5,789,882, issued Aug. 4, 1998 (Ex. 1303) ("Ibaraki '882").

[2] U.S. Patent No. 5,934,395, issued Aug. 10, 1999 (Ex. 1317) ("Koide").

[3] U.S. Patent No. 6,116,363, issued Sept. 12, 2000 (Ex. 1318) ("Frank").

[4] U.S. Patent No. 4,335,429, issued June 15, 1982 (Ex. 1305) ("Kawakatsu").

[5] Oreste Vittone, *Fiat Conceptual Approach to Hybrid Cars Design*, 12TH INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM (1994) (Ex. 1320) ("Vittone").

[6] U.S. Patent No. 5,865,263, issued Feb. 2, 1999 (Ex. 1321) ("Yamaguchi").

claim 22 as obvious over Ibaraki '882, Koide, and Ibaraki '626;[7] and claim 14 as obvious over Ibaraki '882, Koide, and Lateur.[8] Paper 12 ("Dec."). We did not institute *inter partes* review of claim 2 as obvious over Ibaraki '882 and Koide. Dec. 21–22.

Patent Owner filed a Response (Paper 16, "PO Resp."), and Petitioner filed a Reply (Paper 21, "Pet. Reply").[9] Oral hearing was held on June 28, 2016, and the hearing transcript has been entered in the record. Paper 30 ("Tr.").

The Board has jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Pursuant to our jurisdiction under 35 U.S.C. § 6, we conclude, *first*, that Petitioner is estopped from maintaining its challenge in this proceeding against claim 1. For the reasons discussed below, we are persuaded that Petitioner has shown by a preponderance of the evidence that claims 3–5, 14, 16, 19, 20, and 22 of the '347 patent are unpatentable.

B. Related Proceedings

Petitioner indicates that the '347 patent is the subject of *Paice, LLC and The Abell Foundation, Inc. v. Ford Motor Company*, Case No. 1-14-cv-00492 and *Paice LLC and The Abell Foundation, Inc. v. Hyundai Motor*

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[7] U.S. Patent No. 6,003,626, issued Dec. 21, 1999 (Ex. 1322) ("Ibaraki '626").

[8] U.S. Patent No. 5,823,280, issued Oct. 20, 1998 (Ex. 1307) ("Lateur").

[9] In addition, Patent Owner filed a Motion for Observation on Cross-Examination (Paper 23) and Petitioner filed a Response to Motion for Observation on Cross-Examination (Paper 26), both of which have been considered.

America et. al., Case No. 1:2012-cv-00499. Pet. 1; Paper 5, 2. Petitioner also indicates that the '347 patent was the subject of IPR2014-00571, IPR2014-00579, and IPR2014-00884, in which final decisions have been issued. *Id.*; Paper 5, 3. Petitioner further indicates that patents related to the '347 patent are the subject matter of IPR2014-00570, IPR2014-01415, IPR2014-00568, IPR2014-00852, IPR2014-00875, IPR2014-00904, IPR2014-01416, IPR2015-00606, IPR2015-00767, IPR2015-00722, IPR2015-00758, IPR2015-00784, IPR2015-00785, IPR2015-00791, IPR2015-00787, IPR2015-00790, IPR2015-00794, and IPR2015-00792. *Id.* at 1–2; Paper 5, 3.

C. The '347 Patent

The '347 patent describes a hybrid vehicle with an internal combustion engine, two electric motors (a starter motor and a traction motor), and a battery bank, all controlled by a microprocessor that directs the transfer of torque from the engine and traction motor to the drive wheels of the vehicle. Ex. 1301, 17:5–45, Fig. 4. The microprocessor features a control strategy that runs the engine only under conditions of high efficiency, typically when the vehicle's instantaneous torque requirements (i.e., the amount of torque required to propel the vehicle, or "road load") are at least equal to 30% of the engine's maximum torque output ("MTO") capability. *Id.* at 20:52–60, 35:5–14; *see also id.* at 13:47–61 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently").

Running the engine only when it is efficient to do so leads to improved fuel economy and reduced emissions. *Id.* at 13:47–52. To achieve such efficiency, the hybrid vehicle includes various operating modes that

depend on the vehicle's torque requirements, the battery's state of charge, and other operating parameters. *Id.* at 19:53–55. For example, the hybrid vehicle may operate in: (1) an all-electric mode, where only the traction motor provides the torque to propel the vehicle and operation of the engine would be inefficient (i.e., stop-and-go city driving); (2) an engine-only mode, where only the engine provides the torque to propel the vehicle and the engine would run at an efficient level (i.e., highway cruising); (3) a dual-operation mode, where the traction motor provides additional torque to propel the vehicle beyond that already provided by the engine and the torque required to propel the vehicle exceeds the maximum torque output of the engine (i.e., while accelerating, passing, and climbing hills); and (4) a battery recharge mode where the engine operates a generator to recharge the battery while the traction motor drives the vehicle. *Id.* at 35:66–36:58, 37:26–38:55.

D. Illustrative Claim

Petitioner challenges claims 1–5, 14, 16, 19, 20, and 22 of the '347 patent. Pet. 4–60. Claim 1 is illustrative of the claims at issue and is reproduced below:

> 1. A hybrid vehicle, comprising:
>
> an internal combustion engine controllably coupled to road wheels of said vehicle;
>
> a first electric motor connected to said engine nd [sic] operable to start the engine responsive to a control signal;
>
> a second electric motor connected to road wheels of said vehicle, and operable as a motor, to apply torque to said wheels to propel said vehicle, and as a generator, for accepting torque from at least said wheels for generating current;
>
> a battery, for providing current to said motors and accepting charging current from at least said second motor; and

> a controller for controlling the flow of electrical and mechanical power between said engine, first and second motors, and wheels, wherein said controller starts and operates said engine when torque require to be produced by said engine to propel the vehicle and/or to drive either one or both said electric motor(s) to charge said battery is at least equal to a setpoint (SP) above which said engine torque is efficiently produced, and wherein the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine.

Ex. 1301, 58:13–37.

II. ANALYSIS

A. Petitioner Estoppel

On September 28, 2015, we rendered a final written decision of claims 1, 7, 8, 18, 21, 23, and 37 of the '347 patent in IPR2014-00571, and claims 1, 6, 7, 9, 15, 21, 23, and 36 of the '347 patent in IPR2014-00579. *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-00571 (PTAB September 28, 2015) (Paper 44); *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-00579 (PTAB September 28, 2015) (Paper 45). Patent Owner argues that, pursuant to 35 U.S.C. § 315(e)(1), Petitioner may not maintain its challenge of claim 1. PO Resp. 16. Petitioner responds that it is not estopped because it was necessary for it to file multiple petitions to address the '347 patent's many dependent claims, such as dependent claims 3–5, 14, 16, 19, 20, and 22, which depend from independent claim 1. Pet. Reply 2–3.

Under 35 U.S.C. § 315(e)(1), a petitioner who has obtained a final written decision on a patent claim in an *inter partes* review may not maintain a subsequent proceeding with respect to that same claim on a ground that it

"reasonably could have raised" in the original proceeding. Specifically, section 315(e)(1) provides:

> (e) Estoppel.—
>
> (1) Proceedings before the office.—The petitioner in an inter partes review of a claim in a patent under this chapter that results in a final written decision under section 318(a) . . . may not request or maintain a proceeding before the Office with respect to that claim on any ground that the petitioner raised or reasonably could have raised during that inter partes review.

On September 28, 2015, final written decisions were entered in IPR2014-00571 and IPR2014-00579, in which we determined that claim 1 of the '347 patent is unpatentable.[10] Petitioner in this proceeding is the same Petitioner in IPR2014-00571 and IPR2014-00579. The grounds raised by Petitioner in IPR2014-00571 and IPR2014-00579 against claim 1 is not the same as the ground raised against claim 1 in this proceeding. Nonetheless, both Ibaraki '882 and Koide were cited during prosecution that led to the '347 patent and are listed on the face of the '347 patent. Ex. 1301. Petitioner does not argue that it reasonably could not have raised its challenge to claim 1 based on Ibaraki '882 and Koide in IPR2014-00571 and IPR2014-00579. Pet. Reply 2–3. We determine that Petitioner reasonably could have raised this challenge in IPR2014-00571 and IPR2014-00579. Accordingly, Petitioner is estopped under 35 U.S.C. § 315(e)(1) from maintaining the ground based on Ibaraki '882 and Koide against claim 1. We dismiss the *inter partes* review with respect to claim 1.

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[10] Although not argued by Patent Owner, we note that claim 1 was held unpatentable in IPR2014-00884 also. *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-00884 (PTAB December 10, 2015) (Paper 38).

Although we determine it is necessary to address the parties' contentions with respect to independent claim 1 because claims 3–5, 14, 16, 19, 20, and 22 depend from claim 1, we do not otherwise provide a final written decision on the merits with respect to claim 1, or again hold that claim to be unpatentable.

B. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Under the broadest reasonable interpretation standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. "Road Load" or "RL"

The term "road load" or "RL" is recited in dependent claims 3, 4, and 14. The Specification of the '347 patent defines "road load" as "the vehicle's instantaneous torque demands, i.e., that amount of torque required to propel the vehicle at a desired speed," and further notes that it "can be positive or negative, i.e., when decelerating or descending a hill, in which case the negative road load . . . is usually employed to charge the battery." Ex. 1301, 12:38–58. Accordingly, we construe "road load" and "RL" as

"the amount of instantaneous torque required to propel the vehicle, be it positive or negative."[11]

2. "Set Point" or "SP"

The term "setpoint" or "SP" is recited in independent claim 1 and dependent claims 3–5, 14, 16, 19, 20, and 22. Petitioner proposes that "setpoint" or "SP" be construed, in the context of these claims, as "predetermined torque value." Pet. 6–7. Patent Owner argues that "setpoint" should be construed as "a definite, but potentially variable value at which a transition between operating modes may occur." PO Resp. 7–8.[12]

We agree with Petitioner that the claims compare the setpoint either to an engine torque value or a torque based "road load" value. Pet. 6–7. Claim 1 recites a condition "when torque require to be produced . . . is at least equal to a setpoint (SP)." Ex. 1301, 58:29–37.

Nothing in the Specification precludes a setpoint from being reset, after it has been set. A setpoint for however short a period of time still is a setpoint. Accordingly, we construe "setpoint" and "SP" as "predetermined torque value that may or may not be reset."

Patent Owner argues that the claims and the specification of the '347 patent "make clear that a 'setpoint' is not simply a numerical value divorced from the context of the control system," and that "'setpoint' serves the

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[11] This construction is the same as that proposed by Petitioner. Pet. 6–7. Patent Owner does not propose a different construction.

[12] In our Decision to Institute, and upon taking into consideration the parties' arguments and supporting evidence, we interpreted "setpoint" or "SP" to mean "predetermined torque value that may or may not be reset." Dec. 8–10. Petitioner agrees with that interpretation, while Patent Owner does not. Pet. Reply 2; PO Resp. 7–11.

crucial function of marking the transition from one claimed mode to another, and in particular, the transition from propelling the vehicle with the motor to propelling the vehicle with the engine." PO Resp. 7–8. This argument is misplaced. Although such use of a setpoint is described by other language in the '347 patent specification, it is not an intrinsic property of a setpoint and is not a necessary and required use of all setpoints. In that regard, we further note the following passage in the '347 patent specification, which supports not reading a mode switching requirement (i.e., transition requirement) into the term "setpoint":

> the values of the sensed parameters in response to which the operating mode is selected may vary . . ., so that *the operating mode is not repetitively switched simply because one of the sensed parameters fluctuates around a defined setpoint.*

Ex. 1301, 19:58–64 (emphasis added).

It is improper to add an extraneous limitation into a claim, i.e., one that is added wholly apart from any need for the addition to accord meaning to a claim term. *See, e.g.*, *Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 950 (Fed. Cir. 1993); *E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1433 (Fed. Cir. 1988). It is important not to import into a claim limitations that are not a part of the claim. *Superguide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004). For example, a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment. *Id.*; *see also In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). That is no different even if the patent specification describes only a single embodiment. *Liebel-Flarsheim Co. v. Medrad Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004).

Patent Owner brings to our attention that the U.S. District Court for the Eastern District of Texas and the U.S. District Court for the District of Maryland both have construed "setpoint" to mean "a definite, but potentially variable value at which a transition between operating modes may occur." PO Resp. 7 n.1. We note that that construction also does not require that an operating mode be changed at a setpoint, as Patent Owner urges. Instead, the construction of the district courts sets forth that a transition between operating modes "may occur" at a setpoint, which is consistent with our construction here.

Patent Owner additionally argues that "setpoint" should not be limited to a torque value, because the Specification makes clear that it also can be the state of charge of a battery. PO. Resp. 10–11. Patent Owner cites to the following passage in the Specification:

> [T]he microprocessor tests sensed and calculated values for system variables, such as the vehicle's instantaneous torque requirement, i.e., the "road load" RL, the engine's instantaneous torque output ITO, both being expressed as a percentage of the engine's maximum torque output MTO, *and the state of charge of the battery bank BSC*, expressed as a percentage of its full charge, *against setpoints*, and uses the results of the comparisons to control the mode of vehicle operation.

Ex. 1301, 40:22–31 (emphasis added). This argument also is misplaced. As we noted above, independent claim 1 requires a comparison of the setpoint either to an engine torque value or a torque based "road load" value. Thus, in the context of claim 1, and claims dependent therefrom, a setpoint must be a torque value, and not some state of charge of a battery.

For reasons discussed above, we construe "setpoint" and "SP" as "predetermined torque value that may or may not be reset."

3. "said controller starts and operates . . . "when torque require to be produced . . . is at least equal to a setpoint (SP)"

Patent Owner asserts that the challenged claims require a comparison of road load (RL) to setpoint (SP) and also to maximum torque output (MTO). PO Resp. 11–15. The assertion is based on the requirements in claim 1 of "when torque require to be produced . . . is at least equal to a setpoint (SP)." *Id.*

In the above discussion of the construction of setpoint, we already noted that claim 1 requires a comparison of road load to a setpoint because of the claim recitations "when torque require to be produced . . . is at least equal to a setpoint (SP)." Petitioner has not advanced any cogent reasoning why no such comparison is required by the claims. We determine that the claims require a comparison of road load (RL) to a lower level setpoint (SP) and also to a maximum torque output (MTO). That, however, does not mean the claims exclude the comparison of other parameters.

C. Claims 1 and 5 – Obviousness over Ibaraki' 882 and Koide

Petitioner contends that claims 1 and 5 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Koide. Pet. 8–28.

1. Ibaraki '882 (Ex. 1303)

Ibaraki '882 describes a drive control apparatus and method for a hybrid vehicle equipped with two drive power sources consisting of an electric motor and engine such as an internal combustion engine. Ex. 1303, 1:9–14. Drive control apparatus includes controller 128 that includes a drive source selecting means 160. Drive source selecting means is adapted to select one or both of engine 112 and motor 114 as the drive power source or sources according to a drive source selecting data map stored in memory

means 162. *Id.* at 20:38–43, Figs. 8 and 9. In particular, controller 128 has a MOTOR DRIVE mode in which motor 114 is selected as the drive power source, an ENGINE DRIVE mode in which the engine 112 is selected as the drive power mode source, and an ENGINE-MOTOR DRIVE mode in which both the engine 112 and the motor 114 are selected as the drive power sources. *Id.* at 20:43–49.

Figure 11, reproduced below, depicts a graph which represents a predetermined relationship between the vehicle drive torque and running speed V and the three drive modes. *Id.* at 20:50–53.

FIG. 11

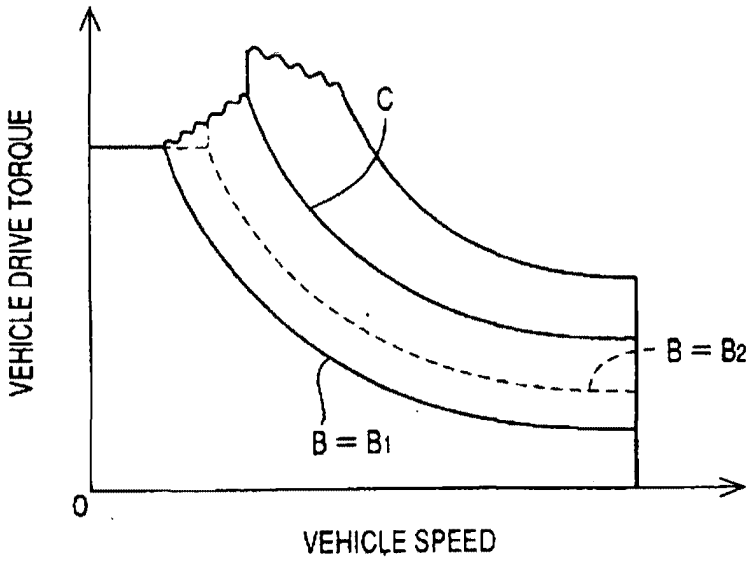

Figure 11 shows a graph which represents a predetermined relationship between the vehicle drive torque and running speed.

Drive source selecting means 160 (Fig. 9) selects the MOTOR DRIVE mode when the vehicle running condition as represented by the current vehicle drive torque and speed V is held within the range below the first boundary line B. When the vehicle running condition is held within the range between the first and second boundary lines B and C, the drive source

selecting means 160 selects the ENGINE DRIVE mode. When the vehicle running condition is in the range above the second boundary line C, the drive source selecting means 160 selects the ENGINE[-MOTOR] DRIVE mode. *Id.* at 20:59–21:1. Ibaraki '882 describes that the boundary line B may be adjusted from B_1 to B_2 so as to enlarge the range in which the MOTOR DRIVE mode is selected. *Id.* at 21:2–4. Ibaraki '882 further describes an ELECTRICITY GENERATING DRIVE mode where the engine provides surplus power that is greater than the vehicle drive torque. The surplus power from the engine is used to operate the electric motor as a generator to regeneratively charge the battery. *Id.* at 23:1–30.

2. Koide (Ex. 1317)

Koide discloses a hybrid drive system for driving a motor vehicle, which has an engine and a motor/generator as driving power sources. Ex. 1317, 1:8–11. Figure 2, which is reproduced below, depicts the hybrid vehicle system that includes a first and second electric motors. *Id.* at 7:45–64.

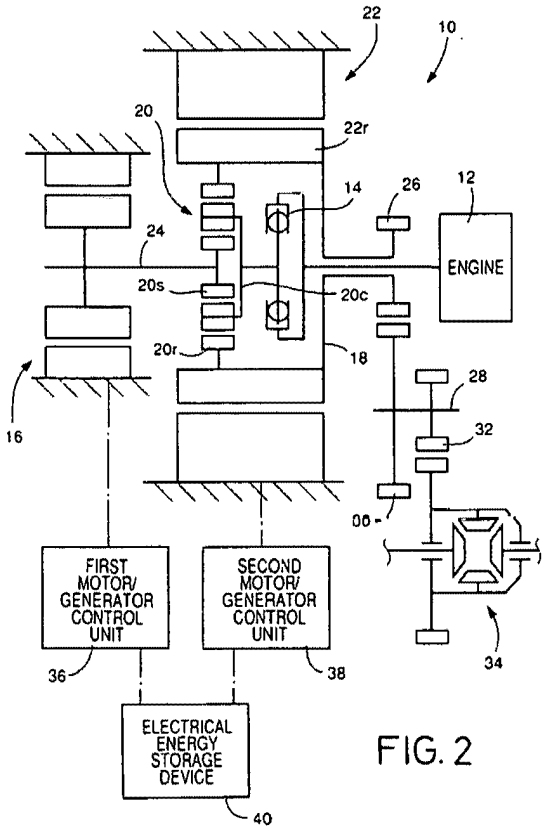

FIG. 2

Figure 2 discloses hybrid drive system 10 for a motor vehicle. *Id.* at 7:45–47. Hybrid drive system 10 includes internal combustion engine 12, first motor/generator 1, distribution mechanism 20, and second motor/generator 22. *Id.* at 7:48–59. Engine 12, distributing mechanism 20, and first motor/generator 16 are disposed coaxially with each other, arranged in the axial direction, whereas second motor/generator 22 is disposed coaxially with and radially outward of distributing mechanism 20. *Id.* at 59–64. First motor/generator 16 and second motor/generator 22 are electrically connected to electric energy storage device 40. *Id.* at 8:14–19.

Electric energy storage device 40 is charged by first motor/generator 16. *Id.* at 1:65–2:2. Engine 12 is started by first electric motor/generator 16. *Id.* at 2:2–4. First motor/generator is also used as a drive power source for

the vehicle. *Id.* at 2:4–5. Second motor/generator 22 is used primarily as an electric motor or drive power source for driving the vehicle, either alone or in cooperation with engine 12. *Id.* at 2:6–9. Second motor/generator 22 is also used as an electric generator for charging electric energy storage device 40 by regenerative braking. *Id.* at 2:9–12.

3. Analysis

Petitioner contends that claims 1 and 5 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Koide. Pet. 8–28. Petitioner provides a detailed analysis, supported by evidence, demonstrating, by a preponderance of the evidence, that claims 1 and 5 are obvious over Ibaraki '882 and Koide. *Id.*

As discussed above, we dismiss the *inter partes* review with respect to claim 1. Claims 3–5, 14, 16, 19, 20, and 22, however, depend from claim 1 and necessarily include all of the limitations of claim 1. Accordingly, we first address the contentions made by Petitioner as to how the combination of Ibaraki '882 and Koide renders obvious claim 1.

Claim 1 recites "[a] hybrid vehicle," the vehicle comprising "an internal combustion engine controllably coupled to road wheels of said vehicle." Petitioner contends that Ibaraki '882 discloses a hybrid vehicle that is propelled by an internal combustion (IC) engine and an electric motor. Pet. 8 (citing Ex. 1303, 1:9–14; Ex. 1308 ¶ 180). Petitioner specifically argues that Ibaraki '882 discloses that the engine is controllably coupled to road wheels via a clutch. *Id.* at 11 (citing Ex. 1303, 19:50–54, Fig. 8; Ex. 1308 ¶¶ 184–190).

Claim 1 further recites "a first electric motor connected to said engine [a]nd operable to start the engine responsive to a control signal" and "a

second electric motor connected to road wheels of said vehicle, and operable as a motor, to apply torque to said wheels to propel said vehicle, and as a generator, for accepting torque from at least said wheels for generating current." Petitioner argues that Ibaraki '882 discloses an electric motor that when the vehicle is in the "drive" state, the electric motor transfers power to the drive wheels. Pet. 16 (citing Ex. 1303, 19:24–28; Ex. 1308 ¶ 213). Petitioner argues that this electric motor meets the claimed "second electric motor" and a person with ordinary skill in the art would have understood that the transferring of power to the drive wheels is the same as applying torque to said wheels. *Id.* (citing Ex. 1308 ¶¶ 214–215). Petitioner contends that Ibaraki '882 discloses a "charge" state where the electric motor serves as an electric generator using regenerative braking. *Id.* at 16–17 (citing Ex. 1303, 19:61–67, 22:19–30). Petitioner further argues that Ibaraki '882 discloses an electric generator in addition to the electric motor and a person with ordinary skill in the art would have understood that the terms "generator" and "electric motor," when discussing hybrid vehicles, "indicate[s] whether the operation of the electric machines is motor or generator-based." *Id.* at 13 (quoting Ex. 1316, 21). Petitioner alternatively argues that Koide discloses an electric generator that may be used as an electric motor. *Id.* (citing Ex. 1317, 1:30–32). Petitioner further argues that Koide discloses a dual electric motor hybrid vehicle, where the first motor is used to start the engine and the second motor is used as a drive power source. *Id.* at 13–15 (citing Ex. 1317, 7:45–64, 8:47–60, 9:9–65; Ex. 1308 ¶¶ 205–206). Petitioner also argues that it would have been obvious to combine the controls of Koide to the existing structure of Ibaraki '882 for starting the engine via Ibaraki's electric generator, and allow the electric

motor to propel the vehicle in order to remove the need for an exclusive engine starter, thereby reducing costs by reducing the number of components. *Id.* at 15–16 (citing Ex. 1317, 1:60–64; Ex. 1308 ¶ 179).

Claim 1 also recites "a battery, for providing current to said motors and accepting charging current from at least said second motor." Petitioner contends that Ibaraki '882 discloses an electrical energy storage device in the form of a battery, and the battery is used for providing current during the "drive" state and a person with ordinary skill in the art would have understood that a battery would have been operable to provide or accept current from any connected electric motor-generator. *Id.* at 17–18 (citing Ex. 1303, 11:31–33, 19:55–57; Ex. 1308 ¶¶ 223–228).

Claim 1 additionally recites "a controller for controlling the flow of electrical and mechanical power between said engine, first and second motors, and wheels." Petitioner contends that Ibaraki '882 discloses a controller that includes four modes: (1) MOTOR DRIVE, where the electric motor is selected as the drive power source, (2) ENGINE DRIVE, where the engine is selected as the drive power source, (3) ENGINE-MOTOR DRIVE, where both the engine and electric motor are selected as the drive power sources, and (4) CHARGING, where electrical energy generated during regenerative braking is transferred to the battery. *Id.* at 18–19 (citing Ex. 1303, 20:43–49, Fig. 8; Ex. 1308 ¶¶ 230, 232, 233).

Claim 1 further recites "wherein said controller starts and operates said engine when torque require to be produced by said engine to propel the vehicle and/or to drive either one or both said electric motor(s) to charge said battery is at least equal to a setpoint (SP) above which said engine torque is efficiently produced, and wherein the torque produced by said

engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine." Petitioner contends that this limitation includes the language "and/or" and, therefore, this limitation is met because Ibaraki '882 discloses "said controller starts and operates said engine when torque require to be produced by said engine to propel the vehicle . . . is at least equal to a setpoint (SP) above which said engine torque is efficiently produced." *Id.* at 19 (emphasis omitted). Specifically, Petitioner contends that Ibaraki '882 discloses a setpoint of engine speed above which the engine torque is efficiently produced, the 70% relative efficiency. *Id.* at 19–24 (citing Ex. 1303, 25:36–26:8, Fig. 5; Ex. 1308 ¶¶ 237–238, 240).

We are similarly persuaded that Petitioner has established by a preponderance of the evidence that claim 5 is obvious over Ibaraki '882 and Koide. *See* Pet. 27–28. Claim 5 recites "said setpoint SP may be varied by said controller as a function of engine speed." Petitioner argues that Ibaraki '882 discloses in Figure 5 that the setpoint along the threshold line $0.7\eta_{ICEmax}$ varies as a function of speed. *Id.* (citing Ex. 1308 ¶ 278); Ex. 1303, Fig. 5. Petitioner also argues that Ibaraki '882 in Figure 11 discloses an X-axis is expressed as speed and setpoints are varied as a function of speed and torque. *Id.* (citing Ex. 1308 ¶ 279); Ex. 1303, Fig. 11.

Notwithstanding Patent Owner's arguments, which we address below, we are persuaded by Petitioner's showing, which we adopt as our own, that Ibaraki '882 in combination with Koide reasonably would have suggested the elements of claim 5, which includes all of the elements of claim 1, and that the combination would have been obvious for the reasons provided by Petitioner.

Patent Owner argues that (1) Ibaraki '882 does not compare road load to setpoint and (2) Ibaraki '882 does not disclose a setpoint that is substantially less than MTO. PO Resp. 16–37. We address each argument in the order presented by Patent Owner. Patent Owner presents these same arguments for each of the grounds challenged in the Petition, and, although we only address these arguments with respect to claims 1 and 5, this analysis applies to each of the grounds challenged. *See* PO Resp. 37–52.

a. Comparison of Road Load to Setpoint

Patent Owner argues Ibaraki '882 describes comparing power to power thresholds to determine the operational mode of the vehicle instead of comparing road load to a setpoint, both of which are torque values. *Id.* at 16–34. We have considered all of Patent Owner's arguments and supporting evidence to which we are directed with respect to the contention, but are not persuaded by Patent Owner's arguments.

It is undisputed that "power" is determined as the multiplicative product of "torque" and "speed." Ex. 1308 ¶ 173; Ex. 2306 ¶ 46. A comparison directed to a selected power point on Figure 11 of Ibaraki '882 necessarily makes a comparison with regard to the torque value associated with the selected power point on the figure, regardless of whether a comparison also is made with respect to speed. In Ibaraki '882 the drive source selecting means selects the MOTOR DRIVE mode, for example, "*when* the vehicle running condition *as represented by the current vehicle drive torque and speed V* is held within the range below the first boundary line B." Ex. 1303, 20:60–62 (emphasis added). Thus, a comparison ("*when* the vehicle running condition *as represented by*") is made based on the constituent parts of the power value of the current vehicle drive torque and

speed. We agree with Patent Owner that the claims require a comparison of road load (RL) to a setpoint (SP) and also to a maximum torque output (MTO), but that does not mean the claims exclude the comparison of other parameters, such as speed. Indeed, they do not. The scope of these claims does not dictate that the only comparison made is with respect to torque, and that no other types of comparisons are involved.

Ibaraki '882 describes selecting an operating mode based on a drive source selecting data map as illustrated in Figure 11. The drive source selecting means selects the MOTOR DRIVE mode, for example, "when the vehicle running condition as represented by *the current vehicle drive torque and speed V* is held within the range below the first boundary line B." Ex. 1303, 20:60–62 (emphasis added). The point corresponding to the required drive power P_L of Figure 11 (annotated above) satisfies the claimed road load, because P_L includes the constituent parts of torque and speed. Ex. 1308 ¶¶ 172–176. Furthermore, the boundary line B is a line below which the MOTOR DRIVE mode is selected, and thus, the points along boundary line B of torque and speed satisfy the setpoint limitation. *Id.* ¶¶ 230–234. Again, the claims do not preclude the comparison of more than two components, as long as torque is one of the components.

Patent Owner argues that the '347 patent specification describes that the instantaneous torque necessary to propel the vehicle is independent of vehicle speed. PO Resp. 20–21; Ex. 1301, 12:51–57. But that passage is in the "DISCUSSION OF THE PRIOR ART" section of the '347 patent. Patent Owner has not shown that that description applies to every embodiment described in the '347 patent. In any event, there is nothing in the claims themselves that precludes speed from also being considered in

determining the mode of operation of the hybrid vehicle. Indeed, the '347 also contemplates including not just the torque value in the comparison, but also speed. *See, e.g.*, Ex. 1301, Fig. 4, 58:53–54.

b. Setpoint is Substantially Less than MTO

Patent Owner argues that Ibaraki '882 does not disclose a setpoint that is substantially less than MTO. PO Resp. 34–37. We disagree with Patent Owner. As discussed by Petitioner, Ibaraki '882 discloses η_{ICEmax} that represents a maximum fuel efficiency and $0.7\eta_{ICEmax}$ that is 70% of the maximum fuel efficiency. Pet. 22–23; Ex. 1303, 13:18–24, 25:46–65, Fig. 5; Ex. 1308 ¶ 252. Dr. Davis explains that a person of ordinary skill in the art would have understood that $0.7\eta_{ICEmax}$ is substantially less than MTO. Ex. 1308 ¶¶ 253–254. Dr. Davis additionally explains that a person with ordinary skill would have understood that Figure 11 illustrates a setpoint along line "B" that is less than MTO. Pet. 23–24; Ex. 1308 ¶¶ 255–258; Ex. 1303, Fig. 11. Dr. Davis explains that a person with ordinary skill in the art would have understood Figure 11 to illustrate that boundary line "C" represents MTO and boundary line "B" represents setpoints, and the setpoints along boundary line "B" are substantially less than a corresponding point along boundary line "C" because, although Figure 11 does not provide any numerical values, the limitation "substantially less than" broadly encompasses the distinction drawn in Figure 11 between boundary line "C" and boundary line "B." *Id.*; Ex. 1308 ¶¶ 256–257. Moreover, Petitioner, directing attention to paragraphs 251–253 of Dr. Davis's declaration, also explains that the Ibaraki '882 setpoint must be substantially less than the MTO because, otherwise, the IC engine would hardly ever be used as a primary drive source for the disclosed vehicle. Pet. 22–23; Ex. 1308

¶¶ 251–253. We give substantial weight to Dr. Davis' testimony, and are persuaded that Ibaraki '882 discloses setpoints that are substantially less than MTO. Thus, we are not persuaded by Patent Owner's argument.

D. Claims 3 and 4 – Obviousness over Ibaraki '882, Koide, and Frank

Petitioner contends that claims 3 and 4 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882, Koide, and Frank. Pet. 29–34. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claims 3 and 4. *Id.*; Ex. 1308.

Dependent claim 3, which depends from independent claim 1, recites "said controller monitors the road load (RL) on the vehicle over time, and controls transition between propulsion of said vehicle by said motor(s) to propulsion by said engine responsive to RL reaching SP, such that said transition occurs only when RL>SP for at least a predetermined time, or when RL>SP2, wherein SP2>SP." Dependent claim 4, which depends from dependent claim 3, recites "said controller further controls transition from propulsion of said vehicle by said engine to propulsion by said motor(s) such that said transition occurs only when RL<SP for at least a predetermined time."

Petitioner contends that Ibaraki '882 discloses all of these limitations, except for the limitation requiring the transition to occur after at least a predetermined time. Pet. 31–33. Petitioner contends that Frank discloses this limitation. *Id.* Petitioner specifically argues that Frank discloses combining a time delay between cycling between different modes in order to

avoid frequent cycling. Pet. 32–33 (citing Ex. 1318, 8:32–37; Ex. 1308 ¶¶ 313–322).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882, Koide, and Frank. *Id.* at 29–30. Petitioner argues that a person with ordinary skill in the art would have recognized the deficiency in Ibaraki '882 that erratic, high frequency cycling between operating modes would result in damage to several parts of the vehicle, such as the engine, motor, clutch, or transmission, and increase exhaust emissions and reduce fuel efficiency. *Id.* (citing Ex. 1308 ¶¶ 287–292). Petitioner explains that a time delay would reduce frequency cycling between operating modes by ensuring the vehicle has fully transitioned between modes, and Frank recognized the problems between frequency cycling and introduced a time delay to solve this problem. *Id.* (citing Ex. 1318, 8:32–37; Ex. 1308 ¶¶ 287–292). Petitioner argues that a person with ordinary skill in the art would have recognized that adding a time delay, as disclosed by Frank, to the Ibaraki '882 hybrid vehicle would have required nothing more than a simple modification, and that such a person would have been motivated to introduce a time delay in order to solve the problem with frequent cycling. *Id.* (citing Ex. 1408 ¶¶ 281–296).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Frank discloses "speed-responsive hysteresis," whereas the claims require "road load-based hysteresis," and, therefore, the combination of Ibaraki '882, Koide, and Frank fails to teach or suggest claims 3 and 4. PO Resp. 38–39. We disagree with Patent Owner's

argument. As discussed above, Ibaraki '882 discloses transitioning between operating modes based on road load. *See* Section II.C.3. Petitioner only relies on Frank to disclose a time delay before transitioning between modes. Pet. 31–33 (citing Ex. 1318, 8:32–37, Ex. 1308 ¶¶ 313–322). As such, Patent Owner's argument is tantamount to an attack on the references separately when the Petitioner's argument is based on what the combination of references teaches or suggests. Nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures. *See In re Merck & Co. Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

Patent Owner further argues that Petitioner "fails to present any rational basis for combining Ibaraki '882/Koide with Frank to arrive at the claimed invention." PO Resp. 39–40. We disagree with Patent Owner. As discussed above, Petitioner explains that a person with ordinary skill in the art would have recognized a problem with Ibaraki '882 is that frequent cycling between operating modes would result in damage to several parts of the vehicle, such as the engine, motor, clutch, or transmission, and increase exhaust emissions and reduce fuel efficiency. Pet. 29–30 (citing Ex. 1308 ¶¶ 287–292). Petitioner explains that a time delay would reduce frequency cycling between operating modes by ensuring the vehicle has fully transitioned between modes, and Frank recognized the problems between frequency cycling and introduced a time delay to solve this problem. *Id.* (citing Ex. 1318, 8:32–37; Ex. 1308 ¶¶ 287–292). We are persuaded by Petitioner that a person with ordinary skill in the art would have recognized the benefit of a time delay before switching operating modes, and would

have been motivated to modify Ibaraki '882/Koide with such a simple modification in order to resolve the problem with frequent cycling.

E. Claim 16 – Obviousness over Ibaraki '882, Koide, and Kawakatsu

Petitioner contends that claim 16 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882, Koide, and Kawakatsu. Pet. 34–37. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 16. *Id.*; Ex. 1308.

Dependent claim 16, which depends from independent claim 1, recites "the total torque available at the road wheels from said internal combustion engine is no greater than the total torque available from said first and second electric motors combined." Petitioner argues that Kawakatsu discloses this limitation. *Id.* Petitioner argues that Kawakatsu discloses in Figure 2 operating regions, where region (4) represents the maximum driving torque that can be produced by the engine and region (2) represents an operating mode where torque is provided by a single motor. *Id.* at 36–37 (citing Ex. 1305, 4:31–32, 4:58–5:2; Ex. 1308 ¶¶ 349–351). Petitioner, therefore, argues that the maximum driving torque in region (2) exceeds the maximum driving torque in region (4). *Id.* (citing Ex. 1308 ¶ 352).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882, Koide, and Kawakatsu. *Id.* at 34–35. Petitioner argues that Kawakatsu discloses that "the electric motor provides more torque than the engine," and this configuration uses a smaller engine in the hybrid vehicle, thereby reducing fuel use and exhaust. *Id.* (citing Ex. 1308 ¶¶ 345–346). Petitioner argues that Ibaraki '882 explains that reducing

the fuel consumption and exhaust gas is an objective. *Id.* (citing Ex. 1303, 2:52–56). Petitioner concludes that a person with ordinary skill in the art would have recognized the benefit of configuration of an additional electric motor and a smaller engine in order to permit "effective reduction in the fuel consumption amount or exhaust gas amount of the engine." *Id.*; Ex. 1303, 2:52–56.

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Petitioner's rationale for combining Kawakatsu with Ibaraki '882 and Koide fails to "take into account the entirely differing control strategies Ibaraki '882 and Kawakatsu that would counsel against adopting the disproportionately large motor and small engine of Kawakatsu into Ibaraki '882." PO Resp. 41–42. Patent Owner argues that Petitioner fails to provide explanation as to why a person of skill in the art would have modified Ibaraki '882's control strategy and how a person of ordinary skill in the art would go about making such a modification.

We disagree with Patent Owner. Patent Owner's arguments and supporting evidence are narrowly based on incorporating physically all technicalities of Kawakatsu with Ibaraki '882 and Koide. The test for obviousness is what the combined teachings of the references would have suggested to a person of ordinary skill in the art, not whether one reference may be bodily incorporated into the structure of another reference. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Petitioner articulates that a person with ordinary skill in the art would have been motivated to combine Kawakatsu with Ibaraki '882 and Koide in order to reduce fuel use and reduce exhaust gas. Pet. 34–35. Accordingly, Petitioner has articulated

reasoning with rationale underpinning in support of its conclusion of obviousness. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1742 (2007).

F. Claim 20 – Obviousness over Ibaraki '882, Koide, and Vittone

Petitioner contends that claim 20 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882, Koide, and Vittone. Pet. 37–43. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 20. *Id.*; Ex. 1408.

Dependent claim 20, which depends from independent claim 1, recites "the rate of change of torque produced by said engine is limited, such that combustion of fuel within said engine can be controlled to occur substantially at the stoichiometric ratio, and wherein if said engine is incapable of supplying the instantaneous torque required, the additional torque required is supplied by either or both of said motor(s)." Petitioner argues that Vittone discloses this limitation. *Id.*

Petitioner argues that Vittone discloses controlling "transients [] to achieve the stoichiometric control over the whole working range." *Id.* at 38 (quoting Ex. 1320, 26). Petitioner further argues that Vittone discloses that the "engine controls during transient conditions include ''steady state' management of the thermal engine' in order to maintain a stoichiometric air-fuel ratio over the whole working range of the engine." *Id.* at 39. "Vittone operates the electric motor to provide any shortfall in the drivability torque requirements as a result of limiting the engine's output." *Id.* (citing Ex. 1320, 27; Ex. 1308 ¶¶ 371–372).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would

have combined Ibaraki '882, Koide, and Vittone. *Id.* at 42–43. Petitioner argues that a person with ordinary skill in the art would have recognized the benefits of controlling the stoichiometric ratio during transient conditions "would lead to reduced exhaust emissions and increased fuel efficiency." *Id.* at 42. Petitioner further argues that a person with ordinary skill in the art would have understood that the combination of Vittone's "controlling the engine such that combustion of fuel within the engine occurs substantially at a stoichiometric ratio" with the hybrid vehicle of Ibaraki '882 would merely require the application of a known technique to a "similar engine in the same way." *Id.*

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Vittone fails to disclose "limiting a rate of change of torque output of the engine." PO Resp. 43–46. Patent Owner argues that "[t]here is no disclosure in Vittone about a control strategy that *controls* the engine to limit the rate of change of the engine torque output." *Id.* at 45 (citing Ex. 2306 ¶ 101). Patent Owner asserts that "Figure 8 simply shows the ramp-up of the engine due to its inherent transient characteristics" and "Vittone does not explain what is meant for 'steady state' management of the thermal engine," where there are other ways to accomplish the steady state management of the engine. *Id.* (citing Ex. 2306 ¶¶ 101–102).

We disagree with Patent Owner. We substantially credit the testimony of Dr. Davis. Petitioner explains that Vittone discloses a "driving torque management" control strategy that "during the transient period of rapid acceleration demand, the electric motor is used to provide the additional propulsive torque requirements while the engine output is limited

between . . . to maintain the stoichiometric ratio." Pet. 40–41; Pet. Reply 18–20. Dr. Davis opines that one of the objectives of Vittone is to reduce emissions, and that is accomplished by limiting the rate of torque output of the engine during transient conditions. Ex. 1308 ¶¶ 371–372 (citing Ex. 1320, 27, Fig. 8). Dr. Davis further opines that during a period of rapid increase in the torque required to propel the vehicle, Vittone's control strategy limits the rate of change of the engine torque so that the engine maintains operation at its stoichiometric ratio and supplements the engine with the electric motor to fulfill the increased torque requirements. Ex. 1308 ¶ 374 (explaining Ex. 1320, Fig. 8). We credit the testimony of Dr. Davis over Mr. Hannemann's testimony who opines that Figure 8 is not based on a control strategy. Mr. Hannemann's testimony does not take into account the description in Vittone as a whole. Instead, his testimony is based narrowly on certain passages of Vittone. Accordingly, we agree with Petitioner that Vittone discloses "limiting a rate of change of torque output of the engine."

Patent Owner further argues that Petitioner "fails to establish a motivation to combine Vittone with Ibaraki '882 and Koide." PO Resp. 46–48. We disagree as Petitioner clearly does provide a reasoned rationale for combining Vittone with Ibaraki '882 and Koide. As explained above, Petitioner explains, with supporting evidence, that a person having ordinary skill in the art would have understood that Vittone's control of the stoichiometric ratio during any transient conditions in the Ibaraki '882 system would have reduced exhaust emissions and increased fuel efficiency, and that the modification would have required a mere change in Ibaraki '882's software. Pet. 42–43; Ex. 1308 ¶¶ 354–365. A person having ordinary skill in the art would have had a reasonable expectation that

modifying Ibaraki '882's controller software to control the stoichiometric ratio as taught by Vittone would have been successful.

Patent Owner disagrees and argues that a person of ordinary skill in the art would not have been motivated to combine Ibaraki '882 and Koide with Vittone because Ibaraki '882 and Vittone are directed to very different hybrid control strategies, such that the engine control strategies of Vittone would not have worked with the engine control strategies of Ibaraki '882. PO Resp. 46–48; Ex. 2306 ¶¶ 104–107. Patent Owner's arguments and supporting evidence are narrowly based on incorporating physically all technicalities of Vittone with Ibaraki '882. The test for obviousness is what the combined teachings of the references would have suggested to a person of ordinary skill in the art, not whether one reference may be bodily incorporated into the structure of another reference. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). In particular, and in support of Patent Owner's arguments, Mr. Hannemann opines that a person of ordinary skill in the art would not have been motivated to modify the power-based engine control strategy of Ibaraki '882 to include the driver-controlled engine control strategy of Vittone. Ex. 2306 ¶ 107. Petitioner, however, does not propose using the whole system of Vittone with the system of Ibaraki '882. Rather, Vittone is relied on for its description of controlling the stoichiometric ratio of the engine during transient conditions to reduce exhaust emissions and increase fuel efficiency. Patent Owner's arguments and the supporting testimony of Mr. Hannemann are premised on the assumption of incorporating all features of Vittone into Ibaraki '882, which is not what Petitioner proposes.

G. Claim 19 – Obviousness over Ibaraki '882, Koide, and Yamaguchi

Petitioner contends that claim 19 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882, Koide, and Yamaguchi. Pet. 43–47. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 19. *Id.*; Ex. 1308.

Dependent claim 19, which depends from independent claim 1, recites "said engine is rotated before starting such that its cylinders are heated by compression of air therein." Petitioner argues that Yamaguchi discloses this limitation. *Id.* Petitioner specifically argues that Yamaguchi discloses that "the engine speed increases from "0" to a non-zero amount [] before the engine control unit (ECU) turns on the ignition to start the engine." *Id.* at 46 (citing Ex. 1308 ¶¶ 384; Ex. 1321, 8:62–65, Fig. 8) (emphasis omitted). Petitioner further argues that Yamaguchi discloses that the motor "is rotated in the positive direction [] to allow for rotating the engine before the engine is ignited." *Id.* (citing Ex. 1421, 8:41–44).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882, Koide, and Yamaguchi. *Id.* at 43–45. Petitioner argues that one of ordinary skill in the art would have known and understood that "[i]t was well-known to preheat the engine and/or the catalyst to reduce engine emissions during a cold start," and one of Ibaraki '882's stated objectives is to "reduc[e]... the fuel consumption amount or exhaust gas amount of the engine." *Id.* (citing Ex. 1319, 52, 62; Ex. 1308 ¶¶ 380–381; Ex. 1303, 2:52–56). Accordingly, Petitioner argues that a person with ordinary skill in the art would have combined the pre-heating

method of Yamaguchi to Ibaraki '882's hybrid vehicle in order to effectively reduce the fuel consumption amount or exhaust gas amount of the engine. *Id.* (citing Ex. 1303, 2:52–56; Ex. 1308 ¶ 381).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Petitioner fails to establish a rationale to combine Ibaraki '882, Koide, and Yamaguchi. PO Resp. 48–49. We disagree. As discussed in detail above, Petitioner provides a reasonable rationale to combine Yamaguchi's engine rotation to the Ibaraki '882/Koide hybrid vehicle. A person having ordinary skill in the art at the time of the invention would have known that rotating the Ibaraki '882/Koide engine before starting the engine would have led to the predictable result of having a less rich fuel-air mixture at start-up, which would minimize vehicle exhaust emissions and waste less fuel during engine starts. Pet. 43–45; Ex. 1321, 1:34–35; Ex. 1319, 52, 62; Ex. 1308 ¶¶ 380–381.

H. Claim 22 – Obviousness over Ibaraki '882, Koide, and Ibaraki '626

Petitioner contends that claim 22 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882, Koide, and Ibaraki '626. Pet. 47–53. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 22. *Id.*; Ex. 1308.

Dependent claim 22, which depends from independent claim 1, recites "said engine can be operated at torque output levels less than SP under abnormal and transient conditions, said conditions comprising starting and stopping of the engine and provision of torque to satisfy drivability or safety considerations." Petitioner argues that Ibaraki '626 discloses this limitation.

Id. at 51–53. Specifically, Petitioner argues that Ibaraki '626 discloses a "normal control routine," and further discloses that a "special control routine . . . is executed in the event of a failure of the electric motor." *Id.* at 52–53 (citing Ex. 1322, 5:25–42, 7:50–52, Fig. 2, Fig. 4; Ex. 1308 ¶¶ 423). During the special control routine, "the hybrid vehicle calculates the 'required drive power P_L' and its associated torque value, and 'the engine 12 [is operated] with the calculated required P_L for driving the vehicle, irrespective of the magnitude of the required power P_L." *Id.* at 53 (citing Ex. 1322, 7:50–61).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882, Koide, and Ibaraki '626. *Id.* at 47–51. Petitioner argues that a person of ordinary skill in the art would have recognized that Ibaraki '882/Koide and Ibaraki '626 disclose "substantially the same general control strategy for operating a parallel hybrid vehicle." *Id.* at 49 (citing Ex. 1308 ¶ 400). Petitioner argues that a person with ordinary skill in the art would have recognized the benefit of Ibaraki '626's control strategy in the event of a failure is to allow the vehicle to maintain regular driving performance allowing for the vehicle to remain safe for driving. *Id.* at 50–51 (citing Ex. 1308 ¶¶ 403–411). Accordingly, Petitioner argues that a person with ordinary skill in the art would have combined Ibaraki '626 with Ibaraki '882 in order to achieve the benefit of allowing the vehicle to remain safe for driving in the event of a failure. *Id.* (citing Ex. 1308 ¶¶ 403–411).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Petitioner fails to establish a motivation to combine Ibaraki '882 with Ibaraki '626. PO Resp. 49–51. Patent Owner argues that Petitioner's reasons to combine Ibaraki '626 with the system in Ibaraki '882/Koide amounts to little more than an argument that the two systems relate to control strategies for hybrid vehicles and contain commonly named inventors from Toyota. *Id.* We disagree. Petitioner does articulate a reason for combining, expressed by Ibaraki '626 itself (preventing the undesirable change in the running performance of the vehicle in the event of a failure of the electronic motor). Pet. 47–51. As discussed above, Petitioner establishes that a person with ordinary skill in the art would have recognized that Ibaraki '882/Koide and Ibaraki '626 disclose "substantially the same general control strategy for operating a parallel hybrid vehicle," and Ibaraki '626 further discloses the benefit of maintaining regular driving performance during the event of a failure. *Id.*. Accordingly, a person with ordinary skill in the art would have combined Ibaraki '882/Koide and Ibaraki '626 in order to achieve this benefit in Ibaraki '882/Koide. *Id.*

I. Claim 14 – Obviousness over Ibaraki '882, Koide, and Lateur

Petitioner contends that claim 14 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882, Koide, and Lateur. Pet. 54–58. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 14. *Id.*; Ex. 1308.

Dependent claim 14 recites "the controller may accept operator input of a desired cruising speed, and thereafter controls the instantaneous torque output by said internal combustion engine and by either or both motor(s) in

accordance with variation in RL so as to maintain vehicle speed substantially constant." Petitioner argues that Lateur discloses this limitation. *Id.* at 55–58. Petitioner argues that Lateur discloses that "it was known to design a cruise control device which provided a controller with operator input specifying a desired speed." *Id.* at 55 (citing Ex. 1308 ¶¶ 441–442; Ex. 1307 9:47–57, Fig. 11).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882, Koide, and Lateur. *Id.* at 54–55. Petitioner argues that the benefit of Lateur's "cruise control" is that it allows "the vehicle operator to relax from constant foot throttle manipulation" and potentially improves the "vehicle's fuel efficiency value by limiting throttle excursions to small steps." *Id.* (citing Ex. 1306, 47). Accordingly, Petitioner argues that a person with ordinary skill in the art would have combined Lateur's "cruise control" functionality with Ibaraki '882's hybrid vehicle in order to allow "the vehicle operator to relax from constant foot throttle manipulation" and potentially improve the "vehicle's fuel efficiency value by limiting throttle excursions to small steps." *Id.* (citing Ex. 1306, 47).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Lateur's "cruise control" feature does not render claim 14 obvious, because, none of the prior art "discloses using road load as a control variable to determine when to operation the engine." PO Resp. 51–52. We disagree with Patent Owner. As discussed above, Ibaraki

'882 discloses the use of road load as a control variable. *See* Sections II.C.2.a, II.C.2.b.

Patent Owner further argues that Petitioner's "argument regarding an alleged rationale to combine Lateur with Ibaraki '882 and Koide is conclusory and ignores the actual requirements of the claims." PO Resp. 52. We disagree with Patent Owner. As discussed above, Petitioner argues that a person with ordinary skill in the art would have recognized the benefit of "cruise control" functionality is that it permits "the vehicle operator to relax from constant foot throttle manipulation" and potentially improve the "vehicle's fuel efficiency value by limiting throttle excursions to small steps." Pet. 54–55 (citing Ex. 1306, 47). Petitioner further argues that a person with ordinary skill in the art would have combined this functionality with Ibaraki '882/Koide in order to provide this same benefit to the Ibaraki '882/Koide hybrid vehicle. *Id.* As such, we disagree with Patent Owner that Petitioner rationale to combine Lateur with Ibaraki '882 is conclusory.

III. CONCLUSION

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 3–5, 14, 16, 19, 20, and 22 of the '347 patent are unpatentable.

IV. ORDER

Accordingly, it is hereby:

ORDERED that the *inter partes* review is *dismissed* with respect to claim 1;

FURTHER ORDERED that, based on the grounds under review, claims 3–5, 14, 16, 19, 20, and 22 of U.S. Patent No. 7,104,347 B2 have been shown by a preponderance of the evidence to be unpatentable; and

FURTHER ORDERED that this is a Final Written Decision of the Board under 35 U.S.C. § 318(a), and parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Paper 31
Entered: November 1, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner,

v.

PAICE LLC and THE ABELL FOUNDATION, INC.,
Patent Owner.

Case IPR2015-00794
Patent 7,104,347 B2

Before SALLY C. MEDLEY, KALYAN K. DESHPANDE, and CARL M. DEFRANCO, *Administrative Patent Judges*.

DESHPANDE, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Ford Motor Company ("Petitioner") filed a Petition requesting an *inter partes* review of claims 23–30, 32, and 39–41 of U.S. Patent No. 7,104,347 B2 (Ex. 1401, "the '347 patent"). Paper 1 ("Pet."). Paice LLC and The Abell Foundation, Inc. (collectively, "Patent Owner") filed a Preliminary Response in unredacted and redacted forms. Papers 9, 10 ("Prelim. Resp."). Patent Owner also filed a Motion to Seal. Paper 11 ("Motion to Seal").

Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review of the '347 patent, on November 2, 2015, under 35 U.S.C. § 103(a), as to claims 23, 28, 30, and 32 as obvious over Ibaraki '882;[1] claim 29 as obvious over Ibaraki '882 and Admitted Prior Art ("APA");[2] claim 39 as obvious over Ibaraki '882 and Vittone;[3] claim 40 as obvious over Ibaraki '882 and Yamaguchi;[4] claim 41 as obvious over Ibaraki '882 and Ibaraki '626;[5] claim

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[1] U.S. Patent No. 5,789,882, issued Aug. 4, 1998 (Ex. 1403) ("Ibaraki '882").

[2] Petitioner relies on Figures 1 and 2 of the '347 patent, reproduced from the '970 patent, and the Masding/Bumby disclosures from the '634 patent (Ex. 1433).

[3] Oreste Vittone, *Fiat Conceptual Approach to Hybrid Cars Design*, 12TH INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM (1994) (Ex. 1420) ("Vittone").

[4] U.S. Patent No. 5,865,263, issued Feb. 2, 1999 (Ex. 1421) ("Yamaguchi").

[5] U.S. Patent No. 6,003,626, issued Dec. 21, 1999 (Ex. 1422) ("Ibaraki '626").

27 as obvious over Ibaraki '882 and Lateur;[6] and claims 25 and 26 as obvious over Ibaraki '882 and Frank.[7] Paper 12 ("Dec."). We did not institute *inter partes* review of claim 24 as obvious over Ibaraki '882. Dec. 20–21.

Patent Owner filed a Response (Paper 16, "PO Resp."), and Petitioner filed a Reply (Paper 22, "Pet. Reply").[8] Oral hearing was held on June 28, 2016, and the hearing transcript has been entered in the record. Paper 30 ("Tr.").

The Board has jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Pursuant to our jurisdiction under 35 U.S.C. § 6, we conclude, *first*, that Petitioner is estopped from maintaining its challenge in this proceeding against claim 23. For the reasons discussed below, we are persuaded that Petitioner has shown by a preponderance of the evidence that claims 25–30, 32, and 39–41 of the '347 patent are unpatentable.

B. Related Proceedings

Petitioner indicates that the '347 patent is the subject of *Paice, LLC and The Abell Foundation, Inc. v. Ford Motor Company*, Case No. 1-14-cv-00492 and *Paice LLC and The Abell Foundation, Inc. v. Hyundai Motor America et. al.*, Case No. 1:2012-cv-00499. Pet. 1; Paper 5, 2. Petitioner

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[6] U.S. Patent No. 5,823,280, issued Oct. 20, 1998 (Ex. 1407) ("Lateur").

[7] U.S. Patent No. 6,116,363, issued Sept. 12, 2000 (Ex. 1418) ("Frank").

[8] In addition, Patent Owner filed a Motion for Observation on Cross-Examination (Paper 23) and Petitioner filed a Response to Motion for Observation on Cross-Examination (Paper 26), both of which have been considered.

also indicates that the '347 patent was the subject of IPR2014-00571, IPR2014-00579, and IPR2014-00884, in which final decisions have been issued. *Id.*; Paper 5, 3. Petitioner further indicates that patents related to the '347 patent are the subject matter of IPR2014-00570, IPR2014-01415, IPR2014-00568, IPR2014-00852, IPR2014-00875, IPR2014-00904, IPR2014-01416, IPR2015-00606, IPR2015-00767, IPR2015-00722, IPR2015-00758, IPR2015-00784, IPR2015-00785, IPR2015-00791, IPR2015-00787, IPR2015-00790, IPR2015-00795, and IPR2015-00792. *Id.* at 1–2; Paper 5, 3.

C. The '347 Patent

The '347 patent describes a hybrid vehicle with an internal combustion engine, two electric motors (a starter motor and a traction motor), and a battery bank, all controlled by a microprocessor that directs the transfer of torque from the engine and traction motor to the drive wheels of the vehicle. Ex. 1401, 17:5–45, Fig. 4. The microprocessor features a control strategy that runs the engine only under conditions of high efficiency, typically when the vehicle's instantaneous torque requirements (i.e., the amount of torque required to propel the vehicle, or "road load") are at least equal to 30% of the engine's maximum torque output ("MTO") capability. *Id.* at 20:52–60, 35:5–14; *see also id.* at 13:47–61 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently").

Running the engine only when it is efficient to do so leads to improved fuel economy and reduced emissions. *Id.* at 13:47–52. To achieve such efficiency, the hybrid vehicle includes various operating modes that depend on the vehicle's torque requirements, the battery's state of charge,

and other operating parameters. *Id.* at 19:53–55. For example, the hybrid vehicle may operate in: (1) an all-electric mode, where only the traction motor provides the torque to propel the vehicle and operation of the engine would be inefficient (i.e., stop-and-go city driving); (2) an engine-only mode, where only the engine provides the torque to propel the vehicle and the engine would run at an efficient level (i.e., highway cruising); (3) a dual-operation mode, where the traction motor provides additional torque to propel the vehicle beyond that already provided by the engine and the torque required to propel the vehicle exceeds the maximum torque output of the engine (i.e., while accelerating, passing, and climbing hills); and (4) a battery recharge mode where the engine operates a generator to recharge the battery while the traction motor drives the vehicle. *Id.* at 35:66–36:58, 37:26–38:55.

D. Illustrative Claim

Petitioner challenges claims 23, 25–30, 32, and 39–41 of the '347 patent. Pet. 4–60. Claim 23 is illustrative of the claims at issue and is reproduced below:

> 23. A method of control of a hybrid vehicle, said vehicle comprising an internal combustion engine capable of efficiently producing torque at loads between a lower level SP and a maximum torque output MTO, a battery, and one or more electric motors being capable of providing output torque responsive to supplied current, and of generating electrical current responsive to applied torque, said engine being controllably connected to wheels of said vehicle for applying propulsive torque thereto and to said at least one motor for applying torque thereto, said method comprising the steps of:
>
> determining the instantaneous torque RL required to propel said vehicle responsive to an operator command;
>
> monitoring the state of charge of said battery;

employing said at least one electric motor to propel said vehicle when the torque RL required to do so is less than said lower level SP;

employing said engine to propel said vehicle when the torque RL required to do so is between said lower level SP and MTO;

employing both said at least one electric motor and said engine to propel said vehicle when the torque RL required to do so is more than MTO; and

employing said engine to propel said vehicle when the torque RL required to do so is less than said lower level SP and using the torque between RL and SP to drive said at least one electric motor to charge said battery when the state of charge of said battery indicates the desirability of doing so; and

wherein the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine.

Ex. 1001, 60:22–54.

II. ANALYSIS

A. Petitioner Estoppel

On September 28, 2015, we rendered a final written decision of claims 1, 7, 8, 18, 21, 23, and 37 of the '347 patent in IPR2014-00571, and claims 1, 6, 7, 9, 15, 21, 23, and 36 of the '347 patent in IPR2014-00579. *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-00571 (PTAB September 28, 2015) (Paper 44); *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-00579 (PTAB September 28, 2015) (Paper 45). Patent Owner argues that, pursuant to 35 U.S.C. § 315(e)(1), Petitioner may not maintain its challenge of claim 23. PO Resp. 14–15. Petitioner responds that it is not estopped because it was necessary for it to file multiple petitions to address the '347 patent's many

dependent claims, such as dependent claims 25–30, 32, and 39–41, which depend from independent claim 23. Pet. Reply 2–3.

Under 35 U.S.C. § 315(e)(1), a petitioner who has obtained a final written decision on a patent claim in an *inter partes* review may not maintain a subsequent proceeding with respect to that same claim on a ground that it "reasonably could have raised" in the original proceeding. Specifically, section 315(e)(1) provides:

> (e) Estoppel.—
>
> (1) Proceedings before the office.—The petitioner in an inter partes review of a claim in a patent under this chapter that results in a final written decision under section 318(a) . . . may not request or maintain a proceeding before the Office with respect to that claim on any ground that the petitioner raised or reasonably could have raised during that inter partes review.

On September 28, 2015, final written decisions were entered in IPR2014-00571 and IPR2014-00579, in which we determined that claim 23 of the '347 patent is unpatentable.[9] Petitioner in this proceeding is the same Petitioner in IPR2014-00571 and IPR2014-00579. The grounds raised by Petitioner in IPR2014-00571 and IPR2014-00579 against claim 23 is not the same as the ground raised against claim 23 in this proceeding. Nonetheless, Ibaraki '882 was cited during prosecution that led to the '347 patent and is listed on the face of the '347 patent. Ex. 1401. Petitioner does not argue that it reasonably could not have raised its challenge to claim 23 based on Ibaraki '882 in IPR2014-00571 and IPR2014-00579. Pet. Reply 2–3. We

[9] The challenge against claim 23 was dismissed in IPR2014-00884. *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-00884 (PTAB December 10, 2015) (Paper 38).

determine that Petitioner reasonably could have raised this challenge in IPR2014-00571 and IPR2014-00579. Accordingly, Petitioner is estopped under 35 U.S.C. § 315(e)(1) from maintaining the ground based on Ibaraki '882 against claim 23. We dismiss the *inter partes* review with respect to claim 23.

Although we determine it is necessary to address the parties' contentions with respect to independent claim 23 because claims 25–30, 32, and 39–41 depend from claim 23, we do not otherwise provide a final written decision on the merits with respect to claim 23, or again hold that claim to be unpatentable.

B. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Under the broadest reasonable interpretation standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. "Road Load" or "RL"

The term "road load" or "RL" is recited in independent claim 23. The Specification of the '347 patent defines "road load" as "the vehicle's instantaneous torque demands, i.e., that amount of torque required to propel the vehicle at a desired speed," and further notes that it "can be positive or negative, i.e., when decelerating or descending a hill, in which case the

negative road load . . . is usually employed to charge the battery." Ex. 1401, 12:38–58. Accordingly, we construe "road load" and "RL" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative."[10]

2. "Set Point" or "SP"

The term "setpoint" or "SP" is recited in independent claim 23 and dependent claims 25–30, 32, and 39–41. Petitioner proposes that "setpoint" or "SP" be construed, in the context of these claims, as "predetermined torque value." Pet. 5–6. Patent Owner argues that "setpoint" should be construed as "a definite, but potentially variable value at which a transition between operating modes may occur." PO Resp. 5–6.[11]

We agree with Petitioner that the claims compare the setpoint either to an engine torque value or a torque based "road load" value. Pet. 5–6. Claim 23 recites a condition "when the torque RL required to do so is less than said lower level SP." Ex. 1401, 60:39–41. Claim 23 further recites a range established by the lower level SP at one end, and the maximum torque output MTO of the engine at the other end, by the language "producing torque at loads between a lower level SP and a maximum torque output MTO" and "when the torque RL required to do so is between said lower level SP and MTO." *Id.* at 60:24–25, 60:40–42.

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[10] This construction is the same as that proposed by Petitioner. Pet. 4–5. Patent Owner does not propose a different construction.

[11] In our Decision to Institute, and upon taking into consideration the parties' arguments and supporting evidence, we interpreted "setpoint" or "SP" to mean "predetermined torque value that may or may not be reset." Dec. 8–10. Petitioner agrees with that interpretation, while Patent Owner does not. Pet. Reply 2; PO Resp. 5–9.

Nothing in the Specification precludes a setpoint from being reset, after it has been set. A setpoint for however short a period of time still is a setpoint. Accordingly, we construe "setpoint" and "SP" as "predetermined torque value that may or may not be reset."

Patent Owner argues that the claims and the specification of the '347 patent "make clear that a 'setpoint' is not simply a numerical value divorced from the context of the control system," and that "'setpoint' serves the crucial function of marking the transition from one claimed mode to another, and in particular, the transition from propelling the vehicle with the motor to propelling the vehicle with the engine." PO Resp. 6. This argument is misplaced. Although such use of a setpoint is described by other language in the '347 patent specification, it is not an intrinsic property of a setpoint and is not a necessary and required use of all setpoints. In that regard, we further note the following passage in the '347 patent specification, which supports not reading a mode switching requirement (i.e., transition requirement) into the term "setpoint":

> the values of the sensed parameters in response to which the operating mode is selected may vary . . ., so that *the operating mode is not repetitively switched simply because one of the sensed parameters fluctuates around a defined setpoint.*

Ex. 1401, 19:58–64 (emphasis added).

It is improper to add an extraneous limitation into a claim, i.e., one that is added wholly apart from any need for the addition to accord meaning to a claim term. *See, e.g., Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 950 (Fed. Cir. 1993); *E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1433 (Fed. Cir. 1988). It is important not to import into a claim limitations that are not a part of the claim. *Superguide Corp. v.*

DirecTV Enterprises, Inc., 358 F.3d 870, 875 (Fed. Cir. 2004). For example, a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment. *Id.*; *see also In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). That is no different even if the patent specification describes only a single embodiment. *Liebel-Flarsheim Co. v. Medrad Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004).

Patent Owner brings to our attention that the U.S. District Court for the Eastern District of Texas and the U.S. District Court for the District of Maryland both have construed "setpoint" to mean "a definite, but potentially variable value at which a transition between operating modes may occur." PO Resp. 5–6 n.1. We note that that construction also does not require that an operating mode be changed at a setpoint, as Patent Owner urges. Instead, the construction of the district courts sets forth that a transition between operating modes "may occur" at a setpoint, which is consistent with our construction here.

Patent Owner additionally argues that "setpoint" should not be limited to a torque value, because the Specification makes clear that it also can be the state of charge of a battery. PO. Resp. 8–9. Patent Owner cites to the following passage in the Specification:

> [T]he microprocessor tests sensed and calculated values for system variables, such as the vehicle's instantaneous torque requirement, i.e., the "road load" RL, the engine's instantaneous torque output ITO, both being expressed as a percentage of the engine's maximum torque output MTO, *and the state of charge of the battery bank BSC*, expressed as a percentage of its full charge, *against setpoints*, and uses the results of the comparisons to control the mode of vehicle operation.

Ex. 1401, 40:22–31 (emphasis added). This argument also is misplaced. As we noted above, independent claim 23 requires a comparison of the setpoint either to an engine torque value or a torque based "road load" value. Thus, in the context of claim 23, and claims dependent therefrom, a setpoint must be a torque value, and not some state of charge of a battery.

For reasons discussed above, we construe "setpoint" and "SP" as "predetermined torque value that may or may not be reset."

3. The "operating" limitations

Patent Owner asserts that the challenged claims require a comparison of road load (RL) to setpoint (SP) and also to maximum torque output (MTO). PO Resp. 9–14. The assertion is based on the requirements in claim 23 of (1) operating at least one electric motor to propel the hybrid vehicle "when the torque RL required to do so is less than said lower level SP," (2) operating an internal combustion engine of the hybrid vehicle to propel the hybrid vehicle "when the torque RL required to do so is between said lower level SP and MTO," and (3) operating both the at least one electric motor and the engine to propel the hybrid vehicle "when the torque RL required to do so is more than MTO."

In the above discussion of the construction of setpoint, we already noted that claim 23 requires a comparison of road load to a setpoint because of the claim recitations "when the torque RL required to do so is less than said lower level SP" and "when the torque RL required to do so is between said lower level SP and MTO." Petitioner has not advanced any cogent reasoning why no such comparison is required by the claims. We determine that the claims require a comparison of road load (RL) to a lower level

setpoint (SP) and also to a maximum torque output (MTO). That, however, does not mean the claims exclude the comparison of other parameters.

C. Claims 23, 28, 30, and 32 – Obviousness over Ibaraki '882

Petitioner contends that claims 23, 28, 30, and 32 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882. Pet. 6–36.

1. Ibaraki '882 (Ex. 1403)

Ibaraki '882 describes a drive control apparatus and method for a hybrid vehicle equipped with two drive power sources consisting of an electric motor and engine such as an internal combustion engine. Ex. 1403, 1:9–14. Drive control apparatus includes controller 128 that includes a drive source selecting means 160. Drive source selecting means is adapted to select one or both of engine 112 and motor 114 as the drive power source or sources according to a drive source selecting data map stored in memory means 162. *Id.* at 20:38–43, Figs. 8 and 9. In particular, controller 128 has a MOTOR DRIVE mode in which motor 114 is selected as the drive power source, an ENGINE DRIVE mode in which the engine 112 is selected as the drive power mode source, and an ENGINE-MOTOR DRIVE mode in which both the engine 112 and the motor 114 are selected as the drive power sources. *Id.* at 20:43–49.

Figure 11, reproduced below, depicts a graph which represents a predetermined relationship between the vehicle drive torque and running speed V and the three drive modes. *Id.* at 20:50–53.

FIG. 11

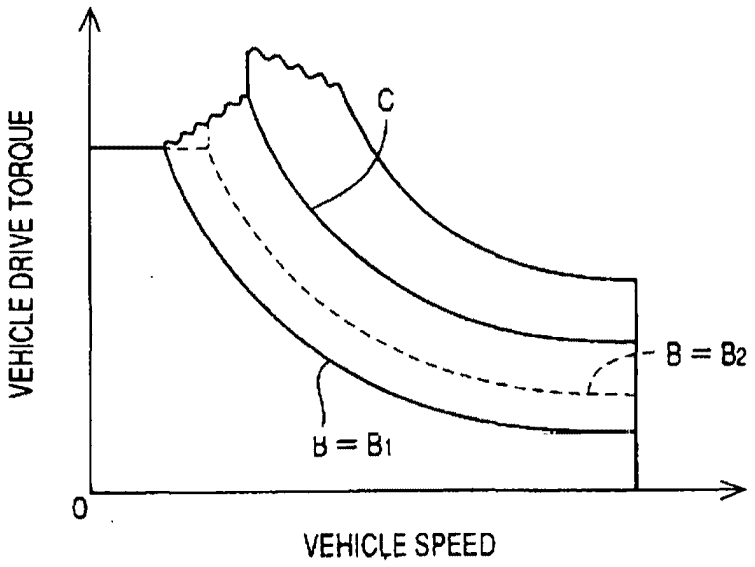


Figure 11 shows a graph which represents a predetermined relationship between the vehicle drive torque and running speed.

Drive source selecting means 160 (Fig. 9) selects the MOTOR DRIVE mode when the vehicle running condition as represented by the current vehicle drive torque and speed V is held within the range below the first boundary line B. When the vehicle running condition is held within the range between the first and second boundary lines B and C, the drive source selecting means 160 selects the ENGINE DRIVE mode. When the vehicle running condition is in the range above the second boundary line C, the drive source selecting means 160 selects the ENGINE[-MOTOR] DRIVE mode. *Id.* at 20:59–21:1. Ibaraki '882 describes that the boundary line B may be adjusted from B_1 to B_2 so as to enlarge the range in which the MOTOR DRIVE mode is selected. *Id.* at 21:2–4. Ibaraki '882 further describes an ELECTRICITY GENERATING DRIVE mode where the engine provides surplus power that is greater than the vehicle drive torque.

The surplus power from the engine is used to operate the electric motor as a generator to regeneratively charge the battery. *Id.* at 23:1–30.

2. Analysis

Petitioner contends that claims 23, 28, 30, and 32 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882. Pet. 6–36. Petitioner provides a detailed analysis, supported by evidence, demonstrating, by a preponderance of the evidence, that claims 23, 28, 30, and 32 are obvious over Ibaraki '882. *Id.*

As discussed above, we dismiss the *inter partes* review with respect to claim 23. Claims 25–30, 32, and 39–41, however, depend from claim 23 and necessarily include all of the limitations of claim 23. Accordingly, we first address the contentions made by Petitioner as to how Ibaraki '882 renders obvious claim 23.

Claim 23 recites a "method of control of a hybrid vehicle," where the "vehicle comprising an internal combustion engine capable of efficiently producing torque at loads between a lower level [setpoint] SP and a maximum torque output MTO." Claim 23 further recites "the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine." Claim 23 additionally recites "a battery" and "monitoring the state of charge of said battery." Petitioner argues that Ibaraki '882 discloses a drive control apparatus for a hybrid vehicle, where the vehicle includes an electric motor and an internal combustion engine. Pet. 6–7 (citing Ex. 1403, 1:9–14, 19:11–54; Ex. 1408 ¶¶ 169–170). Petitioner further argues that Ibaraki '882 discloses an energy efficiency map that includes a threshold and multiple setpoints based on the engine speed. Pet. 8–9 (citing Ex. 1403, 25:46–26:8,

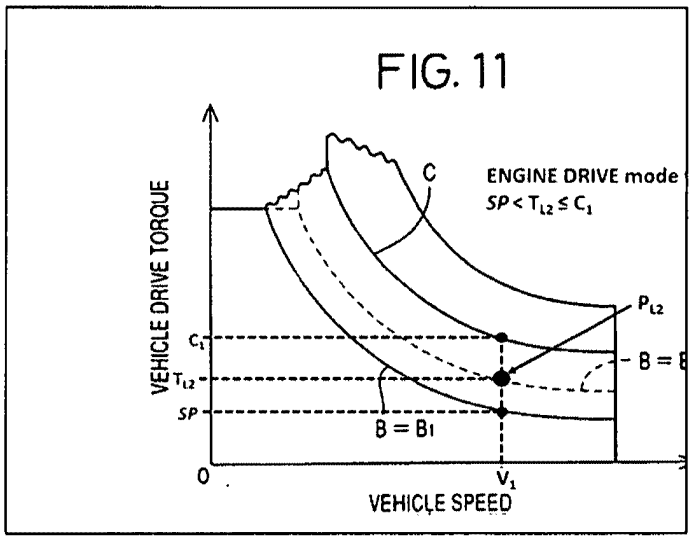
Fig. 5; Ex. 1408 ¶¶ 185–187). Petitioner asserts that the setpoints represent the point where the hybrid vehicle transitions from motor drive mode to engine drive mode and the engine efficiently produces torque above the setpoint. *Id.* Petitioner argues that Ibaraki '882 similarly discloses a drive source selecting data map that includes a boundary line, along which are setpoints. *Id.* at 9–10 (citing Ex. 1403, 20:49–21:20, 24:6–26, Fig. 11; Ex. 1408 ¶¶185, 188–190, 193). Petitioner argues that these setpoints also represent the point where the hybrid vehicle transitions from motor drive mode to engine drive mode and the engine efficiently produces torque above the setpoint. *Id.* Petitioner explains that although the language "substantially less than" is not "mathematically precise," 70% of the MTO is "substantially less than" the MTO and Ibaraki '882 discloses threshold or setpoint at 70% of the engine's maximum efficiency. *Id.* at 25–26 (citing Ex. 1403, 25:46–56, Fig. 5). Petitioner further argues that Ibaraki '882 discloses an energy storage device, which can be "in the form of a battery or condenser" and the controller receives a state of charge SOC of the electric energy storage device or battery. *Id.* at 11, 16 (citing Ex. 1403, 19:55–57, 20:10–23; Ex 1408 ¶¶ 198–199) (emphasis omitted).

Claim 23 further recites "one or more electric motors being capable of providing output torque responsive to supplied current, and of generating electrical current responsive to applied torque." Claim 23 also recites "said engine being controllably connected to wheels of said vehicle for applying propulsive torque thereto and to said at least one motor for applying torque thereto." Petitioner contends that Ibaraki '882 discloses a "dynamo-electric motor" that receives electric energy, i.e. current, from the energy storage device or battery when in a "DRIVE" state and transfers the power to the

wheels ultimately. *Id.* at 11–12 (citing Ex. 1403, 19:24–28, 19:55–63; Ex. 1408 ¶¶ 200–204). Petitioner further contends that Ibaraki '882 discloses a "CHARGING" state, where the motor functions as an electric generator or dynamo, with regenerative braking. *Id.* at 12 (citing Ex. 1403, 19:61–67). Petitioner argues that Ibaraki '882 discloses that the engine is controlled by a "clutch." *Id.* at 12–13 (citing Ex. 1403, 19:50–54, Fig. 8; Ex. 1408 ¶¶ 208–210).

Claim 23 also recites "determining the instantaneous torque RL required to propel said vehicle responsive to an operator command." Petitioner argues that Ibaraki '882 discloses a required drive power for a vehicle that is determined by the vehicle torque and vehicle speed. *Id.* at 13–14 (citing Ex. 1403, 20:39–43, 20:58–21:1, 23:66–24:21; Ex. 1408 ¶¶ 221–224). Petitioner further asserts that Ibaraki '882 discloses that the "instantaneous drive power required for running the vehicle, which power includes components for overcoming the air resistance experienced by the vehicle and the rolling resistance of each vehicle wheel." *Id.* at 14–15 (quoting Ex. 1403, 12:50–54)(emphasis omitted). Petitioner asserts that a person with ordinary skill in the art would have known that power and torque are related by speed. Pet. 14 n.1 (citing Ex. 1408 ¶ 190). Petitioner contends, with supporting evidence, that a person having ordinary skill in the art would have understood that the "vehicle drive torque" values described in Ibaraki '882 represent instantaneous road load (torque) required to propel the vehicle responsive to operator command (accelerator pedal operating amount and rate of change of accelerator pedal operating amount). Pet. 15; Ex. 1408 ¶ 230.

Claim 23 further recites four different modes used to propel the vehicle: (1) "employing said at least one electric motor to propel said vehicle when the torque RL required to do so is less than said lower level SP," (2) "employing said engine to propel said vehicle when the torque RL required to do so is between said lower level SP and MTO," (3) "employing both said at least one electric motor and said engine to propel said vehicle when the torque RL required to do so is more than MTO," and (4) "employing said engine to propel said vehicle when the torque RL required to do so is less than said lower level SP and using the torque between RL and SP to drive said at least one electric motor to charge said battery when the state of charge of said battery indicates the desirability of doing so." Petitioner contends that Ibaraki '882 discloses (1) a "MOTOR DRIVE mode," (2) an "ENGINE DRIVE mode," (3) an "ENGINE-MOTOR DRIVE mode," and (4) an "ELECTRICITY GENERATING DRIVE mode." *Id.* at 16–25 (citing Ex. 1403, 15:37–50, 19:18–27, 19:55–20:9, 20:18–63, 20:43–53, 20:55–21:1, 23:6–19, 23:66–24:30, 26:18–21, 26:28–33, Figs. 5, 7, 10, 11; Ex. 1408 ¶¶ 242-250, 253–262, 266–281, 287–294). In support of its contentions, Petitioner relies on the following annotated Ibaraki '882 Figure 11, reproduced below. Pet. 15.



Ibaraki '882 Figure 11 as annotated in the Petition (Pet. 15)

Petitioner argues that Ibaraki '882 discloses (1) the vehicle operates in "MOTOR DRIVE mode" when the required torque at a given speed is below boundary line B, (2) the vehicle operates in "ENGINE DRIVE mode" when the required torque at a given speed is between boundary line B and boundary line C, and (3) the vehicle operates in "ENGINE-MOTOR DRIVE mode" when the required torque at a given speed is above boundary line C. *Id.* at 16–25. Accordingly, Petitioner asserts that boundary line B is the same as setpoint SP and boundary line C must be at least equal to the maximum torque output MTO. *Id.* Petitioner further argues that Ibaraki '882 discloses that during "ELECTRICITY GENERATING DRIVE mode" the engine speed is held constant at a value greater than the required torque and the surplus torque is used to drive the motor for charging the battery. *Id.* We give substantial weight to Dr. Davis' testimony explaining that Ibaraki '882 discloses four operation modes (MOTOR DRIVE, ENGINE DRIVE, ENGINE-MOTOR DRIVE, and ELECTRICITY GENERATING DRIVE),

and modes are selected as a function of required torque at a given vehicle speed. *See* Pet. 16–25 (citing Ex. 1408 ¶¶ 242–290).

Notwithstanding Patent Owner's arguments, which we address below, we agree with Petitioner's analysis and conclusion with regard to claim 23, and adopt them as our own.

Each of claims 28, 30, and 32 depends from independent claim 23. Notwithstanding Patent Owner's arguments, which we address below, we have considered Petitioner's showing for these claims and are persuaded by such showing. Accordingly, Petitioner has shown by a preponderance of the evidence that claims 28, 30, and 32 would have been obvious based on Ibaraki '882 and the relevant knowledge of a person having ordinary skill in the art.

Patent Owner argues that (1) Ibaraki '882 does not compare road load to setpoint; (2) Ibaraki '882 does not compare road load to MTO; and (3) Ibaraki '882 does not disclose a setpoint that is substantially less than MTO. PO Resp. 15–46. We address each argument in the order presented by Patent Owner. Patent Owner presents these same arguments for each of the grounds challenged in the Petition, and, although we only address these arguments with respect to claims 23, 28, 30 and 32, this analysis applies to each of the grounds challenged. *See* PO Resp. 46–60.

a. Comparison of Road Load to Setpoint

Patent Owner argues Ibaraki '882 describes comparing power to power thresholds to determine the operational mode of the vehicle instead of comparing road load to a setpoint, both of which are torque values. *Id.* at 15–32. We have considered all of Patent Owner's arguments and supporting

evidence to which we are directed with respect to the contention, but are not persuaded by Patent Owner's arguments.

It is undisputed that "power" is determined as the multiplicative product of "torque" and "speed." Ex. 1408 ¶ 225; Ex. 2406 ¶ 46. A comparison directed to a selected power point on Figure 11 of Ibaraki '882 necessarily makes a comparison with regard to the torque value associated with the selected power point on the figure, regardless of whether a comparison also is made with respect to speed. In Ibaraki '882 the drive source selecting means selects the MOTOR DRIVE mode, for example, "*when* the vehicle running condition *as represented by the current vehicle drive torque and speed V* is held within the range below the first boundary line B." Ex. 1403, 20:60–62 (emphasis added). Thus, a comparison ("*when* the vehicle running condition *as represented by*") is made based on the constituent parts of the power value of the current vehicle drive torque and speed. We agree with Patent Owner that the claims require a comparison of road load (RL) to a setpoint (SP) and also to a maximum torque output (MTO), but that does not mean the claims exclude the comparison of other parameters, such as speed. Indeed, they do not. The scope of these claims does not dictate that the only comparison made is with respect to torque, and that no other types of comparisons are involved.

Ibaraki '882 describes selecting an operating mode based on a drive source selecting data map as illustrated in Figure 11. The drive source selecting means selects the MOTOR DRIVE mode, for example, "when the vehicle running condition as represented by *the current vehicle drive torque and speed V* is held within the range below the first boundary line B." Ex. 1403, 20:60–62 (emphasis added). The point corresponding to the

required drive power P_L of Figure 11 (annotated above) satisfies the claimed road load, because P_L includes the constituent parts of torque and speed. Ex. 1408 ¶¶ 224–230. Furthermore, the boundary line B is a line below which the MOTOR DRIVE mode is selected, and thus, the points along boundary line B of torque and speed satisfy the setpoint limitation. *Id.* ¶¶ 244–250. Again, the claims do not preclude the comparison of more than two components, as long as torque is one of the components.

Patent Owner argues that the '347 patent specification describes that the instantaneous torque necessary to propel the vehicle is independent of vehicle speed. PO Resp. 18–19; Ex. 1401, 12:51–57. But that passage is in the "DISCUSSION OF THE PRIOR ART" section of the '347 patent. Patent Owner has not shown that that description applies to every embodiment described in the '347 patent. In any event, there is nothing in the claims themselves that precludes speed from also being considered in determining the mode of operation of the hybrid vehicle. Indeed, the '347 also contemplates including not just the torque value in the comparison, but also speed. *See, e.g.*, Ex. 1401, Fig. 4, 58:53–54.

b. Comparison of Road Load to MTO

Patent Owner argues that Ibaraki '882 does not compare road load to MTO to determine if both the electric motor and engine are required to propel the vehicle. PO Resp. 32–42. Patent Owner argues that Ibaraki '882 does not mention MTO, or use MTO in mode selection control strategy. *Id.* at 32. But Petitioner does not assert that Ibaraki '882 mentions or discusses MTO. Rather, as explained above, Petitioner asserts that Ibaraki '882 would operate the vehicle in the ENGINE-MOTOR DRIVE mode when a point (P_{L3}) denotes that the "current vehicle drive torque" (T_{L3}) at a given vehicle

speed (V_1) is above the torque point (C_1), which would be above the IC engine's MTO. Pet. 20–22; Ex. 1403, 20:55–62, 26:28–33; Ex. 1755 ¶¶ 275–282. Thus, Petitioner asserts that a person having ordinary skill in the art at the time of the invention would have understood the MTO to correspond to, for example, point C_1 in the annotated Figure 11.

Moreover, Dr. Davis testifies that a person of ordinary skill in the art would have understood that it would have been obvious "to use the electric motor to provide additional output torque above the engine's maximum torque output (MTO) during such high vehicle load situations [as described in Ibaraki '882]." Ex. 1408 ¶ 278. In support of that assertion, he explains, with supporting evidence, that it was well known to use both the motor and engine above the engine's MTO. *Id.* Accordingly, even to the extent that Ibaraki '882 alone does not describe explicitly operating the engine and motor "when the torque RL required to do so is more than the MTO," based on the record before us, doing so would have been an obvious modification to make to the Ibaraki '882 control system. "[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Patent Owner does not rebut sufficiently Dr. Davis's testimony that a person of ordinary skill in the art would have understood that it would have been obvious to use the electric motor to provide additional output torque above the engine's maximum torque output (MTO) during the high vehicle load situations described in Ibaraki '882. For this reason alone, we are not persuaded by Patent Owner's arguments that Petitioner fails to show by a

preponderance of the evidence that Ibaraki '882, based on the knowledge of a person of skill in the art, taught or suggested operating both the motor and engine above the engine's MTO.

In any event, we also address Patent Owner's arguments that the curve C of Figure 11 of Ibaraki '882, or any given point along that curve, such as C_1, does not correspond to MTO. In particular, Patent Owner argues that a typical MTO for an engine would be shaped like a bell curve, as opposed to the inverse shaped parabola of boundary line C of Ibaraki '882 Figure 11. PO Resp. 33–37. But as Petitioner points out, this argument and Patent Owner's supporting evidence are based on a Patent Owner presented Figure 11 that is not the same as the actual figure of Ibaraki '882. *See, e.g.*, Pet. Reply 12–17. Patent Owner's proposed Figure 11, which Mr. Hannemann bases his testimony upon, is labeled "engine speed" along the X axis. The X axis of Figure 11 of Ibaraki '882 is labeled "vehicle speed." Moreover, the flat portion on the far left of Figure 11 of Ibaraki '882 is shown as a slope in Patent Owner's rendition of the figure. *See, e.g.*, *id.* at 12–13. Based on this alone, we do not determine the evidence to which we are directed by Patent Owner to be particularly helpful or reliable. As such, the Patent Owner's arguments are not persuasive for this additional reason. On the other hand, and as explained above, we give substantial weight to Dr. Davis's testimony that a person having ordinary skill in the art would have understood that the torque point C_1 would be equal to or possibly less than the maximum torque output (MTO) at that given vehicle speed (V_1). Ex. 1408 ¶ 275.

c. Setpoint is Substantially Less than MTO

Patent Owner argues that Ibaraki '882 does not disclose a setpoint that is substantially less than MTO. PO Resp. 43–46. Patent Owner's arguments are similar to those addressed above with respect to the contention, for example, that point C_1 from Figure 11 does not correspond to MTO. See, e.g., id. at 45 n. 10. The arguments have been addressed, and for reasons already provided, we are not persuaded by Patent Owner's arguments that that point C_1 from Figure 11 does not correspond to MTO. Moreover, Petitioner, directing attention to paragraphs 302 and 303 of Dr. Davis's declaration, also explains that the Ibaraki '882 setpoint must be substantially less than the MTO because, otherwise, the IC engine would hardly ever be used as a primary drive source for the disclosed vehicle. Pet. 25–26; Ex. 1408 ¶¶ 302–303. Patent Owner argues that such an assertion is based on an unreasonably broad construction which essentially reads the "substantially less than the maximum torque output" limitation out of the claim. PO Resp. 45–46. But, as explained previously above, substantially less includes anything less than 70% of MTO. Thus, we are not persuaded by Patent Owner's argument.

D. Claim 29 – Obviousness over Ibaraki '882 and APA

Petitioner contends that claim 29 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and APA. Pet. 36–38. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 29. *Id.*; Ex. 1408.

Dependent claim 29, which depends from independent claim 23, recites "said setpoint SP is at least approximately 30% of MTO." Petitioner

argues that a person with ordinary skill in the art would have understood that Ibaraki '882 included typical engines, such as the ones described by the APA (Masding/Bumby), where Ibaraki '882's 70% fuel efficiency correlates to approximately 33% of MTO. Pet. 37 (citing Ex. 1408 ¶¶ 393–416). Petitioner further contends that such an adjustment is nothing more than an obvious design choice. *Id.*; *See* Ex. 1408 ¶ 392.

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Petitioner's argument is conclusory and fails to set forth "[h]ow Ford calculated the thirty-three to thirty-eight percent range." PO Resp. 47–48. Patent Owner also argues that Petitioner's argument that using a setpoint that is at least approximately 30% of MTO is an obvious design choice is conclusory. *Id.* (citing *Ex Parte* Gunasekar, Appeal 2009-008345, 2011 WL 3872007 at *5 (BPAI 2011)). We disagree with Patent Owner. We give substantial credit to the testimony of Dr. Davis set forth by Petitioner. Pet. 37; Ex. 1408 ¶¶ 392–416. Dr. Davis explains that he has "calculated the 'relative efficiency' values by dividing each absolute efficiency value (for example 29%) by the maximum 32% absolute efficiency, which represents the region [of Ibaraki '882 Figure 5] of 100% relative efficiency." Ex. 1408 ¶ 399. Dr. Davis further explains his calculations and determinations, and concludes that "a person having ordinary skill would have understood that when Ibaraki '882 $0.7\eta_{ICEmax}$ setpoint is applied to conventional prior art engines, the torque produced by the engine would be approximately 33% of MTO (based on Bumby) to about 36–38% of MTO (based on the prior art figures described in the '347 and '970 Patents)." *Id.* ¶ 416; *see* Pet. 37. Petitioner explains that the prior

art engines disclosed in Bumby/Masding 1988, as understood by a person of ordinary skill in the art, use a setpoint of approximately 33% of MTO based on a 70% relative fuel efficiency, and, therefore, a person of ordinary skill in the art would have understood that Ibaraki '882's 70% relative fuel efficiency equates to setpoints between 33–38% of an engine's MTO. Pet. 37–38 (citing Ex. 1408 ¶¶ 393–416). Dr. Davis concludes that "it would have been an obvious design choice to use a set point that is at least approximately 30% of MTO." Ex. 1408 ¶ 417 (emphasis omitted). Accordingly, we do not agree with Patent Owner that Petitioner's explanations of how the limitations of claim 29 are met and using a setpoint that at least approximately 30% of MTO is an obvious design choice are conclusory.

Patent Owner further argues that "Ford completely ignores a motivation to combine Ibaraki '882 with 'the disclosed prior art engine of Bumby/Masding 1988.'" PO Resp. 48. We disagree with Patent Owner. Petitioner establishes that APA of the Masding/Bumby engines are disclosed in the '634 patent. Pet. 37; Ex. 1433. The '634 patent is a divisional of the '347 patent. Ex. 1433 (60). Petitioner sets forth that "a POSA would have known that Ibaraki '882's 70% relative fuel efficiency (*i.e.*, $0.7\eta_{ICEmax}$) correlates to a *setpoint* that is approximately 33% of MTO." Pet. 37 (citing Ex. 1408 ¶¶ 393–416). That is, Petitioner is relying on APA to explain the teachings of Ibaraki '882. Furthermore, Dr. Davis explains that a person with ordinary skill in the art would have looked to both the APA and Ibaraki '882 to correlate relative fuel consumption and relative efficiency. Ex. 1408 ¶¶ 393–416. And the modification to use a setpoint that is at least approximately 30% of MTO, as explained by APA, would be nothing more

than an obvious design choice. *Id.* As such, we are persuaded by Petitioner that a person with ordinary skill in the art would have found it obvious to use a setpoint that is at least approximately 30% of MTO based on the teachings of Ibaraki '882 and APA.

E. Claim 39 – Obviousness over Ibaraki '882 and Vittone

Petitioner contends that claim 39 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Vittone. Pet. 38–43. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 39. *Id.*; Ex. 1408.

Dependent claim 39, which depends from independent claim 23, recites "the rate of change of torque output by said engine is limited, such that combustion of fuel within said engine can be controlled to occur substantially at the stoichiometric ratio" and "if said engine is incapable of supplying the instantaneous torque required, the additional torque required is supplied by either or both of said motor(s)." Petitioner argues that Vittone discloses these limitations. *Id.* Petitioner argues that Vittone discloses controlling "transients [] to achieve the stoichiometric control over the whole working range." *Id.* at 38 (quoting Ex. 1420, 26; citing Ex. 1408 ¶¶ 425–428). Petitioner further argues that Vittone discloses that the "engine controls during transient conditions include ''steady state' management of the thermal engine' in order to maintain a stoichiometric air-fuel ratio over the whole working range of the engine." *Id.* at 39. "Vittone operates the electric motor to provide any shortfall in the drivability torque requirements as a result of limiting the engine's output." *Id.* (citing Ex.

1420, 27; Ex. 1408 ¶ 439). As such, Petitioner argues that Vittone's "steady state management" discloses limiting a rate of change. *Id.* at 39–41.

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Vittone. *Id.* at 42–43. Petitioner argues that a person with ordinary skill in the art would have recognized the benefits of controlling the stoichiometric ratio during transient conditions "would lead to reduced exhaust emissions and increased fuel efficiency." *Id.* at 42. Petitioner further argues that a person with ordinary skill in the art would have understood that the combination of Vittone's "controlling the engine such that combustion of fuel within the engine occurs substantially at a stoichiometric ratio" with the hybrid vehicle of Ibaraki '882 would merely require the application of a known technique to a "similar engine in the same way." *Id.*

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Vittone fails to disclose "limiting a rate of change of torque output of the engine." PO Resp. 49–51. Patent Owner argues that "[t]here is no disclosure in Vittone about a control strategy that *controls* the engine to limit the rate of change of the engine torque output." *Id.* at 51 (citing Ex. 2406 ¶ 107). Patent Owner asserts that "Figure 8 simply shows the ramp-up of the engine due to its inherent transient characteristics" and "Vittone does not explain what is meant for 'steady state' management of the thermal engine," where there are other ways to accomplish the steady state management of the engine. *Id.* (citing Ex. 2406 ¶¶ 107–108).

We disagree with Patent Owner. We substantially credit the testimony of Dr. Davis. Petitioner explains that Vittone discloses a "driving torque management" control strategy that "during the transient period of rapid acceleration demand, the electric motor is used to provide the additional propulsive torque requirements while the engine output is limited between . . . to maintain the stoichiometric ratio." Pet. 40–41; Pet. Reply 20–21. Dr. Davis opines that one of the objectives of Vittone is to reduce emissions, and that is accomplished by limiting the rate of torque output of the engine during transient conditions. Ex. 1408 ¶¶ 439–440 (citing Ex. 1420, 27, Fig. 8). Dr. Davis further opines that during a period of rapid increase in the torque required to propel the vehicle, Vittone's control strategy limits the rate of change of the engine torque so that the engine maintains operation at its stoichiometric ratio and supplements the engine with the electric motor to fulfill the increased torque requirements. Ex. 1408 ¶ 442 (explaining Ex. 1420, Fig. 8). We credit the testimony of Dr. Davis over Mr. Hannemann's testimony who opines that Figure 8 is not based on a control strategy. Mr. Hannemann's testimony does not take into account the description in Vittone as a whole. Instead, his testimony is based narrowly on certain passages of Vittone. Accordingly, we agree with Petitioner that Vittone discloses "limiting a rate of change of torque output of the engine."

Patent Owner further argues that Petitioner "fails to establish a motivation to combine Vittone with Ibaraki '882." PO Resp. 52–54. We disagree as Petitioner clearly does provide a reasoned rationale for combining Vittone with Ibaraki '882. As explained above, Petitioner explains, with supporting evidence, that a person having ordinary skill in the art would have understood that Vittone's control of the stoichiometric ratio

during any transient conditions in the Ibaraki '882 system would have reduced exhaust emissions and increased fuel efficiency, and that the modification would have required a mere change in Ibaraki '882's software. Pet. 42–43; Ex. 1408 ¶¶ 421–431. A person having ordinary skill in the art would have had a reasonable expectation that modifying Ibaraki '882's controller software to control the stoichiometric ratio as taught by Vittone would have been successful.

Patent Owner disagrees and argues that a person of ordinary skill in the art would not have been motivated to combine Ibaraki '882 with Vittone because the two disclosures are directed to very different hybrid control strategies, such that the engine control strategies of Vittone would not have worked with the engine control strategies of Ibaraki '882. PO Resp. 52–54; Ex. 2406 ¶¶ 110–113. Patent Owner's arguments and supporting evidence are narrowly based on incorporating physically all technicalities of Vittone with Ibaraki '882. The test for obviousness is what the combined teachings of the references would have suggested to a person of ordinary skill in the art, not whether one reference may be bodily incorporated into the structure of another reference. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). In particular, and in support of Patent Owner's arguments, Mr. Hannemann opines that a person of ordinary skill in the art would not have been motivated to modify the power-based engine control strategy of Ibaraki '882 to include the driver-controlled engine control strategy of Vittone. Ex. 2406 ¶ 113. Petitioner, however, does not propose using the whole system of Vittone with the system of Ibaraki '882. Rather, Vittone is relied on for its description of controlling the stoichiometric ratio of the engine during transient conditions to reduce exhaust emissions and increase fuel efficiency.

Patent Owner's arguments and the supporting testimony of Mr. Hannemann are premised on the assumption of incorporating all features of Vittone into Ibaraki '882, which is not what Petitioner proposes.

F. Claim 40 – Obviousness over Ibaraki '882 and Yamaguchi

Petitioner contends that claim 40 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Yamaguchi. Pet. 43–45. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 40. *Id.*; Ex. 1408.

Dependent claim 40, which depends from independent claim 23, recites "said engine is rotated before starting such that its cylinders are heated by compression of air therein." Petitioner argues that Yamaguchi discloses this limitation. *Id.* Petitioner specifically argues that Yamaguchi discloses that "the engine speed increases from "0" to a non-zero amount [] before the engine control unit (ECU) turns on the ignition to start the engine." *Id.* at 44–45 (citing Ex. 1408 ¶¶ 456–457; Ex. 1421, 8:62–65, Fig. 8) (emphasis omitted). Petitioner further argues that Yamaguchi discloses that "the motor is rotated to 600 rpm in the positive direction [] to allow for rotating the engine before the engine is ignited." *Id.* (citing Ex. 1408 ¶¶ 456-457; Ex. 1421, 8:41–44) (emphasis omitted).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Yamaguchi. *Id.* at 43. Petitioner argues that one of ordinary skill in the art would have known and understood that "[i]t was well-known to preheat the engine and/or the catalyst to reduce engine emissions during a cold start," and one of Ibaraki '882's stated

objectives is to "reduce the fuel consumption amount or exhaust gas amount of the engine." *Id.* (citing Ex. 1419, 46, 56; Ex. 1408 ¶¶ 452–454; Ex. 1403, 2:52–56). Accordingly, Petitioner argues that a person with ordinary skill in the art would have combined the pre-heating method of Yamaguchi to Ibaraki '882's hybrid vehicle in order to effectively reduce the fuel consumption amount or exhaust gas amount of the engine. *Id.* at 43–44 (citing Ex. 1403, 2:52–56; Ex. 1408 ¶ 461).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Petitioner fails to establish a rationale to combine Ibaraki '882 and Yamaguchi. PO Resp. 54–55. We disagree. As discussed in detail above, Petitioner provides a reasonable rationale to combine Yamaguchi's engine rotation to the Ibaraki '882 hybrid vehicle. A person having ordinary skill in the art at the time of the invention would have known that rotating the Ibaraki '882 engine before starting the engine would have led to the predictable result of having a less rich fuel-air mixture at start-up, which would minimize vehicle exhaust emissions and waste less fuel during engine starts. Pet. 43–45; Ex. 1421, 1:34–35; Ex. 1419, 46, 56; Ex. 1408 ¶¶ 421–422.

G. Claim 41 – Obviousness over Ibaraki '882 and Ibaraki '626

Petitioner contends that claim 41 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Ibaraki '626. Pet. 46–51. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 41. *Id.*; Ex. 1408.

Dependent claim 41, which depends from independent claim 23, recites "said engine can be operated at torque output levels less than SP under abnormal and transient conditions" and "said conditions comprising starting and stopping of the engine and provision of torque to satisfy drivability or safety consideration." Petitioner argues that Ibaraki '626 discloses these limitations. *Id.* Specifically, Petitioner argues that Ibaraki '626 discloses a "normal control routine," and further discloses that a "special control routine . . . is executed in the event of a failure of the electric motor." *Id.* at 49 (citing Ex. 1422, 5:25–42, 7:50–52, Fig. 2, Fig. 4; Ex. 1408 ¶¶ 492–498). During the special control routine, "the hybrid vehicle calculates the 'required drive power P_L' and its associated torque value, and 'the engine 12 [is operated] with the calculated required P_L for driving the vehicle, irrespective of the magnitude of the required power P_L." *Id.* at 49–50 (citing Ex. 1422, 7:50–61).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Ibaraki '626. *Id.* at 46–49. Petitioner argues that a person of ordinary skill in the art would have recognized that both Ibaraki '882 and Ibaraki '626 disclose "substantially the same general control strategy for operating a parallel hybrid vehicle." *Id.* at 47 (citing Ex. 1408 ¶ 475). Petitioner argues that a person with ordinary skill in the art would have recognized the benefit of Ibaraki '626's control strategy in the event of a failure is to allow the vehicle to maintain regular driving performance allowing for the vehicle to remain safe for driving. *Id.* at 47–49 (citing Ex. 1408 ¶¶ 476–484). Accordingly, Petitioner argues that a person with ordinary skill in the art would have combined Ibaraki '626 with Ibaraki

'882 in order to achieve the benefit of allowing the vehicle to remain safe for driving in the event of a failure. *Id.* (citing Ex. 1408 ¶¶ 476–484).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Petitioner fails to establish a motivation to combine Ibaraki '882 with Ibaraki '626. PO Resp. 55–56. Patent Owner argues that Petitioner's reasons to combine Ibaraki '626 with the system in Ibaraki '882 amounts to little more than an argument that the two systems relate to control strategies for hybrid vehicles and contain commonly named inventors from Toyota. *Id.* We disagree. Petitioner does articulate a reason for combining, expressed by Ibaraki '626 itself (preventing the undesirable change in the running performance of the vehicle in the event of a failure of the electronic motor). Pet. 46–49. As discussed above, Petitioner establishes that a person with ordinary skill in the art would have recognized that Ibaraki '882 and Ibaraki '626 disclose "substantially the same general control strategy for operating a parallel hybrid vehicle," and Ibaraki '626 further discloses the benefit of maintaining regular driving performance during the event of a failure. *Id.* at 46–51. Accordingly, a person with ordinary skill in the art would have combined Ibaraki '882 and Ibaraki '626 in order to achieve this benefit in Ibaraki '882. *Id.*

H. Claim 27 – Obviousness over Ibaraki '882 and Lateur

Petitioner contends that claim 27 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Lateur. Pet. 51–54. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claim 27. *Id.*; Ex. 1408.

Dependent claim 27, which depends from independent claim 23, recites "the further step of operating said controller to accept operator input of a desired cruising speed" and "said controller thereafter controlling the instantaneous engine torque output and operation of said motor(s) to supply additional torque as needed in accordance with variation in RL to maintain the speed of said vehicle substantially constant." Petitioner argues that Lateur discloses these limitations. *Id.* at 52–54. Petitioner argues that Lateur discloses that "it was known to design a cruise control device which provided a controller to operator input specifying a desired speed." *Id.* at 52 (citing Ex. 1408 ¶ 521; Ex. 1407 9:47–57, Fig. 11).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Lateur. *Id.* at 51–52. Petitioner argues that the benefit of Lateur's "cruise control" is that it allows "the vehicle operator to relax from constant foot throttle manipulation" and potentially improves the "vehicle's fuel efficiency value by limiting throttle excursions to small steps." *Id.* (citing Ex. 1406, 14). Accordingly, Petitioner argues that a person with ordinary skill in the art would have combined Lateur's "cruise control" functionality with Ibaraki '882's hybrid vehicle in order to allow "the vehicle operator to relax from constant foot throttle manipulation" and potentially improve the "vehicle's fuel efficiency value by limiting throttle excursions to small steps." *Id.* (citing Ex. 1406, 14).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Lateur's "cruise control" feature does not render claim 27 obvious, because, none of the prior art "discloses using road

load as a control variable to determine when to operation the engine." PO Resp. 56–57. We disagree with Patent Owner. As discussed above, Ibaraki '882 discloses the use of road load as a control variable. *See* Sections II.C.2.a, II.C.2.b.

Patent Owner further argues that Petitioner's "argument regarding an alleged rationale to combine Lateur with Ibaraki '882 is conclusory and ignores the actual requirements of the claims." PO Resp. 57–58. We disagree with Patent Owner. As discussed above, Petitioner argues that a person with ordinary skill in the art would have recognized the benefit of "cruise control" functionality is that it permits "the vehicle operator to relax from constant foot throttle manipulation" and potentially improve the "vehicle's fuel efficiency value by limiting throttle excursions to small steps." Pet. 51–52 (citing Ex. 1406, 14). Petitioner further argues that a person with ordinary skill in the art would have combined this functionality with Ibaraki '882 in order to provide this same benefit to the Ibaraki '882 hybrid vehicle. *Id.* As such, we disagree with Patent Owner that Petitioner rationale to combine Lateur with Ibaraki '882 is conclusory.

I. Claims 25 and 26 – Obviousness over Ibaraki '882 and Frank

Petitioner contends that claims 25 and 26 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and Frank. Pet. 54–60. Petitioner provides a detailed analysis, supported by the Declaration of Dr. Davis, explaining how the prior art meets each of the claim limitations of claims 25 and 26. *Id.*; Ex. 1408.

Claims 25 and 26 recite "the further step of employing said controller to monitor RL over time, and to control transition between propulsion of said vehicle by said motor(s) to propulsion by said engine such that said

transition occurs only when RL>SP for at least a predetermined time, or when R>SP2, wherein SP2 is a larger percentage of MTO than SP" and "the further step of employing said controller to monitor RL over time, and to control transition between propulsion of said vehicle by said engine to propulsion by said motor(s) such that said transition occurs only when RL<SP for at least a predetermined time" respectively. Petitioner argues that Frank discloses these limitations. *Id.* at 56–60. Specifically, Petitioner argues that Frank discloses a time based delay between operating modes and a person with ordinary skill in the art would have understood that Frank "recognized the problems associated with 'frequent cycling" that occurs between operating modes of any hybrid vehicle." *Id.* at 57–58 (citing Ex. 1418, 8:32–37, Ex. 1408 ¶¶ 571–580).

Petitioner also articulates reasoning with rational underpinnings on why a person of ordinary skill in the art at the time of the invention would have combined Ibaraki '882 and Frank. *Id.* at 54–56. Petitioner argues that a person with ordinary skill in the art would have recognized the deficiency in Ibaraki '882 that erratic, high frequency cycling between operating modes would result in damage to several parts of the vehicle, such as the engine, motor, clutch, or transmission, and increase exhaust emissions and reduce fuel efficiency. *Id.* (citing Ex. 1408 ¶¶ 545–546). Petitioner explains that a time delay would reduce frequency cycling between operating modes by ensuring the vehicle has fully transitioned between modes, and Frank recognized the problems between frequency cycling and introduced a time delay to solve this problem. *Id.* (citing Ex. 1418, 8:32–37; Ex. 1408 ¶¶ 551–554). Petitioner argues that a person with ordinary skill in the art would have recognized that adding a time delay, as disclosed by Frank, to the

Ibaraki '882 hybrid vehicle would have required nothing more than a simple modification, and that such a person would have been motivated to introduce a time delay in order to solve the problem with frequent cycling. *Id.* (citing Ex. 1408 ¶¶ 539–554, 577–578).

Notwithstanding Patent Owner's arguments, we agree with Petitioner's analysis and conclusion, and adopt them as our own.

Patent Owner argues that Frank discloses "speed-responsive hysteresis," whereas the claims require "road load-based hysteresis," and, therefore, the combination of Ibaraki '882 and Frank fails to teach or suggest claims 25 and 26. PO Resp. 58–59. We disagree with Patent Owner's argument. As discussed above, Ibaraki '882 discloses transitioning between operating modes based on road load. *See* Section II.C.2. Petitioner only relies on Frank to disclose a time delay before transitioning between modes. Pet. 56–60 (citing Ex. 1418, 8:32–37, Ex. 1408 ¶¶ 571–580). As such, Patent Owner's argument is tantamount to an attack on the references separately when the Petitioner's argument is based on what the combination of references teaches or suggests. Nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures. *See In re Merck & Co. Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

Patent Owner further argues that Petitioner "fails to present any rational basis for combining Ibaraki '882 with Frank to arrive at the claimed invention." PO Resp. 59–60. We disagree with Patent Owner. As discussed above, Petitioner explains that a person with ordinary skill in the art would have recognized a problem with Ibaraki '882 is that frequent cycling between operating modes would result in damage to several parts of

the vehicle, such as the engine, motor, clutch, or transmission, and increase exhaust emissions and reduce fuel efficiency. Pet. 54–56 (citing Ex. 1408 ¶¶ 545–546). Petitioner explains that a time delay would reduce frequency cycling between operating modes by ensuring the vehicle has fully transitioned between modes, and Frank recognized the problems between frequency cycling and introduced a time delay to solve this problem. *Id.* (citing Ex. 1418, 8:32–37; Ex. 1408 ¶¶ 551–554). We are persuaded by Petitioner that a person with ordinary skill in the art would have recognized the benefit of a time delay before switching operating modes, and would have been motivated to modify Ibaraki '882 with such a simple modification in order to resolve the problem with frequent cycling.

III. CONCLUSION

We are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 25–30, 32, and 39–41 of the '347 patent are unpatentable.

IV. ORDER

Accordingly, it is hereby:

ORDERED that the *inter partes* review is *dismissed* with respect to claim 23;

FURTHER ORDERED that, based on the grounds under review, claims 25–30, 32, and 39–41 of U.S. Patent No. 7,104,347 B2 have been shown by a preponderance of the evidence to be unpatentable; and

FURTHER ORDERED that this is a Final Written Decision of the Board under 35 U.S.C. § 318(a), and parties to the proceeding seeking

judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner

Case IPR2015-00795
Patent 7,104,347

PATENT OWNER'S NOTICE OF APPEAL

Notice is hereby given, pursuant to 37 C.F.R § 90.2(a), Patent Owners, Paice LLC and the Abell Foundation, Inc. ("Patent Owner"), hereby appeal to the United States Court of Appeals for the Federal Circuit from the Final Written Decision entered on November 1, 2016 (Paper 31) and from all underlying orders, decisions, rulings and opinions that are adverse to Patent Owner, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered November 2, 2015 (Paper 12).

In accordance with 37 C.F.R § 90.2(a)(3)(ii), Patent Owner further indicates that the issues on appeal include, but are not limited to, claim construction; determination of unpatentability of claims 3-5, 14, 16, 19, 20, and 22 of U.S. Patent No. 7,104,347 ("'347 Patent") under 35 U.S.C § 103; any finding or determination supporting or related to those issues (including any finding or determination regarding claim 1); as well as all other issues decided adversely to Patent Owner in any orders, decisions, rulings and opinions.

Contemporaneously with this submission, a copy of the Notice of Appeal is being filed electronically with the Patent Trial and Appeal Board. In addition, a copy of this Notice of Appeal, along with the required docketing fees, are being electronically filed with the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

Date: December 30, 2016

/Linda L. Kordziel/

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Attorney for Patent Owner

CERTIFICATE OF SERVICE

In accordance with 37 CFR § 90.2(a)(1) and § 104.2, I hereby certify that on December 30, 2016, in addition to being filed electronically through the Board's E2E System, the original version of the foregoing, Patent Owner's Notice of Appeal was filed by hand on the Director of the United States Patent and Trademark Office, at the following address:

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
Madison Building East, 10B20
600 Dulany Street
Alexandria, VA 22314-5793

CERTIFICATE OF SERVICE

I hereby certify that on December 30, 2016, a true and correct copy of the foregoing, Patent Owner's Notice of Appeal, along with a copy of the Final Written Decision, was filed electronically with the Clerk's Office of the United States Court of Appeals for the Federal Circuit, at the following address:

United States Court of Appeals for the Federal Circuit
717 Madison Place, N.W., Suite 401
Washington, DC 20005

CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e)(1), the undersigned certifies that on December 30, 2016, a complete and entire copy of this Patent Owner's Notice of Appeal was provided via email, to the Petitioner by serving the email correspondence addresses of record as follows:

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner

Case IPR2015-00794
Patent 7,104,347

PATENT OWNER'S NOTICE OF APPEAL

Notice is hereby given, pursuant to 37 C.F.R § 90.2(a), Patent Owners, Paice LLC and the Abell Foundation, Inc. ("Patent Owner"), hereby appeal to the United States Court of Appeals for the Federal Circuit from the Final Written Decision entered on November 1, 2016 (Paper 31) and from all underlying orders, decisions, rulings and opinions that are adverse to Patent Owner, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered November 2, 2015 (Paper 12).

In accordance with 37 C.F.R § 90.2(a)(3)(ii), Patent Owner further indicates that the issues on appeal include, but are not limited to, claim construction; determination of unpatentability of claims 25-30, 32, and 39-41 of U.S. Patent No. 7,104,347 ("'347 Patent") under 35 U.S.C § 103; any finding or determination supporting or related to those issues (including any finding or determination regarding claim 23); as well as all other issues decided adversely to Patent Owner in any orders, decisions, rulings and opinions.

Contemporaneously with this submission, a copy of the Notice of Appeal is being filed electronically with the Patent Trial and Appeal Board. In addition, a copy of this Notice of Appeal, along with the required docketing fees, are being electronically filed with the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

Date: December 30, 2016

/Linda L. Kordziel/

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Attorney for Patent Owner

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Paper 10
Entered: February 14, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

PAICE LLC & THE ABELL FOUNDATION, INC.,
Patent Owner.

IPR2017-00226, and -00227 (Patent 7,104,347 B2)
IPR2017-00228, -00229, -00230, -00231, -00232,
-00233, -00234, and -00235 (Patent 7,237,634 B2)
IPR2017-00236, and -00237 (Patent 8,214,097 B2) [1]

Before SALLY C. MEDLEY, KALYAN K. DESHPANDE, and CARL M. DEFRANCO, *Administrative Patent Judges*.

MEDLEY, *Administrative Patent Judge*.

JUDGMENT
Termination of the Proceeding
37 C.F.R. § 42.73

[1] This Order applies to each of the above-listed cases. Although we issue one order to be docketed in each case, the parties are not authorized to use this caption for any subsequent papers.

On December 19, 2016, the parties informed the Board that the parties had settled the above-identified proceedings and that the parties sought authorization to file a joint motion to terminate each proceeding. On February 2, 2017, and pursuant to 35 U.S.C. § 317 and 37 C.F.R. § 42.74, the parties filed a joint motion to terminate each of the above-identified proceedings. Paper 7.[2] The parties also filed, in each proceeding, a joint request to have their settlement agreement treated as confidential business information under 35 U.S.C. § 317(b) and 37 C.F.R. § 42.74(c). Paper 8. In each joint motion, the parties represent that the settlement agreement filed is a true copy and resolves their dispute.

Each of these proceedings is in an early stage and no decision whether to institute *inter partes* reviews has been made. Based on the facts of these cases, we determine it is appropriate to terminate the proceedings. Therefore, the joint motions to terminate the proceedings are *granted.*

Accordingly, it is

ORDERED that the joint motions to terminate the proceedings are *granted*; and

FURTHER ORDERED that the parties' joint requests that the settlement agreements be treated as business confidential information, to be kept separate from the patent file are *granted.*

[2] Citations are to IPR2017-00228.

IPR2017-00226, and -00227 (Patent 7,104,347 B2)
IPR2017-00228, -00229, -00230, -00231, -00232,
-00233, -00234, and -00235 (Patent 7,237,634 B2)
IPR2017-00236, and -00237 (Patent 8,214,097 B2)

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Paper 10
Entered: February 14, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
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IPR2017-00226, and -00227 (Patent 7,104,347 B2)
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IPR2017-00236, and -00237 (Patent 8,214,097 B2) [1]

Before SALLY C. MEDLEY, KALYAN K. DESHPANDE, and
CARL M. DEFRANCO, *Administrative Patent Judges*.

MEDLEY, *Administrative Patent Judge*.

JUDGMENT
Termination of the Proceeding
37 C.F.R. § 42.73

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FURTHER ORDERED that the parties' joint requests that the settlement agreements be treated as business confidential information, to be kept separate from the patent file are *granted.*

[2] Citations are to IPR2017-00228.

IPR2017-00226, and -00227 (Patent 7,104,347 B2)
IPR2017-00228, -00229, -00230, -00231, -00232,
-00233, -00234, and -00235 (Patent 7,237,634 B2)
IPR2017-00236, and -00237 (Patent 8,214,097 B2)

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UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

NOTICE OF ENTRY OF JUDGMENT ACCOMPANIED BY OPINION

OPINION FILED AND JUDGMENT ENTERED: 03/07/2017

The attached opinion announcing the judgment of the court in your case was filed and judgment was entered on the date indicated above. The mandate will be issued in due course.

Information is also provided about petitions for rehearing and suggestions for rehearing en banc. The questions and answers are those frequently asked and answered by the Clerk's Office.

Costs are taxed against the appellant in favor of the appellee under Rule 39. The party entitled to costs is provided a bill of costs form and an instruction sheet with this notice.

The parties are encouraged to stipulate to the costs. A bill of costs will be presumed correct in the absence of a timely filed objection.

Costs are payable to the party awarded costs. If costs are awarded to the government, they should be paid to the Treasurer of the United States. Where costs are awarded against the government, payment should be made to the person(s) designated under the governing statutes, the court's orders, and the parties' written settlement agreements. In cases between private parties, payment should be made to counsel for the party awarded costs or, if the party is not represented by counsel, to the party pro se. Payment of costs should not be sent to the court. Costs should be paid promptly.

If the court also imposed monetary sanctions, they are payable to the opposing party unless the court's opinion provides otherwise. Sanctions should be paid in the same way as costs.

Regarding exhibits and visual aids: Your attention is directed Fed. R. App. P. 34(g) which states that the clerk may destroy or dispose of the exhibits if counsel does not reclaim them within a reasonable time after the clerk gives notice to remove them. (The clerk deems a reasonable time to be 15 days from the date the final mandate is issued.)

FOR THE COURT

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

16-1412, 16-1415 - Paice LLC v. Ford Motor Company
United States Patent and Trademark Office, Case Nos. IPR2014-00571, IPR2014-00579

16-1745 – Paice LLC v. Ford Motor Company
United States Patent and Trademark Office, Case No. IPR2014-00884

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1412, 2016-1415

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-00571, IPR2014-00579.

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1745

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2014-00884.

Decided: March 7, 2017

RUFFIN B. CORDELL, Fish & Richardson, PC, Washington, DC, argued for appellants. Also represented by TIMOTHY W. RIFFE, LINDA KORDZIEL, DANIEL TISHMAN, BRIAN JAMES LIVEDALEN.

MATTHEW J. MOORE, Latham & Watkins LLP, Washington, DC, argued for appellee. Also represented by GABRIEL BELL; ANDREW B. TURNER, JOHN P. RONDINI, FRANK A. ANGILERI, SANGEETA G. SHAH, Brooks Kushman PC, Southfield, MI.

Before PROST, *Chief Judge*, SCHALL and STOLL, *Circuit Judges*.

Opinion for the court filed PER CURIAM.

Opinion dissenting-in-part filed by *Circuit Judge* STOLL.

PER CURIAM.

This is an appeal from final written decisions by the Patent Trial and Appeal Board in three inter partes review proceedings that invalidated various claims of Paice's patent relating to hybrid vehicle control strategies. Paice contends that the Board misconstrued two claim terms and lacked substantial evidence to support its obviousness findings. We disagree with Paice and affirm the Board's decisions.

BACKGROUND

In early 2014, Paice LLC and the Abell Foundation (collectively, "Paice") sued Ford Motor Company for infringement of several patents covering hybrid vehicle technology, including U.S. Patent No. 7,104,347. Hybrid cars, in general, contain both a gas-powered engine and one or more battery-powered electric motors that can be used in isolation or in tandem to propel the car. The '347 patent teaches a vehicle control strategy to reduce emissions that operates the engine only when it is efficient to do so and uses the motor to propel the vehicle in scenarios where the engine cannot operate efficiently. The efficient range for engine operation is determined, in part, based on the vehicle's instantaneous torque demands, or road load ("RL"). '347 patent col. 19 ll. 54–56, col. 12 ll. 38–43. Typically, this efficient range occurs when the vehicle's road load is a substantial percentage of the engine's maximum torque output ("MTO"), i.e., when the torque demand is greater than 30% of MTO. *Id.* at col. 20 ll. 52–60, col. 13 ll. 60–61.

The '347 patent teaches that the vehicle can operate in multiple different modes depending on its instantaneous torque requirements, the battery's state of charge, and other operating parameters. *Id.* at col. 19 ll. 54–56. Three possible operating modes include: 1) an electric mode used during low-speed driving in which the required torque is provided to the wheels only by the motor, *id.* at col. 35 l. 66 – col. 36 l. 7; 2) an engine mode used during highway cruising where the engine alone provides the required torque, *id.* at col. 36 ll. 23–39; and 3) a hybrid mode that is used when the torque required is above the engine's MTO and the motor provides the additional torque above that provided by the engine, *id.* at col. 36 ll. 40–46. Claim 1 is illustrative and recites:

1. A hybrid vehicle comprising:

an internal combustion engine controllably coupled to road wheels of said vehicle;

a first electric motor connected to said engine [a]nd operable to start the engine responsive to a control signal;

a second electric motor connected to road wheels of said vehicle, and operable as a motor, to apply torque to said wheels to propel said vehicle, and as a generator, for accepting torque from at least said wheels for generating current;

a battery, for providing current to said motors and accepting charging current from at least said second motor; and

a controller for controlling the flow of electrical and mechanical power between said engine, first and second motors, and wheels,

wherein said *controller starts and operates said engine when torque require[d] to be produced by said engine to propel the vehicle and/or to drive either one or both said electric motor(s) to charge said battery is at least equal to a setpoint (SP)* above which said engine torque is efficiently produced, and wherein the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine.

Id. at col. 58 ll. 13–37 (emphasis added).

Following Paice's assertion of its patents against Ford in the district court, Ford filed a series of inter partes review petitions, three of which were instituted for the '347 patent: the 884, 571, and 579 petitions. The Board

construed the terms "setpoint" and "road load" in all three decisions, but each of the petitions addressed different combinations of prior art references. For example, the 884 petition invalidated claims 1, 7, and 10 of the '347 patent as obvious in light of the Caraceni reference. *Ford Motor Co. v. Paice LLC*, IPR2014-884, 2015 WL 8536739, at *12 (PTAB Dec. 10, 2015) ("*884 Board Decision*"). In the 571 petition, the Board concluded that the Severinsky reference rendered obvious claims 23 and 36 and found that claims 1, 6, 7, 9, 15, and 21 would have been obvious over a combination of Severinsky and the Ehsani reference. *Ford Motor Co. v. Paice LLC*, IPR2014-571, 2015 WL 5782084, at *13 (PTAB Sept. 28, 2015) ("*571 Board Decision*"). Finally, the Board found claims 1, 7, 8, 18, 21, 23, and 37 would have been obvious over the collective teachings of the Bumby references in the 579 petition, which was combined with the 571 petition on appeal to this court. *Ford Motor Co. v. Paice LLC*, IPR2014-579, 2015 WL 5782085, at *17 (PTAB Sept. 28, 2015) ("*579 Board Decision*").

Paice appeals from the Board's final written decisions in all three petitions. We have jurisdiction pursuant to 35 U.S.C. § 141(a) and 28 U.S.C. § 1295(a)(4)(A).

DISCUSSION

Paice raises four main arguments on appeal. First, Paice asserts that the Board improperly construed "setpoint" and "road load" in the '347 patent. Second, Paice faults the Board for concluding that Caraceni teaches certain disputed limitations of claims 1, 7, and 10. Paice next argues that the Board erred in concluding that Severinsky renders obvious claims 23 and 36 and that Severinsky in combination with Ehsani renders obvious claims 1, 6, 7, 9, 15, and 21. Finally, Paice challenges the Board's conclusion that a POSA would have been motivated to combine the Bumby references and that they teach the limitations of claims 1, 7, 8, 18, 21, 23, and 37.

A claim is unpatentable as obvious "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103.[1] We review the Board's ultimate obviousness determination de novo and underlying factual findings for substantial evidence. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). Substantial evidence "means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938). Factual findings underlying the obviousness inquiry include the scope and content of the prior art, the differences between the prior art and the claimed invention, whether there is a motivation to combine prior art references, the level of ordinary skill in the art, and relevant secondary considerations. *Merck & Cie v. Gnosis S.P.A.*, 808 F.3d 829, 833 (Fed. Cir. 2015), *cert. denied*, 137 S. Ct. 297 (2016).

I.

Paice first alleges that the Board erred by construing the claim term "setpoint" as a "predetermined torque value that may or may not be reset." *884 Board* Decision, 2015 WL 8536739, at *4. Paice asserts that the Board's construction misses the fundamental purpose of the setpoint, which Paice claims is to trigger a transition between operating modes, and that this purpose should be included in the construction. We see no error in the Board's construction and decline to read a requirement

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[1] Given the effective filing date of the '347 patent's claims, the version of 35 U.S.C. § 103 that applies here is the one in force preceding the changes made by the America Invents Act. *See* Leahy–Smith America Invents Act, Pub. L. No. 112-29, § 3(n), 125 Stat. 284, 293 (2011).

that the setpoint trigger a transition between operating modes into the construction.

When construing claims, the Board must apply the broadest reasonable construction in light of the patent's specification. *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016). "We review intrinsic evidence and the ultimate construction of the claim de novo." *SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1316 (Fed. Cir. 2015).

Like the Board, we start with the plain claim language. Claim 1, for example requires the controller to "start[] and operate[] said engine when *torque* require[d] to be produced by said engine . . . is at least equal to a setpoint (SP)." '347 patent col. 58 ll. 29–33 (emphasis added). This language equates the setpoint to a torque value and makes clear that the transition requirement Paice urges us to read into the meaning of "setpoint" is included in the claim's structure and need not be read into the definition of setpoint. The claim itself calls for the controller to start the engine, i.e., transition between modes, when the torque required by the engine reaches a setpoint, i.e., a "predetermined torque value that may or may not be reset," *884 Board Decision*, 2015 WL 8536739, at *4.

The specification and dependent claims demonstrate that transitions can occur before a setpoint is reached, in addition to not occurring despite reaching a setpoint, which further bolsters our conclusion that this requirement should not be included in the term's construction. For example, the specification describes a scenario where the driver rapidly depresses the accelerator pedal while in low-speed operation—indicating an urgent need for full power—which causes the engine to start "*before* the road load reaches any particular setpoint SP." '347 patent col. 41 ll. 14–19 (emphasis added). The specification also teaches hysteresis in the mode-switching determination,

meaning that a new mode might be entered "only after the road load exceeded a first, lower setpoint SP *for an extended period of time*." *Id.* at col. 41 ll. 41–43 (emphasis added). Similarly, several claims that depend from claim 1 show that a transition will only occur if the setpoint has been maintained for a period of time. Claim 3 uses the controller to effect a transition "only when RL>SP *for at least a predetermined time*." *Id.* at col. 58 ll. 41–46 (emphasis added). Claim 4 requires the controller to switch from engine propulsion to motor propulsion but "only when RL<SP *for at least a predetermined time*." *Id.* at col. 58 ll. 48–52 (emphasis added). Accordingly, for all these reasons, we agree with the Board's construction of setpoint.

We also discern no error in the Board's construction of the term "road load" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative." *884 Board Decision*, 2015 WL 8536739, at *3. The Board's construction is amply supported by the specification, which repeatedly defines the road load as the vehicle's instantaneous torque requirement. *See, e.g.*, '347 patent col. 12 ll. 38–42 ("The '817 and '743 applications also disclose that the vehicle operating mode is determined by a microprocessor responsive to the 'road load', that is, the vehicle's instantaneous torque demands, i.e., that amount of torque required to propel the vehicle at a desired speed."); *id.* at col. 38 ll. 41–42 ("FIG. 7(*a*) shows the vehicle's instantaneous torque requirement, that is, the 'road load' . . . ."); *id.* at col. 36 ll. 8–10, col. 40 ll. 24–25.

Despite acknowledging that the Board "properly construed" road load, Paice alleges that the Board impermissibly broadened the construction during its invalidity analysis to encompass not only the instantaneous torque required to propel the vehicle—the Board's construction—*but also* the driver's request for torque "as indicated by mere accelerator pedal position." Appellant Br. 29 (16-

1745 appeal). According to Paice, the accelerator pedal position alone does not identify the road load, and the Board's application of this broader construction to the prior art references was error. We view Paice's argument as a challenge to the Board's application of its claim construction, which we address in various sections below and review for substantial evidence. We also note that the '347 patent itself does not disclose how to determine road load other than by reference to the accelerator pedal position. In discussing the prior art, for example, the specification states: "the operator's depressing the accelerator pedal signifies an increase in desired speed, *i.e., an increase in road load,* while reducing the pressure on the accelerator or depressing the brake pedal signifies a desired reduction in vehicle speed." '347 patent col. 12 ll. 46–50 (emphasis added); *see also id.* at col. 30 ll. 1–2 (determining road load "by measuring the rate at which the operator depresses accelerator pedal").

II.

Paice next articulates several reasons for reversing the Board's conclusion that claims 1, 7, and 10 are obvious over the Caraceni reference. First, with respect to all three claims, Paice alleges that Caraceni fails to disclose using a setpoint to start and operate the gas engine. Next, Paice claims that Caraceni does not disclose a battery for providing current to the first and second electric motors, as required by all three claims. Finally, Paice contends that Caraceni does not meet the road load limitation of claim 7. We find none of these arguments persuasive and that substantial evidence supports the Board's contrary fact findings.

A.

Paice first argues that the decision to operate the engine in Caraceni is a manual one and that there is no disclosure in Caraceni's hybrid mode of starting the engine because of a setpoint, as required by claims 1, 7,

and 10. Paice also contends that the contrary testimony of Ford's expert, Dr. Davis, is nothing more than hindsight bias that relies on the teachings of the '347 patent to explain how to use its patented method to accomplish Caraceni's goal of operating the gas engine when the specific fuel consumption is low. These arguments were considered and rejected by the Board. And we find that substantial evidence supports the Board's finding that, when operating in hybrid mode, Caraceni compares "the torque require[d] to be produced by said engine to propel the vehicle" to a torque-based setpoint and starts the engine if that torque is at least equal to the setpoint, as required by claims 1, 7, and 10.[2]

Although the driver in Caraceni manually selects the vehicle's mode of operation—all-electric, engine-only, or hybrid—substantial evidence supports the Board's finding that, once the driver selects the hybrid mode, Caraceni's vehicle management unit ("VMU") maximizes fuel efficiency by automatically splitting power between the

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[2] Paice also contends that the Board lacks substantial evidence to support its finding that Caraceni uses a torque-based setpoint to start and operate the gas engine to charge the battery. We need not reach this argument because the broadest reasonable construction of claim 1 only requires that the torque-based setpoint be used either to start and operate the engine to propel the vehicle or to charge the battery, but not both. '347 patent col. 58 ll. 29–33 (requiring a "controller [to] start[] and operate[] said engine when torque require[d] to be produced by said engine to [1] propel the vehicle *and/or* [2] to drive either one or both said electric motor(s) to charge said battery is at least equal to a setpoint (SP)" (emphasis added)). Indeed, Paice admitted in its briefing for the related 16-1412 and 16-1415 appeals "that the limitation is written in the disjunctive." Appellant Reply Br. 27.

engine and electric motor according to the control algorithm depicted graphically in Figure 9 of Caraceni. *884 Board Decision*, 2015 WL 8536739, at *8. As the Board emphasized in its decision, Caraceni states that, in "hybrid mode," the VMU "*activates the two drive trains* through the inverter for the electric motor and the engine electronic control unit respectively." *Id.* (quoting J.A. 1392).[3] Thus, contrary to Paice's suggestion, substantial evidence supports the Board's finding that the VMU, not the driver, activates the engine and motor in hybrid mode. The Board's finding is further supported by the testimony of Ford's expert, Dr. Davis, who cited portions of Caraceni to reasonably demonstrate that, in the hybrid mode, Caraceni's VMU sends control signals to start and operate the gas engine. J.A. 1893–94.

The Board's finding that Caraceni discloses a hybrid mode in which the VMU starts and operates the engine when the torque required to propel the vehicle is at least equal to a torque-based setpoint is further supported by Dr. Davis's annotated version of Caraceni Figure 9 and supporting testimony. Annotated Figure 9 is shown below:

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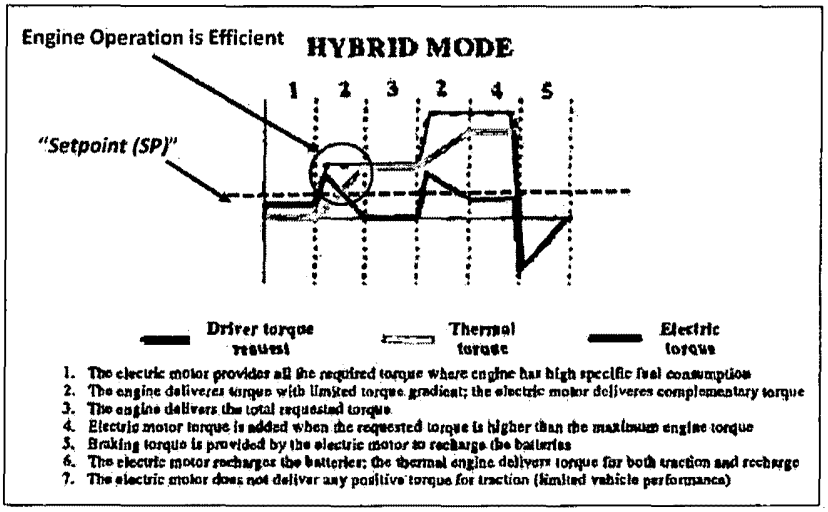
[3] Appendix citations in this section are to the 16-1745 appeal materials.



884 Board Decision, 2015 WL 8536739, at *9 (reproducing figure on J.A. 1904). As Dr. Davis explained and annotated Figure 9 fairly clearly depicts, the engine is off in region 1 and the motor alone propels the vehicle. *Id.* (citing J.A. 1902–05, ¶¶ 275–79). Dr. Davis further testified that, in the transition between regions 1 and 2, as the driver's request for torque increases above a predetermined threshold level—noted by Dr. Davis using a green dashed line—the engine is automatically activated by Caraceni's VMU. *Id.* We find that Dr. Davis's testimony and annotated Figure 9 provide substantial evidence to support the Board's finding that Caraceni's engine is started and operated based on a setpoint when in hybrid mode.

B.

In addition, substantial evidence supports the Board's finding that Caraceni discloses a traction battery for providing current to the engine starter and electric motor, thus satisfying the requirement of claims 1, 7, and 10 of a battery that provides current to the first and second

electric motors. It is true that, as Paice points out, Caraceni does not depict a connection between the traction battery and the engine starter. Nor does Caraceni state that such a connection exists. But, as the Board explained, Caraceni's engine starter must be connected to a battery to operate, and Caraceni discloses only one battery—the traction battery. *Id.* at *10–11; *see also* J.A. 1392 (Figure 10). These two facts are undisputed on the record and provide substantial evidence in support of the Board's finding that one of ordinary skill in the art would have understood that the traction battery needed to be connected to the engine starter.

In its opinion, the Board relied on "common sense" to conclude that "a skilled artisan would have readily understood that the 'engine starter' needed to be connected, directly or indirectly, to one of the battery packs that make up the 'traction battery.'" *884 Board Decision*, 2015 WL 8536739, at *11. Citing *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355 (Fed. Cir. 2016), Paice argues that the Board erred by relying on "common sense" to supply a missing element in the claims. First, we note that the Board only resorted to common sense as a secondary rationale for its conclusion that Caraceni's engine starter receives current from the traction battery. *884 Board Decision*, 2015 WL 8536739, at *11 (introducing the common sense argument with the phrase "[e]ven so").

In any event, we conclude that the Board did not err by invoking common sense in its analysis. In *Arendi*, this court held that the Board can rely on common sense to inform its obviousness analysis "if explained with sufficient reasoning." *Arendi*, 832 F.3d at 1361. Continuing, this court explained that the Board's "common sense" determination cannot be conclusory or unsupported by substantial evidence. *Id.* at 1366. In this case, the Board's conclusion that, "as a matter of common sense," a skilled artisan would have understood that the engine starter needed to be connected to the traction battery was

supported by the undisputed fact that Caraceni's engine starter must be connected to a battery and Caraceni only discloses one battery. Because it was supported by substantial evidence, the Board's common sense analysis did not run afoul of *Arendi*. As such, we conclude that the Board properly relied on a common sense analysis.

Finally, we address Paice's factual assertion that Caraceni's engine starter would have been connected to a standard battery because it would have been too small to accept current from the traction battery. As the Board noted, "[n]owhere does Caraceni disclose that the 'engine starter' is connected to a standard battery." *884 Board Decision*, 2015 WL 8536739, at *11. The Board also credited Dr. Davis's testimony, including his testimony explaining that one of ordinary skill in the art reading Caraceni would have understood that Caraceni's engine starter was an electric motor that could not operate unless a current is supplied from the car battery. Though not specifically cited by the Board, Dr. Davis testified at length that, by 1993, there were several well-known techniques for providing power to a starter motor using a hybrid battery like the traction battery. On this record, we find substantial evidence to support the Board's holding that this limitation is obvious in view of Caraceni.

C.

Paice also alleges that Caraceni does not disclose claim 7's requirement that the vehicle is operated in one of a plurality of operating modes based on a comparison of road load to a setpoint. According to Paice, the Board erred by relying solely on Caraceni's required traction torque, which is set by the accelerator pedal position, to teach road load because road load also must account for external factors such as wind, rolling friction, and grade. The Board's finding to the contrary, however, is supported by substantial evidence.

As stated above, we agree with the Board that the term "road load," properly construed, means "the amount of instantaneous torque required to propel the vehicle, be it positive or negative." When applying this construction, the Board correctly noted that the '347 patent's specification itself undermines Paice's argument by tying the accelerator pedal position to road load: "the operator's depressing the accelerator pedal signifies an increase in desired speed, *i.e., an increase in road load.*" *884 Board Decision*, 2015 WL 8536739, at *3 (quoting '347 patent col. 12 ll. 45–51). In fact, the '347 patent's specification does not disclose how to determine road load other than by reference to the accelerator pedal position. The Board also properly relied on the testimony of Ford's expert, Dr. Davis, in concluding that Caraceni's use of the required traction torque to select whether to operate the engine, motor, or both in Caraceni's hybrid mode is no different than using road load as recited in claim 7. *Id.* at *11 (citing J.A. 1913–26, ¶¶ 297–317). Given this record, we conclude that substantial evidence supports the Board's finding that Caraceni discloses the road load limitations in claim 7.

III.

Paice also challenges the Board's conclusion that claims 23 and 36 are obvious in view of Severinsky and that claims 1, 6, 7, 9, 15, and 21 are obvious based on Severinsky in combination with Ehsani. Specifically, Paice advances a series of interrelated arguments focusing on whether Severinsky discloses the use of road load and a setpoint to make decisions on the operating mode and charging of the battery. We find that substantial evidence supports the Board's fact findings, and we discern no error in its conclusion that the claims are obvious.

A.

Paice first asserts that the Board erred in finding that Severinsky[4] teaches a comparison of road load to a set-point to determine when to operate the engine as required by claims 1, 6, 7, 9, 15, 21, 23, and 36. According to Paice, Severinsky's microprocessor uses speed to make such determinations regarding operation of the engine. There is substantial evidence, however, to support the Board's determination that, although Severinsky describes the use of speed as a factor considered by the microprocessor, it also uses the vehicle's torque requirements, or road load, in determining when to operate the engine. For example, the Board relied on the following passage from Severinsky: "It will be appreciated that according to the invention the internal combustion engine is run *only* in the near vicinity of its most efficient operational point, that is, such that it produces 60-90% of its maximum torque whenever operated." U.S. Patent No. 5,343,970 col. 20 ll. 63–67 (emphasis added); *571 Board Decision*, 2015 WL 5782084, at *8. The Board found Dr. Davis's interpretation of this passage credible when he explained that "[t]he lower end of the 60-90% range disclosed by Severinsky '970 would also be known as the proposed 'predetermined torque value' or '*setpoint*' below which the engine does not operate." J.A. 1586, ¶ 204; *571 Board Decision*, 2015 WL 5782084, at *10.[5] The Board was further persuaded by Dr. Davis's testimony that Severinsky "is generally, if not always, using torque/road load in its mode decisions." *571 Board Decision*, 2015 WL

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[4] The Severinsky reference was incorporated into, and shares an inventor with, the '347 patent. '347 patent col. 10 ll. 37–41.

[5] Appendix citations in this section and Section IV, *infra*, are to the materials from the combined joint appendix in the 16-1412 and 16-1415 appeals.

5782084, at *10 (quoting J.A. 3326, ¶ 19). After reviewing the record and the Board's analysis, we conclude that substantial evidence supports the Board's fact finding that Severinsky teaches a comparison of road load to a setpoint to determine when to operate the engine.

B.

Even if Severinsky does rely on torque as a control variable, Paice alleges that Severinsky's discussion of the 60-90% efficient torque range refers to *output* torque as opposed to *input* torque and, thus, the Board erred in finding claims 1, 6, 7, 9, 15, 21, 23, and 36 obvious in view of Severinsky or based on Severinsky in view of Ehsani. The Board concluded that road load is an output torque, not an input torque, "for the simple reason" that the claims compare road load to the engine's maximum torque output. *Id.* at *11. We disagree with the Board's reinterpretation of "road load" as including output torque. As we noted above, the Board properly construed "road load" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative." The Board erred by reinterpreting the claim.

Nonetheless, the '347 patent itself admits that Severinsky discloses a torque-based control mode, stating: "an important aspect of the invention of the [Severinsky] '970 patent" is improving efficiency "by operating the internal combustion engine only at relatively high torque output levels." '347 patent col. 25 ll. 4–7. Although this passage refers to output torque, the next sentence discusses the required torque, or input torque: "[w]hen the vehicle operating conditions *require torque* of this approximate magnitude, the engine is used to propel the vehicle" and "when *less torque is required*, an electric motor powered by electrical energy stored in a substantial battery bank drives the vehicle." *Id.* at col. 25 ll. 8–13 (emphases added). These "same advantages," the '347 patent notes, are "provided by the system of the present invention." *Id.*

at col. 25 ll. 15–16. Accordingly, we conclude that the Board's finding that Severinsky relies on road load to start and operate the engine and motor was supported by substantial evidence.

C.

Paice also argues that Severinsky does not render claims 23 and 36 obvious because Severinsky uses speed and the battery's state of charge as the two criteria for determining when to charge the battery, not road load and the state of battery charge as recited by claim 23.[6] The claim requires an exception to the general rule of not operating the engine when road load is less than the setpoint; specifically, the claim requires operating the engine when road load is less than the setpoint and "the state of charge of said battery indicates the desirability of doing so." '347 patent col. 60 ll. 46–51.

Substantial evidence supports the Board's finding that Severinsky discloses this same operation. The Board found that Severinsky, like the '347 patent, teaches a battery charging mode that is responsive to the state of charge of the battery. *571 Board Decision*, 2015 WL 5782084, at *12. We agree.

At the outset, we observe that this recitation has two components: (1) "using the torque between RL and SP to drive said at least one electric motor;" and (2) "to charge said battery when the state of charge of said battery indicates the desirability of doing so." '347 patent col. 60 ll. 46–51. In other words, the first component evaluates the magnitude of the torque used to charge the battery and the second requires the state of charge to indicate the desirability of doing so. The Board's decision, and the

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[6] The Board also rejected claim 9 and its battery charging limitation for the same reasons as claim 23. *571 Board Decision*, 2015 WL 5782084, at *13.

parties' arguments to the Board, primarily focused on the second component of this recited feature. *See 571 Board Decision*, 2015 WL 5782084, at *12 ("But the problem with [Paice's] argument is that the claimed invention recites the same approach as Severinsky—using the 'state of charge of the battery' to indicate when charging is necessary."). Yet on appeal, Paice primarily focuses on the first component; in particular, whether Severinsky uses the excess road load to charge the battery. During oral argument, Paice conceded the conventional nature of at least using excess torque to charge the battery:

> COURT: "Do you think it's conventional, the part in the claim that talks about . . . the excess amount of energy, which is defined in the claim as SP minus RL, do you think . . . that part is conventional?"
>
> MR. CORDELL (counsel for Paice): "No because SP is not conventional. . . . [I]t is conventional to use excess torque from the engine or energy . . . it is conventional to use excess power to charge the battery because it's free . . . ."

Indeed, Severinsky confirms Paice's concession that it is conventional to use excess torque to charge the battery. *See* '970 patent col. 10 ll. 32–36 (describing a downhill scenario in which the driver removes his foot from the accelerator pedal and the engine's excess torque can be used to charge the batteries). As cited above, Paice, however, does not concede that using the difference between setpoint and road load is conventional. But as Dr. Davis explained, a POSA would understand from this passage that, even though the torque required to propel the vehicle may be less than the setpoint because the car is traveling downhill, the engine will continue to operate above the setpoint and will use its excess torque to charge the battery if the battery requires charging. J.A. 1623–25, ¶¶ 296–97. This constitutes substantial evidence to

support the Board's finding that Severinsky discloses the battery charging limitation in claims 23 and 36.

IV.

Finally, Paice asserts that the Board erred in holding claims 1, 7, 8, 18, 21, 23, and 37 obvious in view of the Bumby references. Specifically, Paice asserts that the Board lacked a motivation to combine the Bumby references for purposes of its obviousness analysis, that the Board impermissibly cherry-picked elements from distinct embodiments disclosed by the Bumby references, and that several claim limitations were not satisfied by the Bumby references. We disagree.

First, Paice argues that the Board did not establish a motivation to combine the Bumby references—five articles sharing one common author—which Paice views as a series of disparate references relating to various different aspects of hybrid vehicle design. Motivation to combine prior art references is a question of fact, *Merck*, 808 F.3d at 833, and Paice's arguments cannot overcome the substantial evidence relied on by the Board to support its reasons for combining the references.

The Board found that "the Bumby references document, chronologically, the evolution of a hybrid vehicle project undertaken by Professor James Bumby and his team." *579 Board Decision*, 2015 WL 5782085, at *9. This finding was supported by a later-published thesis by Philip Masding—an author on two of the Bumby references—which "brings together the five Bumby references in a single compilation and summarizes the efforts" of Dr. Bumby and his team. *Id.*

In addition, Paice asserts that the Board erred by combining elements from separate, allegedly incompatible embodiments in the Bumby references without providing a supporting rationale for the specific combination. Paice cites *Boston Scientific Scimed, Inc. v. Cordis Corp.*,

554 F.3d 982 (Fed. Cir. 2009) for support. In *Boston Scientific*, one reference disclosed all of the asserted claim's elements, but those elements were taught by two different embodiments that were pictured side-by-side in the patent. This court nonetheless found that claim obvious because "[c]ombining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness." *Id.* at 991. We also acknowledged that as long as a POSA "can implement a predictable variation, § 103 likely bars its patentability." *Id.* (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)). Here, the Board combined portions of the optimal and sub-optimal control strategies that are disclosed in the Bumby II and Bumby III references, each of which provides a method for controlling the performance of a hybrid vehicle. Bumby II acknowledges that the sub-optimal strategy was derived from the optimal strategy by simplifying its algorithm based on the tendencies of the optimal strategy to select engine operation whenever an operating point can be obtained near the high-efficiency region. J.A. 5629–30. And Bumby III discusses these two embodiments in sequential subsections of its "Control of the Hybrid Electric Drivetrain" section. J.A. 5638–41. Like the combination of two side-by-side embodiments in *Boston Scientific*, we view the combination of elements from the optimal and sub-optimal embodiments as a "predictable variation" that does not "require a leap of inventiveness." *Boston Sci.*, 554 F.3d at 991. As such, we discern no error in the Board's opinion.

Paice also asserts that the Board lacked substantial evidence to support its findings that the Bumby references disclosed several limitations of the challenged claims. First, Paice argues that the Bumby references do not use road load and a setpoint to determine when and how to charge the battery, as required by claims 1 and 23. The Board disagreed, relying on passages from Bumby II and Bumby V that it found "suggest that, when the torque

required to propel the vehicle is less than a certain value, or setpoint, the excess torque output of the engine is used to charge the battery." *579 Board Decision*, 2015 WL 5782085, at *16. Dr. Davis's expert report supported the Board's conclusion, *see* J.A. 5783–85, ¶¶ 284–86; J.A. 5846–51, ¶¶ 438–49, and the Board also noted that its understanding was confirmed by Dr. Davis's deposition testimony. Based on this record, we conclude that substantial evidence supports the Board's finding that the Bumby references teach the battery charging limitations in claims 1 and 23.

Paice also argues that the Bumby references rely on demand power, instead of road load, as the control variable and focus on selecting the optimum gear ratio rather than comparing road load to a setpoint. The Board considered and rejected these arguments, and its contrary conclusions are supported by substantial evidence. Even though demand power is an input, the Board found that "the suboptimal control algorithm *converts the instantaneous power* and speed requirement *into a torque* and speed demand." *579 Board Decision*, 2015 WL 5782085, at *12 (quoting J.A. 5630). The Board found that the Bumby references teach using those torque and speed demands to select the mode of operation. *Id.* Indeed, the Board reasoned that the fact that the sub-optimal control strategy is based on a boxed region defined by upper and lower torque and speed bounds "would have suggested to a skilled artisan a setpoint that utilizes torque as a factor in determining the operational mode." *Id.* at *11. Moreover, the Board relied on passages from the Bumby references that expressly disclose calculations to determine the required torque at the wheels (albeit in the optimal control strategy), and on Dr. Davis's expert report, which "confirm[ed] that a skilled artisan would have understood these references as speaking to the road load required to propel the vehicle." *Id.* at *13.

CONCLUSION

We have considered Paice's remaining arguments and find them unpersuasive. For the reasons stated above, the Board's claim constructions were not erroneous and substantial evidence supports the Board's fact findings and legal conclusions in holding the challenged claims invalid on obviousness grounds. Accordingly, we affirm the Board's decisions in the appealed IPRs.

AFFIRMED

COSTS

Costs to Appellees.

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1412, 2016-1415

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-00571, IPR2014-00579.

PAICE LLC, THE ABELL FOUNDATION, INC.,
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v.

FORD MOTOR COMPANY,
Appellee

2016-1745

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2014-00884.

STOLL, *Circuit Judge*, dissenting-in-part.

I respectfully dissent with respect to Section III.C on the ground that there is no substantial evidence to support the Board's conclusion that claims 9, 23, and 36 would have been obvious in view of Severinsky. The Board's decision does not adequately explain its bases for concluding that Severinsky teaches "employing said engine to propel said vehicle when the torque RL required to do so is less than said lower level SP and using the torque between RL and SP to drive said at least one electric motor to charge said battery when the state of charge of said battery indicates the desirability of doing so," '347 patent col. 60 ll. 46–52, as required by claims 23 and 36. Nor has the Board provided sufficient rationale to support its conclusion that Severinsky teaches claim 9's specific requirement of "a low-speed battery charging mode II." *Id.* at col. 59 ll. 13–24.

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Questions and Answers

Petitions for Rehearing (Fed. Cir. R. 40) and Petitions for Hearing or Rehearing En Banc (Fed. Cir. R. 35)

Q. When is a petition for rehearing appropriate?

A. Petitions for panel rehearing are rarely successful because they most often fail to articulate sufficient grounds upon which to grant them. For example, a petition for panel rehearing should not be used to reargue issues already briefed and orally argued; if a party failed to persuade the court on an issue in the first instance, a petition for panel rehearing should not be used as an attempt to get a second "bite at the apple." This is especially so when the court has entered a judgment of affirmance without opinion under Fed. Cir. R. 36. Such dispositions are entered if the court determines the judgment of the trial court is based on findings that are not clearly erroneous, the evidence supporting the jury verdict is sufficient, the record supports the trial court's ruling, the decision of the administrative agency warrants affirmance under the appropriate standard of review, or the judgment or decision is without an error of law.

Q. When is a petition for hearing or rehearing en banc appropriate?

A. En banc decisions are extraordinary occurrences. To properly answer the question, one must first understand the responsibility of a three-judge merits panel of the court. The panel is charged with deciding individual appeals according to the law of the circuit as established in the court's precedential opinions. While each merits panel is empowered to enter precedential opinions, the ultimate duty of the court en banc is to set forth the law of the Federal Circuit, which merit panels are obliged to follow.

Thus, as a usual prerequisite, a merits panel of the court must have entered a precedential opinion in support of its judgment for a suggestion for rehearing en banc to be appropriate. In addition, the party seeking rehearing en banc must show that either the merits panel has failed to follow identifiable decisions of the U.S. Supreme Court or Federal Circuit precedential opinions or that the merits panel has followed circuit precedent, which the party seeks to have overruled by the court en banc.

Q. How frequently are petitions for rehearing granted by merits panels or petitions for rehearing en banc accepted by the court?

A. The data regarding petitions for rehearing since 1982 shows that merits panels granted some relief in only three percent of the more than 1900 petitions filed. The relief granted usually involved only minor corrections of factual misstatements, rarely resulting in a change of outcome in the decision.

En banc petitions were accepted less frequently, in only 16 of more than 1100 requests. Historically, the court itself initiated en banc review in more than half (21 of 37) of the very few appeals decided en banc since 1982. This sua sponte, en banc review is a by-product of the court's practice of circulating every precedential panel decision to all the judges of the Federal Circuit before it is published. No count is kept of sua sponte, en banc polls that fail to carry enough judges, but one of the reasons that virtually all of the more than 1100 petitions made by the parties since 1982 have been declined is that the court itself has already implicitly approved the precedential opinions before they are filed by the merits panel.

Q. Is it necessary to have filed either of these petitions before filing a petition for certiorari in the U.S. Supreme Court?

A. No. All that is needed is a final judgment of the Court of Appeals. As a matter of interest, very few petitions for certiorari from Federal Circuit decisions are granted. Since 1982, the U.S. Supreme Court has granted certiorari in only 31 appeals heard in the Federal Circuit. Almost 1000 petitions for certiorari have been filed in that period.

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

INFORMATION SHEET

FILING A PETITION FOR A WRIT OF CERTIORARI

There is no automatic right of appeal to the Supreme Court of the United States from judgments of the Federal Circuit. You must file a petition for a writ of certiorari which the Supreme Court will grant only when there are compelling reasons. (See Rule 10 of the Rules of the Supreme Court of the United States, hereinafter called Rules.)

Time. The petition must be filed in the Supreme Court of the United States within 90 days of the entry of judgment in this Court or within 90 days of the denial of a timely petition for rehearing. The judgment is entered on the day the Federal Circuit issues a final decision in your case. [The time does not run from the issuance of the mandate, which has no effect on the right to petition.] (See Rule 13 of the Rules.)

Fees. Either the $300 docketing fee or a motion for leave to proceed in forma pauperis with an affidavit in support thereof must accompany the petition. (See Rules 38 and 39.)

Authorized Filer. The petition must be filed by a member of the bar of the Supreme Court of the United States or by the petitioner representing himself or herself.

Format of a Petition. The Rules are very specific about the order of the required information and should be consulted before you start drafting your petition. (See Rule 14.) Rules 33 and 34 should be consulted regarding type size and font, paper size, paper weight, margins, page limits, cover, etc.

Number of Copies. Forty copies of a petition must be filed unless the petitioner is proceeding in forma pauperis, in which case an original and ten copies of the petition for writ of certiorari and of the motion for leave to proceed in forma pauperis. (See Rule 12.)

Where to File. You must file your documents at the Supreme Court.

Clerk
Supreme Court of the United States
1 First Street, NE
Washington, DC 20543
(202) 479-3000

No documents are filed at the Federal Circuit and the Federal Circuit provides no information to the Supreme Court unless the Supreme Court asks for the information.

Access to the Rules. The current rules can be found in Title 28 of the United States Code Annotated and other legal publications available in many public libraries.

NOTE: This order is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1412, 2016-1415

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-00571, IPR2014-00579.

ON PETITION FOR REHEARING EN BANC

Before PROST, *Chief Judge*, NEWMAN, LOURIE, SCHALL*, DYK, O'MALLEY, REYNA, WALLACH, TARANTO, CHEN, HUGHES, and STOLL, *Circuit Judges*. **

PER CURIAM.

ORDER

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* Circuit Judge Schall participated only in the decision on the petition for panel rehearing.

** Circuit Judge Moore did not participate.

Appellants Paice LLC and The Abell Foundation, Inc. filed a petition for rehearing en banc. The petition was first referred as a petition for rehearing to the panel that heard the appeal, and thereafter the petition for rehearing en banc was referred to the circuit judges who are in regular active service.

Upon consideration thereof,

IT IS ORDERED THAT:

(1) The petition for panel rehearing is denied.

(2) The petition for rehearing en banc is denied.

The mandate of the court will issue on May 15, 2017.

FOR THE COURT

May 8, 2017
Date

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

2016-1412, 2016-1415

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

Appeals from the United States Patent and Trademark Office in Nos. IPR2014-00571, IPR2014-00579.

MANDATE

In accordance with the judgment of this Court, entered March 7, 2017, and pursuant to Rule 41(a) of the Federal Rules of Appellate Procedure, the formal mandate is hereby issued.

FOR THE COURT

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

cc: Frank A. Angileri
Gabriel Bell
Ruffin B. Cordell
Brian James Livedalen
Matthew J. Moore
Timothy W. Riffe
John P. Rondini
Sangeeta G. Shah
Daniel Tishman
Andrew B. Turner
United States Patent and Trademark Office

Nos. 2016-1412, -1415

United States Court Of Appeals for the Federal Circuit

PAICE LLC & THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

APPEALS FROM THE UNITED STATES PATENT AND TRADEMARK OFFICE, PATENT TRIAL AND APPEAL BOARD IN NOS. IPR2014-00571 AND IPR2014-00579

ADMINISTRATIVE PATENT JUDGES SALLY C. MEDLEY, KALYAN K. DESHPANDE, AND CARL M. DEFRANCO

APPELLANTS' PETITION FOR REHEARING EN BANC

Ruffin B. Cordell
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ATTORNEYS FOR APPELLANTS,
PAICE LLC & THE ABELL
FOUNDATION, INC.

Amended Certificate of Interest

Pursuant to Federal Circuit Rule 47.4, counsel for the Appellants Paice LLC and the Abell Foundation, Inc. certifies the following:

1. The full name of every party or amicus represented by me is:

   Paice LLC and the Abell Foundation, Inc.

2. The name of the real party in interest represented by me is:

   Paice LLC and the Abell Foundation, Inc.

3. The parent corporation or publicly held companies that own 10 percent or more of the stock of the parties or amicus curiae represented by me is

   None.

4. The names of all law firms and the partners or associates that appeared for the parties or amicus now represented by me in the trial court or are expected to appear in this court (**and who have not or will not enter an appearance in this case**) are:

   Fish & Richardson P.C.: Kevin E. Greene and Linda Liu Kordziel (no longer with the Firm) and W. Peter Guarnieri (walled from this case and will not enter an appearance).

Date: April 14, 2017 /s/ *Ruffin B. Cordell*

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STATEMENT OF COUNSEL
UNDER FEDERAL CIRCUIT RULE 35(B)(2)

Based on my professional judgment, I believe the panel decision is contrary to the following decision of the Supreme Court of the United States: *U.S. Securities and Exchange Commission v. Chenery Corp.*, 318 U.S. 80 (1943).

/s/ Ruffin B. Cordell
Ruffin B. Cordell
Attorney for Appellants
Paice LLC and Abell Foundation, Inc.

PRELIMINARY STATEMENT

The Supreme Court in *SEC v. Chenery Corp.*, 318 U.S. 80 (1943), required appellate courts to review only fact findings an agency has made and not to supplement those findings. The *Chenery* rule is important because the agency should be required to base its decision on proper grounds and explain those grounds to enable appellate review. The panel here did not hold the agency to the *Chenery* standard; it instead found omissions and errors by the Board, but then made its own fact findings to excuse that error. To stay true to Supreme Court precedent, the panel should have at least vacated and required the Board to articulate supportable findings, as other panels of this Court have done.[1]

STATEMENT OF THE CASE

A. The '347 Patent—Determining When to Turn on an Engine in a Hybrid Car By Comparing Road Load to a Setpoint

The '347 Patent centers on when a hybrid vehicle should use its electric motor, its gas engine, or both. Before the Patent, hybrid vehicles lacked a combination of high performance and good fuel economy. [Appeal -1412, Appx90 (13:11-17).] They used a variety of inefficient and ultimately ineffective parameters to determine when to operate the gas engine verses electric motor. [Appeal -1412, Appx85 (4:42-

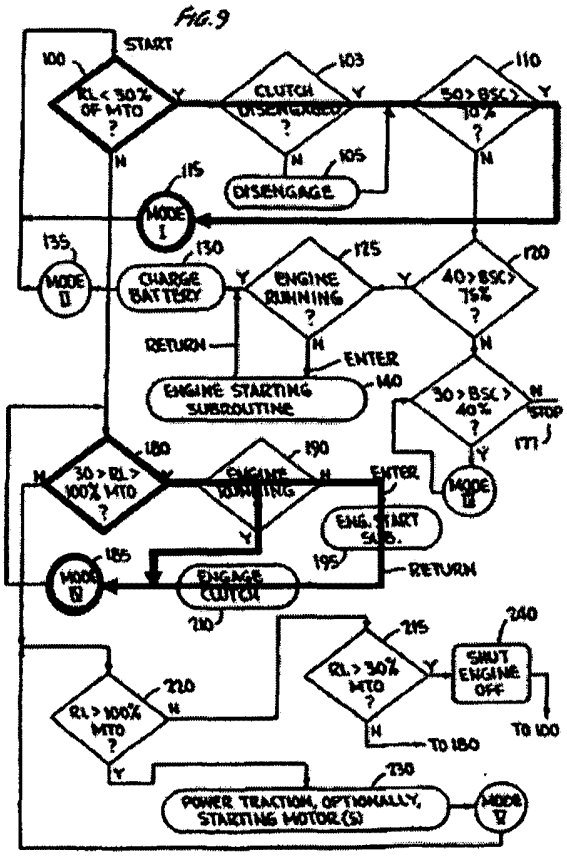
[1] Because the panel's opinion addressed Appeals -1412, -1415, and -1745, Appellants have consolidated their arguments into one petition for convenience of the Court.

57), Appx90 (13:1-17) (describing various prior art control systems).] For example, they looked at inputs like vehicle speed and accelerator pedal position, but those could not take into account varying conditions—*e.g.*, a particular pedal position or speed could vary greatly relative to what a driver needs based on whether the car is going uphill or downhill, is driving in snow, or is at high altitudes. [Appeal -1412, Appx90 (13:11-17).] In fact, the '347 Patent denigrated the use of accelerator pedal position as a control parameter. [Appeal -1412, Appx87 (7:66-8:47).]

The '347 Patent was first to recognize that "widely varying conditions encountered in 'real world' driving situations" create an ever-changing picture for a control system to address, and that the "current torque requirement" at the wheels best encapsulates those conditions into a single value that will always be a good indicator of when the engine should and should not be employed. [Appeal -1412, Appx90 (13:11-17).]

The Patent thus claims triggering hybrid operating mode transitions based on "road load"—"the amount of instantaneous torque required to propel the vehicle, be it positive or negative." To determine when to turn the engine on, the Patent compares this road load torque to a setpoint, which it shows in the algorithm of Figure 9 below–operating in Mode I (electric motor propulsion) if road load (RL) is

under a setpoint of 30% of maximum torque output (MTO)[2] (green lines) and in Mode IV (gas engine propulsion) if RL is between the setpoints of 30% and 100% of MTO (blue lines)]:



[2] MTO represents the maximum torque the engine can produce. [Appeal -1412, Appx727 (20:49-58).] The Patent benchmarks to MTO by describing road load and setpoint as percentages of MTO. [Appeal -1412, Appx737 (39:27-37).]

Representative claim 23 requires evaluating the road load against the setpoint to switch operating modes: "employing said at least one electric motor to propel said vehicle when the torque RL required to do so is less than said lower level SP" and "employing said engine to propel said vehicle when the torque RL required to do so is between said lower level SP and MTO." [Appeal -1412, Appx113.][3]

B. The PTAB Proceeding and this Appeal

The panel's decision involved three IPRs—each addressing different prior art, but the same "setpoint" construction.

Setpoint Construction: Paice urged in each IPR that the term "setpoint" requires a transition between operating modes. *See, e.g.*, Appeal -1412, Blue Br. at 21-30. The Board refused such a construction, and although the panel here did not find it necessary to separately construe the term "setpoint" it nevertheless found the transition requirement "in the claim's structure." *Paice LLC v. Ford Motor Co.*, No. 2016-1412, -- Fed. Appx. --, 2017 WL 900062, at *3 (Fed. Cir. Mar. 7, 2017)

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[3] Claim 1 compares the "torque require[d]" to a setpoint. [Appeal -1412, Appx112.]

("*Paice*").[4] The Board's failure to find any transition requirement in the claims meant that the Board failed to find this element of the claims in the prior art, yet the panel filled that gap.

571 IPR (Appeal -1412):[5] The primary reference in this IPR was an earlier patent[6] to Paice inventor Dr. Alex Severinsky, over which the Board found each challenged claim obvious over Severinsky alone or with a patent to Ehsani.[7] Paice explained that Severinsky compares vehicle speed to a speed-based setpoint, rather than comparing road load. [Appeal -1412, Appx1508 (18:34-38).] The Board acknowledged Severinsky's speed-based control, but found that it also controls for torque, relying on a passage in Severinsky about the engine's ***output*** torque and stating that it interpreted "road load" as an output torque. [Appeal -1412, Appx14-15 (citing Appx1509 (Severinsky) at 20:63–67 ("the internal combustion engine is run only in the near vicinity of its most efficient operational point, that is, such that it produces 60-90% of its maximum torque.")); Appeal -1412, Appx20 ("according

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[4] The claims were 1, 6, 7, 9, 15, 21, 23, and 36—of which 1 and 23 were independent. The panel found that at least claim 1 includes the transition requirement but did not expressly state whether claim 23 does.

[5] Appeals -1412 and -1415 were consolidated for briefing purposes and thus share the same joint appendix. Citations to the briefing and joint appendix are indicated by "Appeal -1412."

[6] U.S. Patent 5,343,970 ("Severinsky") [Appeal -1412, Appx1487-1513.]

[7] U.S. Patent 5,586,613 ("Ehsani") [Appeal -1412, Appx1514-22.] The Board relied on Ehsani only for teaching two electric motors, and it is not relevant here.

to Paice, "road load" (or "RL"), as used in the claims, refers to input torque, not output torque. This argument fails for the simple reason that the claims themselves express "road load" as a torque output, not an input.").]

But as Paice pointed out on appeal, it was wrong to construe road load as an output of the engine, where the claims required it to be a monitored input. Appeal -1412, Blue Br. at 32-38. The panel agreed that the Board erred by misinterpreting road load as "output torque," *Paice*, *7, but then, instead of remanding, the panel looked to a statement in the '347 Patent concerning Severinsky to conclude that Severinsky compares road load to a setpoint (the Board's error notwithstanding)—a passage the Board never considered, and a fact finding the Board never made. *Id.*

The 579 IPR (Appeal -1415): This IPR used different art—a group of five papers termed the "Bumby References" because they share the author J.R. Bumby. The Board found claims 1, 7, 8, 18, 21, 23, and 37 obvious over the Bumby References. The Board found the "road load" and "setpoint" limitations, respectively, in the "optimization process" and the "sub-optimal control algorithm" embodiments of two of the articles. [Appeal -1412, Appx46-47, Appx50.] But it failed to recognize that it borrowed those teachings from different embodiments and consequently failed to make a fact finding on a reason to combine them. [*Id.*] On appeal, the panel agreed with Paice that these features were in different Bumby embodiments and that a reason to combine was needed. *Paice*, *8. But instead of

remanding so that the Board could make that factual determination in the first instance, the panel affirmed by providing its own reason to combine.

The 884 IPR (Appeal -1745): The art here was Caraceni.[8] The Board made a fact finding that Caraceni's "traction torque" satisfied the "road load" requirement. [Appeal -1745, Appx23.] Paice argued on appeal that the "traction torque" merely represents the position of the accelerator pedal, Appeal -1745, Blue Br. at 49-53, and the panel, rather considering whether "traction torque" is "road load," instead made its own fact finding: that accelerator position alone satisfied the "road load" requirement (a finding never made by the Board). The panel reasoned that "the '347 patent's specification does not disclose how to determine road load other than by reference to the accelerator pedal position," *Paice*, *6, again a fact-finding never made by the Board.[9]

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[8] A. Caraceni et al., *Hybrid Power Unit Development for Fiat Multipla Vehicle*, SAE Technical Paper 981124, pub. 1998 [Appeal -1745, Appx1387-94.]

[9] At most, the Board only concluded that "depressing the accelerator pedal 'signifies ... an increase in road load." [Appeal -1745, Appx23 (quoting Appx56, '347 patent at 12:42-51).] [Appeal -1745, Appx23 (quoting Appx56, '347 patent at 12:42-51).] Notably, the same quotation states that depressing the accelerator pedal "signifies an increase in desired speed." But pedal position and speed are not the same thing just like pedal position and road load are not the same thing. Moreover, the claims do not speak to increases in road load. The unremarkable fact that changing pedal position signifies that the driver desires to accelerate which also requires an increase in road load says nothing about comparing the *instantaneous* torque to a setpoint to determine mode. The desired change is not at issue.

ARGUMENT

A. The Panel Violated *Chenery* by Making its Own New Fact Findings

In *SEC v. Chenery Corp.*, 318 U.S. 80 (1943), the Supreme Court established the proposition that appeals courts review agency action, but the agency must make fact findings and articulate them in the first instance. *Id.* at 95. In other words, when an agency gives a wrong reason for a decision, vacatur and remand is appropriate even if an appellate court might have upheld the decision for a different reason. *Id.* The rationale is that the agency should be required to think through the decisions it makes and explain them so that the decisions and the bases therefor may be tested on appeal, and that it is wrong for courts to overtake that role. *Salt River Project Agr. Improvement & Power Dist. v. United States*, 762 F.2d 1053, 1060 n.8 (D.C. Cir. 1985).

Chenery's policy is two-fold. First, *Chenery* recognizes that the appeal court cannot do its job unless the agency sufficiently discloses its rationale supporting its conclusions. *Chenery*, 318 U.S. at 94 ("courts cannot exercise their duty of review unless they are advised of the considerations underlying the [agency] action under review" and that "the orderly functioning of the process of review requires that the grounds upon which the administrative agency acted be clearly disclosed and adequately sustained."). As this Court aptly stated, the agency must "provide an administrative record showing the evidence on which the findings are based,

accompanied by the agency's reasoning in reaching its conclusions." *Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 992 (Fed. Cir. 2017) (internal quotations omitted).

Second, *Chenery* creates a check on the judiciary's ability to intrude on the domain of exclusive agency authority created by Congress. By requiring that the agency develop a full record, *Chenery* "prevents judicial intrusion on agency authority to make factual, policy, and discretionary determinations committed to the agency." *Pers. Web Techs.*, 848 F.3d at 992. In other words, *Chenery* precludes the reviewing court from substituting the agency's basis with what it considers a more adequate or proper basis for the agency action. *SEC v. Chenery Corp.*, 332 U.S. 194, 196 (1947) ("*Chenery* II"). And while there is some debate as to *Chenery*'s reach, there is no debate that *Chenery* precludes a reviewing court from making new fact finding. *See, e.g., In re Comiskey*, 554 F. 3d 967, 974 (Fed. Cir. 2009).[10]

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[10] This Court has consistently applied *Chenery* in refusing to make new fact findings to affirm Board decisions. *See In re Thrift*, 298 F.3d 1357, 1367 (Fed. Cir. 2002) (refusing to affirm an obviousness rejection based on a prior art reference not relied on by the Board because doing so would require, among other things, a determination of whether there was a motivation to combine); *In re Margolis*, 785 F.2d 1029, 1032 (Fed. Cir. 1986) (refusing to consider invalidity grounds based on prior art references submitted to the examiner but not considered by the examiner or the Board); *In re Hounsfield*, 699 F.2d 1320, 1324 (Fed. Cir. 1983) (refusing to

This case represents just what *Chenery* prohibits. The panel here explicitly identified errors in the Board's analysis and fact findings, and interpreted claims in a manner the Board never considered, so that many of the Board's subsequent fact findings were moot. But instead of remanding the case for further consideration, the panel usurped the Board's role as fact finder and provided its own grounds.

This occurred with respect to each IPR here:

- **All IPRs**: The Board found there was no requirement for a transition between hybrid operating modes, whereas the panel did (though for a reason different than Paice had urged). *Paice*, *3. Though the Board never considered this transition requirement when analyzing the prior art, the panel affirmed, filling in the Board's analysis with its own. For example, with respect to the **571 IPR**, the panel went as far as to say that "substantial evidence supports the Board's fact finding that Severinsky teaches a comparison of road load to a setpoint to determine when to operate the engine." *Paice*, *6. The Board, however, never found that Severinsky compares road load to a setpoint, much less effects a transition based on this comparison.

- **571 IPR:** The panel found that the Board erred in its "reinterpretation of 'road load' as including output torque," *Paice*, *7—a reinterpretation necessary to the Board's finding that Severinsky's description of the

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consider new ground for affirmance that would require determination of scope of a prior art patent and a comparison between the claims of the prior art patent and the claims of the application); *Application of Fisher*, 58 C.C.P.A. 1419, 448 F.2d 1406, 1407 (1971) (refusing to consider technical authorities urged by the PTO on appeal but not in the record).

engine output torque satisfied the "road load" limitation. [Appeal -1412, Appx14-15.] But in the face of this serious error, the panel relied on a statement in the '347 Patent describing Severinsky—a statement that the Board did not consider—to conclude that Severinsky relies on road load. *Paice*, *7.[11] So the panel reached the same result as the Board but rejected the fact finding the Board made, and introduced a different one for the first time on appeal.

- **579 IPR:** The panel agreed with Paice that the Board combined teachings from two separate Bumby embodiments to satisfy the "road load" and "setpoint" limitations and that the Board was required to provide a reason to combine them. *Paice*, *8. But the Board made no findings on a reason to combine those teachings because it never even appreciated the distinction between the two embodiments. The panel instead provided its own analysis (and implied fact findings) on reasons to combine. *Paice*, *8.

- **884 IPR:** The Board construed "road load" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative," and never found as a factual matter that mere pedal position satisfies the "road load" term. The panel took a different route, equated Caraceni's discussion of pedal position to "road load" on grounds not addressed by the Board—namely, the panel's finding that "the '347 patent's specification does not disclose how to determine road load other than by reference to the accelerator pedal position," *Paice*, *6 (citing Appeal -1412, Appx89 ('347 patent at 12:46–50)). Notably, the quotation on which the panel relies states that depressing the accelerator pedal "signifies an increase in desired speed" and an "increase in road load." [Appeal -1412, Appx89 ('347 patent at 12:46–50).] It does not state that pedal position and speed are the same thing. Nor does it state that pedal position and road load are the same thing. The best that can

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[11] The panel relied on the statement likely at the direction of Ford's counsel, who mistakenly represented that the Board considered the '347 Patent statement at issue. Oral Argument Tr. 34:10 – 36:00 ([Judge Prost]: "What did the PTAB rely on besides this 60% to 90% language to find that there is a disclosure of using torque or road load in order to determine which engine is provided? [Matthew Moore]: ... It [the Board] also relied on the admissions from the '347 patent that Judge Schall referred to in column 25 lines 4 through 16 of the '347 patent.").

> be said is that pedal position indicates the driver's desire to accelerate, which may have an impact on road load (depending on what other forces are acting on the vehicle such as traveling up or down hill), but this in no way represents the *instantaneous* torque required to propel the vehicle. Recall that the claim requires comparison of this instantaneous value to a setpoint. The fact that the driver is requesting *additional* acceleration does not tell us the instantaneous value to be used to effect the claimed comparison. The panel's incorrect conclusion here demonstrates the risk of the panel making its own fact finding.

Because the panel's affirmance is based, in each instance, on its own grounds and fact findings rather than those of the Board, the decision violates *Chenery*. The panel's divergence from *Chenery* is not inconsequential—it is critical in the context of IPRs that the Board (having the relevant technical expertise) present not only a full and reasoned explanation of its decision, but a correct one. *See In re Sang Su Lee*, 277 F.3d 1338, 1344–45 (Fed. Cir. 2002) ("The Board's findings must extend to all material facts and must be documented on the record, lest the "haze of so-called expertise" acquire insulation from accountability."). To allow the panel to remedy the Board's erroneous factual findings with its own findings not only excuses the Board of accountability, but diminishes the Board's authority and muddies the separation of powers that *Chenery* so dearly protects.

Upon identifying the Board's errors, the panel should have compelled the Board to "think it over" and set forth the bases of its determinations. Henry J. Friendly, "*Chenery Revisited: reflections on Reversal and Remand of Administrative*

Orders," 1969 DUKE L. REV. 199, 209 (1969).[12] Because the panel failed to do so, its decision should be corrected.

B. No Exceptions to *Chenery* Apply Here

No recognized exceptions to the *Chenery* doctrine exist in this case. ***First***, the panel's findings are not purely legal in character. *In re Comiskey*, 554 F. 3d at 974. Each of the panel's independent findings relate to whether the prior art disclosed disputed claim limitations or whether there were reasons to combine certain embodiments—factual determinations that the Board did not make.

Second, the grounds are not very closely related and it is not clear that the agency would have reached the same result under the other rationale. *See Salt River*, 762 F.2d at 1060 n.8. To the contrary, "there is a significant chance that but for the errors the agency might have reached a different result." *Id.* For example, as discussed above with respect to Severinsky, absent the Board's erroneous

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[12] The Board's errors here are even more severe than the Board's errors in other recent cases in which this Court has properly vacated and remanded in view of *Chenery*. For example, in *Personal Web Technologies v. Apple*, 848 F.3d 987, 992-993 (Fed. Cir. 2017) and *In re Nuvasive, Inc.*, 842 F.3d 1376, 1384-1385 (Fed. Cir. 2016), this Court vacated the Board's obviousness determinations because the Board did not sufficiently explain its conclusions. Here, the Court need not weigh sufficiency. In this case, the Board either erred (for example, by erroneously interpreting "road load" as "output torque") or failed to act at all (for example, by failing to provide a reason to combine the embodiments of the "Bumby references"). These errors—errors of commission and errors of omission—require vacatur and remand.

interpretation of "road load" to include output torque (which the panel recognized as error), the Board would not have found that Severinsky's disclosure of engine output torque satisfies the "road load" limitation.

Third, there are no other grounds within the power of the reviewing court to sustain the Board decisions. *Chenery*, 318 U.S. at 88. It is not within the panel's power to formulate alternative grounds based on new fact findings. Fact finding is left to the Board. Because the Board's decision turned on factual findings (*e.g.*, that "road load" includes output torque) while the panel's turned on others (*e.g.*, the discussion of Severinsky in the '347 Patent itself), the panel's decision interferes with the agency's powers. *Dickinson v. Zurko*, 527 U.S. 150, 154-155 (1999).

Because no recognized exceptions to *Chenery* apply, the panel should not have affirmed the Board's erroneous determinations. At minimum, this case should be vacated for the Board to make the necessary factual findings.

CONCLUSION

Because the panel recognized that the Board did not follow a proper path, it should have never affirmed the Board's decisions. At a minimum, it should have vacated the decisions rather than affirming them based on factual determinations that were solely in the ambit of the Board's authority. Accordingly, Appellants respectfully request rehearing *en banc* on the panel's failure to follow *Chenery*.

Date: April 14, 2017

Respectfully submitted,

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FOUNDATION, INC.

Addendum

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1412, 2016-1415

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-00571, IPR2014-00579.

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1745

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2014-00884.

Decided: March 7, 2017

RUFFIN B. CORDELL, Fish & Richardson, PC, Washington, DC, argued for appellants. Also represented by TIMOTHY W. RIFFE, LINDA KORDZIEL, DANIEL TISHMAN, BRIAN JAMES LIVEDALEN.

MATTHEW J. MOORE, Latham & Watkins LLP, Washington, DC, argued for appellee. Also represented by GABRIEL BELL; ANDREW B. TURNER, JOHN P. RONDINI, FRANK A. ANGILERI, SANGEETA G. SHAH, Brooks Kushman PC, Southfield, MI.

Before PROST, *Chief Judge*, SCHALL and STOLL, *Circuit Judges*.

Opinion for the court filed PER CURIAM.

Opinion dissenting-in-part filed by *Circuit Judge* STOLL.

PER CURIAM.

This is an appeal from final written decisions by the Patent Trial and Appeal Board in three inter partes review proceedings that invalidated various claims of Paice's patent relating to hybrid vehicle control strategies. Paice contends that the Board misconstrued two claim terms and lacked substantial evidence to support its obviousness findings. We disagree with Paice and affirm the Board's decisions.

BACKGROUND

In early 2014, Paice LLC and the Abell Foundation (collectively, "Paice") sued Ford Motor Company for infringement of several patents covering hybrid vehicle technology, including U.S. Patent No. 7,104,347. Hybrid cars, in general, contain both a gas-powered engine and one or more battery-powered electric motors that can be used in isolation or in tandem to propel the car. The '347 patent teaches a vehicle control strategy to reduce emissions that operates the engine only when it is efficient to do so and uses the motor to propel the vehicle in scenarios where the engine cannot operate efficiently. The efficient range for engine operation is determined, in part, based on the vehicle's instantaneous torque demands, or road load ("RL"). '347 patent col. 19 ll. 54–56, col. 12 ll. 38–43. Typically, this efficient range occurs when the vehicle's road load is a substantial percentage of the engine's maximum torque output ("MTO"), i.e., when the torque demand is greater than 30% of MTO. *Id.* at col. 20 ll. 52–60, col. 13 ll. 60–61.

The '347 patent teaches that the vehicle can operate in multiple different modes depending on its instantaneous torque requirements, the battery's state of charge, and other operating parameters. *Id.* at col. 19 ll. 54–56. Three possible operating modes include: 1) an electric mode used during low-speed driving in which the required torque is provided to the wheels only by the motor, *id.* at col. 35 l. 66 – col. 36 l. 7; 2) an engine mode used during highway cruising where the engine alone provides the required torque, *id.* at col. 36 ll. 23–39; and 3) a hybrid mode that is used when the torque required is above the engine's MTO and the motor provides the additional torque above that provided by the engine, *id.* at col. 36 ll. 40–46. Claim 1 is illustrative and recites:

1. A hybrid vehicle comprising:

an internal combustion engine controllably coupled to road wheels of said vehicle;

a first electric motor connected to said engine [a]nd operable to start the engine responsive to a control signal;

a second electric motor connected to road wheels of said vehicle, and operable as a motor, to apply torque to said wheels to propel said vehicle, and as a generator, for accepting torque from at least said wheels for generating current;

a battery, for providing current to said motors and accepting charging current from at least said second motor; and

a controller for controlling the flow of electrical and mechanical power between said engine, first and second motors, and wheels,

wherein said *controller starts and operates said engine when torque require[d] to be produced by said engine to propel the vehicle and/or to drive either one or both said electric motor(s) to charge said battery is at least equal to a setpoint (SP)* above which said engine torque is efficiently produced, and wherein the torque produced by said engine when operated at said setpoint (SP) is substantially less than the maximum torque output (MTO) of said engine.

Id. at col. 58 ll. 13–37 (emphasis added).

Following Paice's assertion of its patents against Ford in the district court, Ford filed a series of inter partes review petitions, three of which were instituted for the '347 patent: the 884, 571, and 579 petitions. The Board

construed the terms "setpoint" and "road load" in all three decisions, but each of the petitions addressed different combinations of prior art references. For example, the 884 petition invalidated claims 1, 7, and 10 of the '347 patent as obvious in light of the Caraceni reference. *Ford Motor Co. v. Paice LLC*, IPR2014-884, 2015 WL 8536739, at *12 (PTAB Dec. 10, 2015) ("*884 Board Decision*"). In the 571 petition, the Board concluded that the Severinsky reference rendered obvious claims 23 and 36 and found that claims 1, 6, 7, 9, 15, and 21 would have been obvious over a combination of Severinsky and the Ehsani reference. *Ford Motor Co. v. Paice LLC*, IPR2014-571, 2015 WL 5782084, at *13 (PTAB Sept. 28, 2015) ("*571 Board Decision*"). Finally, the Board found claims 1, 7, 8, 18, 21, 23, and 37 would have been obvious over the collective teachings of the Bumby references in the 579 petition, which was combined with the 571 petition on appeal to this court. *Ford Motor Co. v. Paice LLC*, IPR2014-579, 2015 WL 5782085, at *17 (PTAB Sept. 28, 2015) ("*579 Board Decision*").

Paice appeals from the Board's final written decisions in all three petitions. We have jurisdiction pursuant to 35 U.S.C. § 141(a) and 28 U.S.C. § 1295(a)(4)(A).

DISCUSSION

Paice raises four main arguments on appeal. First, Paice asserts that the Board improperly construed "setpoint" and "road load" in the '347 patent. Second, Paice faults the Board for concluding that Caraceni teaches certain disputed limitations of claims 1, 7, and 10. Paice next argues that the Board erred in concluding that Severinsky renders obvious claims 23 and 36 and that Severinsky in combination with Ehsani renders obvious claims 1, 6, 7, 9, 15, and 21. Finally, Paice challenges the Board's conclusion that a POSA would have been motivated to combine the Bumby references and that they teach the limitations of claims 1, 7, 8, 18, 21, 23, and 37.

A claim is unpatentable as obvious "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103.[1] We review the Board's ultimate obviousness determination de novo and underlying factual findings for substantial evidence. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). Substantial evidence "means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938). Factual findings underlying the obviousness inquiry include the scope and content of the prior art, the differences between the prior art and the claimed invention, whether there is a motivation to combine prior art references, the level of ordinary skill in the art, and relevant secondary considerations. *Merck & Cie v. Gnosis S.P.A.*, 808 F.3d 829, 833 (Fed. Cir. 2015), *cert. denied*, 137 S. Ct. 297 (2016).

I.

Paice first alleges that the Board erred by construing the claim term "setpoint" as a "predetermined torque value that may or may not be reset." *884 Board* Decision, 2015 WL 8536739, at *4. Paice asserts that the Board's construction misses the fundamental purpose of the setpoint, which Paice claims is to trigger a transition between operating modes, and that this purpose should be included in the construction. We see no error in the Board's construction and decline to read a requirement

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[1] Given the effective filing date of the '347 patent's claims, the version of 35 U.S.C. § 103 that applies here is the one in force preceding the changes made by the America Invents Act. *See* Leahy–Smith America Invents Act, Pub. L. No. 112-29, § 3(n), 125 Stat. 284, 293 (2011).

that the setpoint trigger a transition between operating modes into the construction.

When construing claims, the Board must apply the broadest reasonable construction in light of the patent's specification. *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016). "We review intrinsic evidence and the ultimate construction of the claim de novo." *SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1316 (Fed. Cir. 2015).

Like the Board, we start with the plain claim language. Claim 1, for example requires the controller to "start[] and operate[] said engine when *torque* require[d] to be produced by said engine . . . is at least equal to a setpoint (SP)." '347 patent col. 58 ll. 29–33 (emphasis added). This language equates the setpoint to a torque value and makes clear that the transition requirement Paice urges us to read into the meaning of "setpoint" is included in the claim's structure and need not be read into the definition of setpoint. The claim itself calls for the controller to start the engine, i.e., transition between modes, when the torque required by the engine reaches a setpoint, i.e., a "predetermined torque value that may or may not be reset," *884 Board Decision*, 2015 WL 8536739, at *4.

The specification and dependent claims demonstrate that transitions can occur before a setpoint is reached, in addition to not occurring despite reaching a setpoint, which further bolsters our conclusion that this requirement should not be included in the term's construction. For example, the specification describes a scenario where the driver rapidly depresses the accelerator pedal while in low-speed operation—indicating an urgent need for full power—which causes the engine to start "*before* the road load reaches any particular setpoint SP." '347 patent col. 41 ll. 14–19 (emphasis added). The specification also teaches hysteresis in the mode-switching determination,

meaning that a new mode might be entered "only after the road load exceeded a first, lower setpoint SP *for an extended period of time*." *Id.* at col. 41 ll. 41–43 (emphasis added). Similarly, several claims that depend from claim 1 show that a transition will only occur if the setpoint has been maintained for a period of time. Claim 3 uses the controller to effect a transition "only when RL>SP *for at least a predetermined time*." *Id.* at col. 58 ll. 41–46 (emphasis added). Claim 4 requires the controller to switch from engine propulsion to motor propulsion but "only when RL<SP *for at least a predetermined time*." *Id.* at col. 58 ll. 48–52 (emphasis added). Accordingly, for all these reasons, we agree with the Board's construction of setpoint.

We also discern no error in the Board's construction of the term "road load" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative." *884 Board Decision*, 2015 WL 8536739, at *3. The Board's construction is amply supported by the specification, which repeatedly defines the road load as the vehicle's instantaneous torque requirement. *See, e.g.*, '347 patent col. 12 ll. 38–42 ("The '817 and '743 applications also disclose that the vehicle operating mode is determined by a microprocessor responsive to the 'road load', that is, the vehicle's instantaneous torque demands, i.e., that amount of torque required to propel the vehicle at a desired speed."); *id.* at col. 38 ll. 41–42 ("FIG. 7(*a*) shows the vehicle's instantaneous torque requirement, that is, the 'road load' . . . ."); *id.* at col. 36 ll. 8–10, col. 40 ll. 24–25.

Despite acknowledging that the Board "properly construed" road load, Paice alleges that the Board impermissibly broadened the construction during its invalidity analysis to encompass not only the instantaneous torque required to propel the vehicle—the Board's construction—*but also* the driver's request for torque "as indicated by mere accelerator pedal position." Appellant Br. 29 (16-

1745 appeal). According to Paice, the accelerator pedal position alone does not identify the road load, and the Board's application of this broader construction to the prior art references was error. We view Paice's argument as a challenge to the Board's application of its claim construction, which we address in various sections below and review for substantial evidence. We also note that the '347 patent itself does not disclose how to determine road load other than by reference to the accelerator pedal position. In discussing the prior art, for example, the specification states: "the operator's depressing the accelerator pedal signifies an increase in desired speed, *i.e., an increase in road load*, while reducing the pressure on the accelerator or depressing the brake pedal signifies a desired reduction in vehicle speed." '347 patent col. 12 ll. 46–50 (emphasis added); *see also id.* at col. 30 ll. 1–2 (determining road load "by measuring the rate at which the operator depresses accelerator pedal").

II.

Paice next articulates several reasons for reversing the Board's conclusion that claims 1, 7, and 10 are obvious over the Caraceni reference. First, with respect to all three claims, Paice alleges that Caraceni fails to disclose using a setpoint to start and operate the gas engine. Next, Paice claims that Caraceni does not disclose a battery for providing current to the first and second electric motors, as required by all three claims. Finally, Paice contends that Caraceni does not meet the road load limitation of claim 7. We find none of these arguments persuasive and that substantial evidence supports the Board's contrary fact findings.

A.

Paice first argues that the decision to operate the engine in Caraceni is a manual one and that there is no disclosure in Caraceni's hybrid mode of starting the engine because of a setpoint, as required by claims 1, 7,

and 10. Paice also contends that the contrary testimony of Ford's expert, Dr. Davis, is nothing more than hindsight bias that relies on the teachings of the '347 patent to explain how to use its patented method to accomplish Caraceni's goal of operating the gas engine when the specific fuel consumption is low. These arguments were considered and rejected by the Board. And we find that substantial evidence supports the Board's finding that, when operating in hybrid mode, Caraceni compares "the torque require[d] to be produced by said engine to propel the vehicle" to a torque-based setpoint and starts the engine if that torque is at least equal to the setpoint, as required by claims 1, 7, and 10.[2]

Although the driver in Caraceni manually selects the vehicle's mode of operation—all-electric, engine-only, or hybrid—substantial evidence supports the Board's finding that, once the driver selects the hybrid mode, Caraceni's vehicle management unit ("VMU") maximizes fuel efficiency by automatically splitting power between the

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[2] Paice also contends that the Board lacks substantial evidence to support its finding that Caraceni uses a torque-based setpoint to start and operate the gas engine to charge the battery. We need not reach this argument because the broadest reasonable construction of claim 1 only requires that the torque-based setpoint be used either to start and operate the engine to propel the vehicle or to charge the battery, but not both. '347 patent col. 58 ll. 29–33 (requiring a "controller [to] start[] and operate[] said engine when torque require[d] to be produced by said engine to [1] propel the vehicle *and/or* [2] to drive either one or both said electric motor(s) to charge said battery is at least equal to a setpoint (SP)" (emphasis added)). Indeed, Paice admitted in its briefing for the related 16-1412 and 16-1415 appeals "that the limitation is written in the disjunctive." Appellant Reply Br. 27.

engine and electric motor according to the control algorithm depicted graphically in Figure 9 of Caraceni. *884 Board Decision*, 2015 WL 8536739, at *8. As the Board emphasized in its decision, Caraceni states that, in "hybrid mode," the VMU "*activates the two drive trains* through the inverter for the electric motor and the engine electronic control unit respectively." *Id.* (quoting J.A. 1392).[3] Thus, contrary to Paice's suggestion, substantial evidence supports the Board's finding that the VMU, not the driver, activates the engine and motor in hybrid mode. The Board's finding is further supported by the testimony of Ford's expert, Dr. Davis, who cited portions of Caraceni to reasonably demonstrate that, in the hybrid mode, Caraceni's VMU sends control signals to start and operate the gas engine. J.A. 1893–94.

The Board's finding that Caraceni discloses a hybrid mode in which the VMU starts and operates the engine when the torque required to propel the vehicle is at least equal to a torque-based setpoint is further supported by Dr. Davis's annotated version of Caraceni Figure 9 and supporting testimony. Annotated Figure 9 is shown below:

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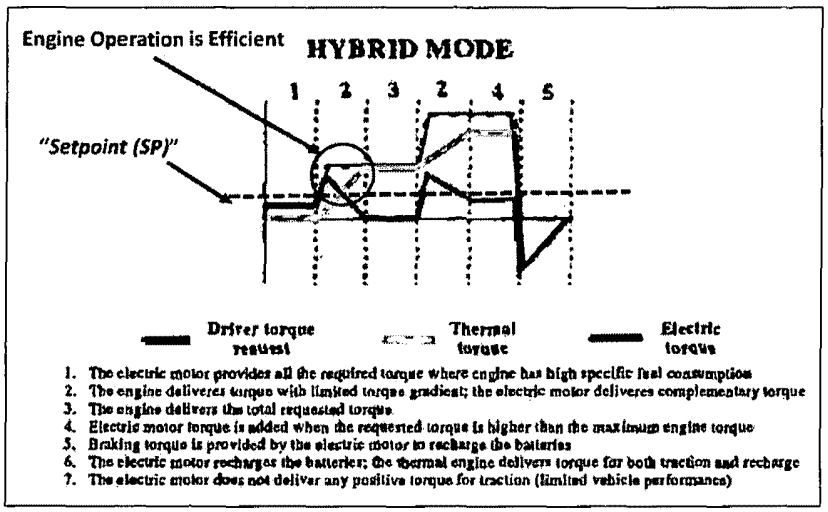
[3] Appendix citations in this section are to the 16-1745 appeal materials.



884 Board Decision, 2015 WL 8536739, at *9 (reproducing figure on J.A. 1904). As Dr. Davis explained and annotated Figure 9 fairly clearly depicts, the engine is off in region 1 and the motor alone propels the vehicle. *Id.* (citing J.A. 1902–05, ¶¶ 275–79). Dr. Davis further testified that, in the transition between regions 1 and 2, as the driver's request for torque increases above a predetermined threshold level—noted by Dr. Davis using a green dashed line—the engine is automatically activated by Caraceni's VMU. *Id.* We find that Dr. Davis's testimony and annotated Figure 9 provide substantial evidence to support the Board's finding that Caraceni's engine is started and operated based on a setpoint when in hybrid mode.

B.

In addition, substantial evidence supports the Board's finding that Caraceni discloses a traction battery for providing current to the engine starter and electric motor, thus satisfying the requirement of claims 1, 7, and 10 of a battery that provides current to the first and second

electric motors. It is true that, as Paice points out, Caraceni does not depict a connection between the traction battery and the engine starter. Nor does Caraceni state that such a connection exists. But, as the Board explained, Caraceni's engine starter must be connected to a battery to operate, and Caraceni discloses only one battery—the traction battery. *Id.* at *10–11; *see also* J.A. 1392 (Figure 10). These two facts are undisputed on the record and provide substantial evidence in support of the Board's finding that one of ordinary skill in the art would have understood that the traction battery needed to be connected to the engine starter.

In its opinion, the Board relied on "common sense" to conclude that "a skilled artisan would have readily understood that the 'engine starter' needed to be connected, directly or indirectly, to one of the battery packs that make up the 'traction battery.'" *884 Board Decision*, 2015 WL 8536739, at *11. Citing *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355 (Fed. Cir. 2016), Paice argues that the Board erred by relying on "common sense" to supply a missing element in the claims. First, we note that the Board only resorted to common sense as a secondary rationale for its conclusion that Caraceni's engine starter receives current from the traction battery. *884 Board Decision*, 2015 WL 8536739, at *11 (introducing the common sense argument with the phrase "[e]ven so").

In any event, we conclude that the Board did not err by invoking common sense in its analysis. In *Arendi*, this court held that the Board can rely on common sense to inform its obviousness analysis "if explained with sufficient reasoning." *Arendi*, 832 F.3d at 1361. Continuing, this court explained that the Board's "common sense" determination cannot be conclusory or unsupported by substantial evidence. *Id.* at 1366. In this case, the Board's conclusion that, "as a matter of common sense," a skilled artisan would have understood that the engine starter needed to be connected to the traction battery was

supported by the undisputed fact that Caraceni's engine starter must be connected to a battery and Caraceni only discloses one battery. Because it was supported by substantial evidence, the Board's common sense analysis did not run afoul of *Arendi*. As such, we conclude that the Board properly relied on a common sense analysis.

Finally, we address Paice's factual assertion that Caraceni's engine starter would have been connected to a standard battery because it would have been too small to accept current from the traction battery. As the Board noted, "[n]owhere does Caraceni disclose that the 'engine starter' is connected to a standard battery." *884 Board Decision*, 2015 WL 8536739, at *11. The Board also credited Dr. Davis's testimony, including his testimony explaining that one of ordinary skill in the art reading Caraceni would have understood that Caraceni's engine starter was an electric motor that could not operate unless a current is supplied from the car battery. Though not specifically cited by the Board, Dr. Davis testified at length that, by 1993, there were several well-known techniques for providing power to a starter motor using a hybrid battery like the traction battery. On this record, we find substantial evidence to support the Board's holding that this limitation is obvious in view of Caraceni.

C.

Paice also alleges that Caraceni does not disclose claim 7's requirement that the vehicle is operated in one of a plurality of operating modes based on a comparison of road load to a setpoint. According to Paice, the Board erred by relying solely on Caraceni's required traction torque, which is set by the accelerator pedal position, to teach road load because road load also must account for external factors such as wind, rolling friction, and grade. The Board's finding to the contrary, however, is supported by substantial evidence.

As stated above, we agree with the Board that the term "road load," properly construed, means "the amount of instantaneous torque required to propel the vehicle, be it positive or negative." When applying this construction, the Board correctly noted that the '347 patent's specification itself undermines Paice's argument by tying the accelerator pedal position to road load: "the operator's depressing the accelerator pedal signifies an increase in desired speed, *i.e., an increase in road load.*" *884 Board Decision*, 2015 WL 8536739, at *3 (quoting '347 patent col. 12 ll. 45–51). In fact, the '347 patent's specification does not disclose how to determine road load other than by reference to the accelerator pedal position. The Board also properly relied on the testimony of Ford's expert, Dr. Davis, in concluding that Caraceni's use of the required traction torque to select whether to operate the engine, motor, or both in Caraceni's hybrid mode is no different than using road load as recited in claim 7. *Id.* at *11 (citing J.A. 1913–26, ¶¶ 297–317). Given this record, we conclude that substantial evidence supports the Board's finding that Caraceni discloses the road load limitations in claim 7.

III.

Paice also challenges the Board's conclusion that claims 23 and 36 are obvious in view of Severinsky and that claims 1, 6, 7, 9, 15, and 21 are obvious based on Severinsky in combination with Ehsani. Specifically, Paice advances a series of interrelated arguments focusing on whether Severinsky discloses the use of road load and a setpoint to make decisions on the operating mode and charging of the battery. We find that substantial evidence supports the Board's fact findings, and we discern no error in its conclusion that the claims are obvious.

A.

Paice first asserts that the Board erred in finding that Severinsky[4] teaches a comparison of road load to a set-point to determine when to operate the engine as required by claims 1, 6, 7, 9, 15, 21, 23, and 36. According to Paice, Severinsky's microprocessor uses speed to make such determinations regarding operation of the engine. There is substantial evidence, however, to support the Board's determination that, although Severinsky describes the use of speed as a factor considered by the microprocessor, it also uses the vehicle's torque requirements, or road load, in determining when to operate the engine. For example, the Board relied on the following passage from Severinsky: "It will be appreciated that according to the invention the internal combustion engine is run *only* in the near vicinity of its most efficient operational point, that is, such that it produces 60-90% of its maximum torque whenever operated." U.S. Patent No. 5,343,970 col. 20 ll. 63–67 (emphasis added); *571 Board Decision*, 2015 WL 5782084, at *8. The Board found Dr. Davis's interpretation of this passage credible when he explained that "[t]he lower end of the 60-90% range disclosed by Severinsky '970 would also be known as the proposed 'predetermined torque value' or '*setpoint*' below which the engine does not operate." J.A. 1586, ¶ 204; *571 Board Decision*, 2015 WL 5782084, at *10.[5] The Board was further persuaded by Dr. Davis's testimony that Severinsky "is generally, if not always, using torque/road load in its mode decisions." *571 Board Decision*, 2015 WL

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[4] The Severinsky reference was incorporated into, and shares an inventor with, the '347 patent. '347 patent col. 10 ll. 37–41.

[5] Appendix citations in this section and Section IV, *infra*, are to the materials from the combined joint appendix in the 16-1412 and 16-1415 appeals.

5782084, at *10 (quoting J.A. 3326, ¶ 19). After reviewing the record and the Board's analysis, we conclude that substantial evidence supports the Board's fact finding that Severinsky teaches a comparison of road load to a setpoint to determine when to operate the engine.

B.

Even if Severinsky does rely on torque as a control variable, Paice alleges that Severinsky's discussion of the 60-90% efficient torque range refers to *output* torque as opposed to *input* torque and, thus, the Board erred in finding claims 1, 6, 7, 9, 15, 21, 23, and 36 obvious in view of Severinsky or based on Severinsky in view of Ehsani. The Board concluded that road load is an output torque, not an input torque, "for the simple reason" that the claims compare road load to the engine's maximum torque output. *Id.* at *11. We disagree with the Board's reinterpretation of "road load" as including output torque. As we noted above, the Board properly construed "road load" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative." The Board erred by reinterpreting the claim.

Nonetheless, the '347 patent itself admits that Severinsky discloses a torque-based control mode, stating: "an important aspect of the invention of the [Severinsky] '970 patent" is improving efficiency "by operating the internal combustion engine only at relatively high torque output levels." '347 patent col. 25 ll. 4–7. Although this passage refers to output torque, the next sentence discusses the required torque, or input torque: "[w]hen the vehicle operating conditions *require torque* of this approximate magnitude, the engine is used to propel the vehicle" and "when *less torque is required*, an electric motor powered by electrical energy stored in a substantial battery bank drives the vehicle." *Id.* at col. 25 ll. 8–13 (emphases added). These "same advantages," the '347 patent notes, are "provided by the system of the present invention." *Id.*

at col. 25 ll. 15–16. Accordingly, we conclude that the Board's finding that Severinsky relies on road load to start and operate the engine and motor was supported by substantial evidence.

C.

Paice also argues that Severinsky does not render claims 23 and 36 obvious because Severinsky uses speed and the battery's state of charge as the two criteria for determining when to charge the battery, not road load and the state of battery charge as recited by claim 23.[6] The claim requires an exception to the general rule of not operating the engine when road load is less than the setpoint; specifically, the claim requires operating the engine when road load is less than the setpoint and "the state of charge of said battery indicates the desirability of doing so." '347 patent col. 60 ll. 46–51.

Substantial evidence supports the Board's finding that Severinsky discloses this same operation. The Board found that Severinsky, like the '347 patent, teaches a battery charging mode that is responsive to the state of charge of the battery. *571 Board Decision*, 2015 WL 5782084, at *12. We agree.

At the outset, we observe that this recitation has two components: (1) "using the torque between RL and SP to drive said at least one electric motor;" and (2) "to charge said battery when the state of charge of said battery indicates the desirability of doing so." '347 patent col. 60 ll. 46–51. In other words, the first component evaluates the magnitude of the torque used to charge the battery and the second requires the state of charge to indicate the desirability of doing so. The Board's decision, and the

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[6] The Board also rejected claim 9 and its battery charging limitation for the same reasons as claim 23. *571 Board Decision*, 2015 WL 5782084, at *13.

parties' arguments to the Board, primarily focused on the second component of this recited feature. *See 571 Board Decision*, 2015 WL 5782084, at *12 ("But the problem with [Paice's] argument is that the claimed invention recites the same approach as Severinsky—using the 'state of charge of the battery' to indicate when charging is necessary."). Yet on appeal, Paice primarily focuses on the first component; in particular, whether Severinsky uses the excess road load to charge the battery. During oral argument, Paice conceded the conventional nature of at least using excess torque to charge the battery:

> COURT: "Do you think it's conventional, the part in the claim that talks about . . . the excess amount of energy, which is defined in the claim as SP minus RL, do you think . . . that part is conventional?"
>
> MR. CORDELL (counsel for Paice): "No because SP is not conventional. . . . [I]t is conventional to use excess torque from the engine or energy . . . it is conventional to use excess power to charge the battery because it's free . . . ."

Indeed, Severinsky confirms Paice's concession that it is conventional to use excess torque to charge the battery. *See* '970 patent col. 10 ll. 32–36 (describing a downhill scenario in which the driver removes his foot from the accelerator pedal and the engine's excess torque can be used to charge the batteries). As cited above, Paice, however, does not concede that using the difference between setpoint and road load is conventional. But as Dr. Davis explained, a POSA would understand from this passage that, even though the torque required to propel the vehicle may be less than the setpoint because the car is traveling downhill, the engine will continue to operate above the setpoint and will use its excess torque to charge the battery if the battery requires charging. J.A. 1623–25, ¶¶ 296–97. This constitutes substantial evidence to

support the Board's finding that Severinsky discloses the battery charging limitation in claims 23 and 36.

IV.

Finally, Paice asserts that the Board erred in holding claims 1, 7, 8, 18, 21, 23, and 37 obvious in view of the Bumby references. Specifically, Paice asserts that the Board lacked a motivation to combine the Bumby references for purposes of its obviousness analysis, that the Board impermissibly cherry-picked elements from distinct embodiments disclosed by the Bumby references, and that several claim limitations were not satisfied by the Bumby references. We disagree.

First, Paice argues that the Board did not establish a motivation to combine the Bumby references—five articles sharing one common author—which Paice views as a series of disparate references relating to various different aspects of hybrid vehicle design. Motivation to combine prior art references is a question of fact, *Merck*, 808 F.3d at 833, and Paice's arguments cannot overcome the substantial evidence relied on by the Board to support its reasons for combining the references.

The Board found that "the Bumby references document, chronologically, the evolution of a hybrid vehicle project undertaken by Professor James Bumby and his team." *579 Board Decision*, 2015 WL 5782085, at *9. This finding was supported by a later-published thesis by Philip Masding—an author on two of the Bumby references—which "brings together the five Bumby references in a single compilation and summarizes the efforts" of Dr. Bumby and his team. *Id.*

In addition, Paice asserts that the Board erred by combining elements from separate, allegedly incompatible embodiments in the Bumby references without providing a supporting rationale for the specific combination. Paice cites *Boston Scientific Scimed, Inc. v. Cordis Corp.*,

554 F.3d 982 (Fed. Cir. 2009) for support. In *Boston Scientific*, one reference disclosed all of the asserted claim's elements, but those elements were taught by two different embodiments that were pictured side-by-side in the patent. This court nonetheless found that claim obvious because "[c]ombining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness." *Id.* at 991. We also acknowledged that as long as a POSA "can implement a predictable variation, § 103 likely bars its patentability." *Id.* (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)). Here, the Board combined portions of the optimal and sub-optimal control strategies that are disclosed in the Bumby II and Bumby III references, each of which provides a method for controlling the performance of a hybrid vehicle. Bumby II acknowledges that the sub-optimal strategy was derived from the optimal strategy by simplifying its algorithm based on the tendencies of the optimal strategy to select engine operation whenever an operating point can be obtained near the high-efficiency region. J.A. 5629–30. And Bumby III discusses these two embodiments in sequential subsections of its "Control of the Hybrid Electric Drivetrain" section. J.A. 5638–41. Like the combination of two side-by-side embodiments in *Boston Scientific*, we view the combination of elements from the optimal and sub-optimal embodiments as a "predictable variation" that does not "require a leap of inventiveness." *Boston Sci.*, 554 F.3d at 991. As such, we discern no error in the Board's opinion.

Paice also asserts that the Board lacked substantial evidence to support its findings that the Bumby references disclosed several limitations of the challenged claims. First, Paice argues that the Bumby references do not use road load and a setpoint to determine when and how to charge the battery, as required by claims 1 and 23. The Board disagreed, relying on passages from Bumby II and Bumby V that it found "suggest that, when the torque

required to propel the vehicle is less than a certain value, or setpoint, the excess torque output of the engine is used to charge the battery." *579 Board Decision*, 2015 WL 5782085, at *16. Dr. Davis's expert report supported the Board's conclusion, *see* J.A. 5783–85, ¶¶ 284–86; J.A. 5846–51, ¶¶ 438–49, and the Board also noted that its understanding was confirmed by Dr. Davis's deposition testimony. Based on this record, we conclude that substantial evidence supports the Board's finding that the Bumby references teach the battery charging limitations in claims 1 and 23.

Paice also argues that the Bumby references rely on demand power, instead of road load, as the control variable and focus on selecting the optimum gear ratio rather than comparing road load to a setpoint. The Board considered and rejected these arguments, and its contrary conclusions are supported by substantial evidence. Even though demand power is an input, the Board found that "the suboptimal control algorithm *converts the instantaneous power* and speed requirement *into a torque* and speed demand." *579 Board Decision*, 2015 WL 5782085, at *12 (quoting J.A. 5630). The Board found that the Bumby references teach using those torque and speed demands to select the mode of operation. *Id.* Indeed, the Board reasoned that the fact that the sub-optimal control strategy is based on a boxed region defined by upper and lower torque and speed bounds "would have suggested to a skilled artisan a setpoint that utilizes torque as a factor in determining the operational mode." *Id.* at *11. Moreover, the Board relied on passages from the Bumby references that expressly disclose calculations to determine the required torque at the wheels (albeit in the optimal control strategy), and on Dr. Davis's expert report, which "confirm[ed] that a skilled artisan would have understood these references as speaking to the road load required to propel the vehicle." *Id.* at *13.

CONCLUSION

We have considered Paice's remaining arguments and find them unpersuasive. For the reasons stated above, the Board's claim constructions were not erroneous and substantial evidence supports the Board's fact findings and legal conclusions in holding the challenged claims invalid on obviousness grounds. Accordingly, we affirm the Board's decisions in the appealed IPRs.

AFFIRMED

COSTS

Costs to Appellees.

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1412, 2016-1415

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-00571, IPR2014-00579.

- -

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2016-1745

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2014-00884.

STOLL, *Circuit Judge*, dissenting-in-part.

I respectfully dissent with respect to Section III.C on the ground that there is no substantial evidence to support the Board's conclusion that claims 9, 23, and 36 would have been obvious in view of Severinsky. The Board's decision does not adequately explain its bases for concluding that Severinsky teaches "employing said engine to propel said vehicle when the torque RL required to do so is less than said lower level SP and using the torque between RL and SP to drive said at least one electric motor to charge said battery when the state of charge of said battery indicates the desirability of doing so," '347 patent col. 60 ll. 46–52, as required by claims 23 and 36. Nor has the Board provided sufficient rationale to support its conclusion that Severinsky teaches claim 9's specific requirement of "a low-speed battery charging mode II." *Id.* at col. 59 ll. 13–24.

CERTIFICATE OF SERVICE AND FILING

I certify that I electronically filed the foregoing Appellants' Petition for Rehearing En Banc and served a copy on counsel of record on April 14, 2017 using the Court's CM/ECF filing system.

Date: April 14, 2017

/s/ Ruffin B. Cordell
Ruffin B. Cordell
Fish & Richardson P.C.
1425 K Street NW, 11th Floor
Washington, D.C. 20005
cordell@fr.com

CERTIFICATE OF COMPLIANCE

Appellants' Petition for Rehearing En Banc is submitted in accordance with the page limitation of Federal Rule of Appellate Procedure 35(b)(2).

Dated: April 14, 2017

/s/ Ruffin B. Cordell
Ruffin B. Cordell
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1425 K Street NW, 11th Floor
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cordell@fr.com

NOTE: This order is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1442, -1443

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794 and IPR2015-00795.

FORD MOTOR COMPANY,
Appellant

v.

PAICE LLC, ABELL FOUNDATION, INC.,
Appellees

2017-1472

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2015-00794.

FORD MOTOR COMPANY,
Appellant

v.

PAICE LLC, ABELL FOUNDATION, INC.,
Appellees

2017-1473

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2015-00795.

ON MOTION

O R D E R

Upon consideration of Ford Motor Company's unopposed motion to dismiss its cross-appeals, 2017-1472 and 2017-1473,

IT IS ORDERED THAT:

(1) The motion is granted. 2017-1472 and 2017-1473 are dismissed.

(2) Each side shall bear its own costs in 2017-1472 and 2017-1473.

(3) The revised official caption in 2017-1442,-1443 is reflected above.

(4) Ford's response brief is due no later than June 30, 2017. Paice LLC and Abell Foundation, Inc.'s reply brief is due no later than July 14, 2017.

FOR THE COURT

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

s25

ISSUED AS A MANDATE (AS TO 2017-1472 AND 2017-1473 ONLY): June 30, 2017

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

NOTICE OF ENTRY OF JUDGMENT ACCOMPANIED BY OPINION

OPINION FILED AND JUDGMENT ENTERED: 02/01/2018

The attached opinion announcing the judgment of the court in your case was filed and judgment was entered on the date indicated above. The mandate will be issued in due course.

Information is also provided about petitions for rehearing and suggestions for rehearing en banc. The questions and answers are those frequently asked and answered by the Clerk's Office.

Costs are taxed against the appellants in favor of the appellee under Rule 39. The party entitled to costs is provided a bill of costs form and an instruction sheet with this notice.

The parties are encouraged to stipulate to the costs. A bill of costs will be presumed correct in the absence of a timely filed objection.

Costs are payable to the party awarded costs. If costs are awarded to the government, they should be paid to the Treasurer of the United States. Where costs are awarded against the government, payment should be made to the person(s) designated under the governing statutes, the court's orders, and the parties' written settlement agreements. In cases between private parties, payment should be made to counsel for the party awarded costs or, if the party is not represented by counsel, to the party pro se. Payment of costs should not be sent to the court. Costs should be paid promptly.

If the court also imposed monetary sanctions, they are payable to the opposing party unless the court's opinion provides otherwise. Sanctions should be paid in the same way as costs.

Regarding exhibits and visual aids: Your attention is directed Fed. R. App. P. 34(g) which states that the clerk may destroy or dispose of the exhibits if counsel does not reclaim them within a reasonable time after the clerk gives notice to remove them. (The clerk deems a reasonable time to be 15 days from the date the final mandate is issued.)

FOR THE COURT

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

17-1263, 17-1264, 17-1308, 17-1309, 17-1310, 17-1311, 17-1442, 17-1443 - Paice LLC v. Ford Motor Company
United States Patent and Trademark Office, Case Nos. IPR2015-00722, IPR2015-00800, IPR2015-00784, IPR2015-00787, IPR2015-00790, IPR2015-00791

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1263, 2017-1264, 2017-1308, 2017-1309, 2017-1310, 2017-1311

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00722, IPR2015-00784, IPR2015-00787, IPR2015-00790, IPR2015-00791, IPR2015-00800.

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1442, 2017-1443

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794, IPR2015-00795.

Decided: February 1, 2018

RUFFIN B. CORDELL, Fish & Richardson, PC, Washington, DC, argued for appellants. Also represented by TIMOTHY W. RIFFE, BRIAN JAMES LIVEDALEN, DANIEL TISHMAN.

MATTHEW J. MOORE, Latham & Watkins LLP, Washington, DC, argued for appellee. Also represented by GABRIEL BELL; FRANK A. ANGILERI, JOHN P. RONDINI, ANDREW B. TURNER, Brooks Kushman PC, Southfield, MI.

Before LOURIE, O'MALLEY, and TARANTO, *Circuit Judges.*

Opinion for the court filed by *Circuit Judge* TARANTO.

Opinion dissenting in part filed by *Circuit Judge* O'MALLEY.

TARANTO, *Circuit Judge.*

U.S. Patent Nos. 7,237,634 and 7,104,347, which are owned by Paice LLC and The Abell Foundation (collectively, Paice), describe and claim asserted improvements in a hybrid vehicle—a vehicle that has available for propulsion both a battery-powered electric motor and an internal combustion (gas) engine. At Ford's request, the Patent and Trademark Office instituted inter partes reviews of various claims of the two patents under 35 U.S.C. §§ 311–19. The Patent Trial and Appeal Board

ultimately held numerous claims of the two patents unpatentable. Paice appeals. We affirm.

I

The '634 and '347 patents describe a control strategy, based on the torque needed for propulsion, for switching between different modes of operating a hybrid vehicle—use of (one or more) electric motors, a gas engine, or both. The subject matter has been discussed in previous decisions of this court. *See Paice LLC v. Ford Motor Co.*, 681 F. App'x 885, 887–88 (Fed. Cir. 2017) (*Paice I*) (involving Paice's related U.S. Patent No. 7,559,388); *Paice LLC v. Ford Motor Co.*, 681 F. App'x 904, 908–09 (Fed. Cir. 2017) (*Paice II*) (involving the '347 patent); *Paice LLC v. Ford Motor Co.*, 685 F. App'x 940, 943 (Fed. Cir. 2017) (*Paice III*) (involving Paice's related U.S. Patent No. 8,214,097); *see also Paice LLC v. Ford Motor Co.*, 685 F. App'x 950 (Fed. Cir. 2017) (*Paice IV*) (summary affirmance of Board decisions involving the '634 patent).[1] We recite here only the background necessary to resolve the issues on appeal.

The common specification explains that the control strategy bases selection decisions on instantaneous torque demand, or "road load." '634 patent, col. 13, lines 12–21, 44–65.[2] Because the gas engine runs most efficiently when it produces torque near its maximum torque output,

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[1] Related subject matter is also at issue in appeals 17-1387, 17-1388, 17-1390, 17-1457, 17-1458, and 17-1406, which were argued in tandem with the present appeals.

[2] The '634 patent issued from a divisional application, under 35 U.S.C. § 121, of the application that issued as the '347 patent. Because the patent specifications are identical in all material respects, this opinion cites only to the '634 patent, and to the materials submitted in appeal 17-1263, unless specifically noted otherwise.

the control strategy is designed to operate the engine "only under circumstances where the engine will be loaded so as to require at least 30% of its maximum torque output ('MTO') (it being understood throughout this specification and the appended claims that this 30% figure [setpoint] is arbitrary and can be varied)." *Id.*, col. 13, lines 14–29, 44–65; *see also id.*, col. 2, lines 58–60. Generally, the electric motor alone is used to run the vehicle below the 30% setpoint, the gas engine is used to run the vehicle in the "efficien[t]" range of 30% to 100% of the engine's maximum torque output, and both propulsion sources are used to run the engine when more than 100% of the gas engine's maximum torque output is required (the electric motor providing the additional torque required). *Id.*, col. 41, line 59 through col. 43, line 25 & Fig. 9.

The relevant claims of the Paice patents require two comparisons—of the vehicle's road load to a setpoint, and of the vehicle's road load to the gas engine's maximum torque output—for the decision whether to operate the electric motor, the gas engine, or both. Independent claim 80 of the '634 patent is representative.[3] That claim reads:

> 80. A method for controlling a hybrid vehicle, comprising:
>
> determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;
>
> monitoring the RL over time;

---

[3] In appeals 17-1442 and 17-1443, the parties treat claims 1 and 23 of the '347 patent as representative. Those claims are materially identical to claim 80 of the '634 patent. *Compare* '634 patent, col. 65, lines 11–33 *with* '347 patent, col. 58, lines 13–37 *and id.*, col. 60, lines 22–54.

> operating the at least one electric motor to propel the hybrid vehicle when the RL required to do so is less than a setpoint (SP);
>
> operating the internal combustion engine of the hybrid vehicle to propel the hybrid vehicle when the RL required to do so is between the SP and a maximum torque output (MTO) of the engine, wherein the engine is operable to efficiently produce torque above the SP, and wherein the SP is substantially less than the MTO; and
>
> wherein said operating the internal combustion engine to propel the hybrid vehicle is performed when:
>
> the RL>the SP for at least a predetermined time; or
>
> the RL>a second setpoint (SP2), wherein the SP2 is a larger percentage of the MTO than the SP; and
>
> operating both the at least one electric motor and the engine to propel the hybrid vehicle when the torque RL required to do so is more than the MTO.

'634 patent, col. 65, lines 11–33.[4]

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[4] In IPR2015-00791, the Board dismissed the challenge to claim 80 from the inter partes review because that claim had been held unpatentable in an earlier Board decision, *Ford Motor Co. v. Paice LLC*, No. IPR2014-01416, 2016 WL 932948, at *1 (P.T.A.B. Mar. 10, 2016), *aff'd*, *Paice IV*, 685 F. App'x 950. Though not at issue here, claim 80 contains the relevant limitations and is representative of the claims on appeal.

In the final written decisions in seven inter partes reviews, the Board determined that the following claims—claims 2–4, 6–13, 15, 17, 19, 23, 25, 27–30, 32, 66–67, 79, 94, 96, 106–08, 113, 128, 140–41, 146, 173, 229, 231, 238–41, 252–56, 259, 261–62, 267, 281–82, 285, and 287–88 of the '634 patent; and claims 3–5, 14, 16, 19–20, 22, 25–30, 32, and 39–41 of the '347 patent—are unpatentable for obviousness over U.S. Patent No. 5,789,882 (Ibaraki), either alone or in combination with other references.[5] The Board's decision in IPR2015-00722, on appeal here in 17-1263, is representative. *Ford Motor Co. v. Paice LLC*, IPR2015-00722, 2016 WL 5636817 (P.T.A.B. Sept. 26, 2016) (*IPR 722 Final Written Decision*).

On appeal pursuant to 35 U.S.C. § 319, Paice challenges those Board decisions, under 5 U.S.C. § 706(2)(E), as not supported by substantial evidence. We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

II

We review the Board's factual findings underlying its obviousness determinations for substantial evidence, which "means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1061 (Fed.

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[5] In the eighth Board decision on appeal (involving IPR2015-00800), the Board determined that claims 172, 226, 230, and 234 of the '634 patent are unpatentable for obviousness over a series of articles written by J.R. Bumby. We are unpersuaded by Paice's arguments on appeal challenging that determination. We affirm the decision without further discussion, except to note that in *Paice II*, 681 F. App'x at 917–18, we affirmed the Board's determination of unpatentability of similar claims in Paice's '347 patent based on obviousness over the Bumby references.

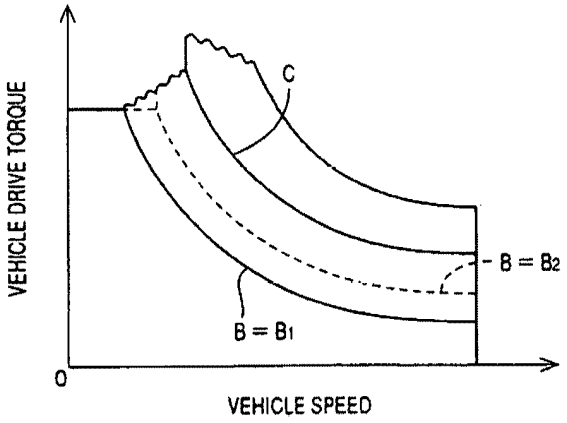
Cir. 2016) (quoting *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938)).

A

Paice's main argument is that the Board's finding that Ibaraki discloses torque-based comparisons is not supported by substantial evidence. We disagree.

As the Board correctly found, *IPR 722 Final Written Decision*, 2016 WL 5636817, at *7, Ibaraki describes a hybrid vehicle with "a drive control apparatus" (controller) that, like the microprocessor in the '634 and '347 patents, "includes drive source selecting means" for selecting the engine, motor, or both. Ibaraki, col. 1, lines 10–13; *id.*, col. 20, lines 38–43. The controller makes the selection "according to a drive source selecting data map," illustrated in Figure 11 (below), "which represents a predetermined relationship between the vehicle drive torque and running speed V and the . . . three drive modes" of motor drive (electric motor only), engine drive (gas engine only), and engine-motor drive (both). *Id.*, col. 20, lines 38–53.

FIG. 11



"[W]hen the vehicle running condition as represented by the current vehicle drive torque and speed" falls in the area below curve B, the controller selects motor drive

mode. *Id.*, col. 20, line 55–62; *see also id.*, col. 21, lines 2–4 (B can be shifted from B_1 to B_2 to enlarge the motor drive range, if such a condition is desired). Similarly, the controller selects engine drive mode when the running condition falls in the area between curve B and curve C, and engine-motor drive mode in the area above curve C. *Id.*, col. 20, line 55 through col. 21, line 1; *id.*, col. 24, lines 16–21 & Fig. 10.[6]

Paice does not dispute the finding that Ibaraki teaches comparisons to setpoints to select engine, motor, or engine-motor operation. In Figure 11, curve B and curve C each is a constant level of power, and the flowchart in Ibaraki's Figure 10 expressly refers to a power comparison ("$P_L > B$?"; "$P_L > C$?") for selecting the mode of operation. Precisely because that comparison employs power, however, Paice argues that Ibaraki's controller does not base mode selection on comparisons to torque, as required by the patent claims.

The question before us is not whether the Board might properly have accepted Paice's contention about the teachings of Ibaraki. The question is whether the Board had an adequate evidentiary basis for its contrary finding. The Board found that Ibaraki teaches reliance on *both* power *and* torque; it thus rejected Paice's contention that one teaching excludes the other. *IPR 722 Final Written*

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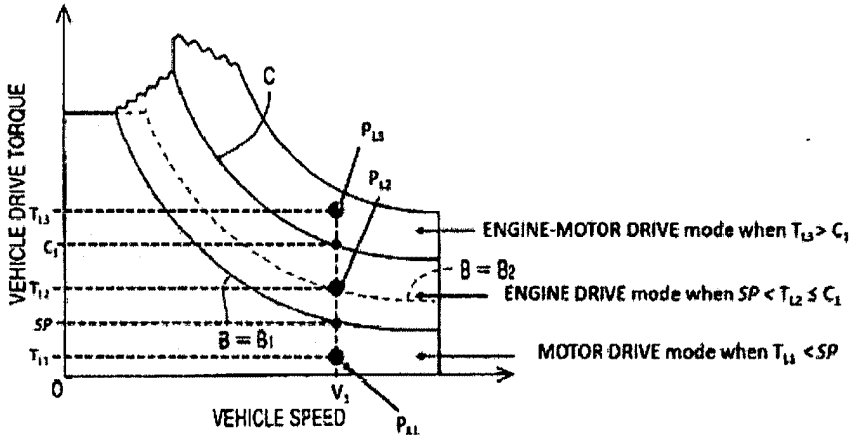
[6] Ibaraki at col. 20 line 66 through col. 21, line 1, states that "[w]hen the vehicle running condition is in the range above the second boundary line C, the drive source selecting means [] selects the ENGINE-DRIVE mode." Based on context and Figure 10, that appears to be a typographical error: the passage should say "ENGINE-MOTOR DRIVE mode." Paice does not dispute that Ibaraki discloses that if the power level is greater than curve C, "the vehicle is driven in 'Engine-Motor Drive Mode.'" Paice Br. 20.

Decision, 2016 WL 5636817, at *7–12. We conclude that the Board's finding is reasonable on this record.

Ford's expert Dr. Gregory Davis pointed out that "Ibaraki [] states that the 'vehicle drive torque and speed' determine 'a point corresponding to the required drive power P_L." J.A. 16133 (quoting Ibaraki, col. 23, line 66 through col. 24, line 2 (explaining that in Figure 10's flowchart of controller decisionmaking, step Q8 is where the controller "determine[s] whether a point corresponding to the required drive power P_L (determined by the current vehicle drive torque and speed V) is located above the first boundary line B.")). It is undisputed that the relationship between the required drive power P_L, torque, and speed is P_L = torque x speed, which makes each of curve B and C in Figure 11's graph of torque x speed a constant power level. Dr. Davis explained that any particular point on one of the Figure 11 curves (*e.g.*, on B or on C) relates to a "required drive power P_L at a given vehicle drive torque and vehicle speed." J.A. 16133 (internal quotation marks omitted).

To show how Ibaraki's controller makes operation decisions based on torque comparisons at a given speed, Dr. Davis provided an annotated version of Figure 11, shown at *IPR 722 Final Written Decision*, 2016 WL 5636817, at *8:

FIG. 11



That figure illustrates Dr. Davis's reading of Ibaraki as teaching selection decisions based on torque. At a given speed (V_1), the selection decision is based on where on the torque axis the desired torque is: Ibaraki selects motor drive mode at T_{L1}, engine drive mode at T_{L2}, and engine-motor drive mode at T_{L3}. The comparisons of desired torque are to the torque levels on curves B and C at speed V_1, *i.e.*, SP (set point) on curve B and C_1 on curve C.

The Board relied on Ibaraki and the knowledge of a person of skill in the art, as explained by Dr. Davis, to find that power is directly related to torque, that Ibaraki's controller determines the required drive power based on the current vehicle drive torque and speed, and that Ibaraki teaches selection decisions dependent on torque (though not only on torque)—specifically, on torque levels at a given speed. *See IPR 722 Final Written Decision*, 2016 WL 5636817, at *8–9, *13–14.[7] The Board had a

[7] Similarly, in the '634 patent, as the Board pointed out, speed may also be "considered in determining the mode of operation of the vehicle": the patent "contemplates including not just the torque value in the [setpoint] comparison, but also speed." *IPR 722 Final Written*

sufficient basis for rejecting Paice's reading of Ibaraki as not teaching torque-based comparisons.

The Board also had a sufficient basis for rejecting a related contention made by Paice—that, even if Ibaraki shows torque-based comparisons, it does not show comparing the vehicle's required torque to the engine's "maximum torque output" and using both propulsion sources when the required torque exceeds that level, as required by the patent claims. Dr. Davis explained that a person of skill in the art would know the following: curve C of Ibaraki's Figure 11 is less than or equal to the engine's maximum torque output (the engine, alone, is running just below that curve); the motor is turned on to provide additional torque above curve C; and "'a hybrid vehicle control strategy would at some point allow the [internal combustion] engine to provide output torque near and potentially including its [maximum torque output]. Otherwise, the system would be artificially limiting the performance of the vehicle.'" *Id.* at *11 (quoting Dr. Davis's declaration). The Board was persuaded. It found that Ibaraki, combined with the knowledge of a person of ordinary skill in the art, taught the Paice claim limitation

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Decision, 2016 WL 5636817, at *14 (citing '634 patent, Fig. 4 & col. 59, lines 3–5 (dependent claim 12 recites "the hybrid vehicle of claim 1, wherein the controller is operable to vary the SP as a function of speed of the engine"); *cf.* '634 patent, col. 58, lines 19–27 (claim 1 requirement that the controller, among other things, "is operable to operate the engine when torque . . . is at least equal to a setpoint (SP) above which the torque produced by the engine is efficiently produced"). *See also id.*, col. 19, lines 63–65 ("The vehicle is operated in different modes, depending on its instantaneous torque requirements, and the state of charge of the battery, and other operating parameters.").

that both the engine and motor be used to propel the vehicle above the engine's maximum torque output. *Id.* at *11–12. Dr. Davis's testimony supplies an adequate basis for that finding.

We note that, in the alternative, the Board found that "operating the engine and motor when the torque [road load] required to do so is more than the [maximum torque output] . . . would have been an obvious modification to make to the Ibaraki [] control system." *Id.* at *14 (internal quotation marks omitted). We agree with that determination on the evidence-supported facts found by the Board.

B

Paice also challenges the Board's finding that Ibaraki discloses the claim requirement of a setpoint that is "substantially less" than the engine's maximum torque output—the engine alone operating when the required torque is between those figures. *See IPR 722 Final Written Decision*, 2016 WL 5636817, at *10. It is undisputed, based on claim 15 of the '634 patent, that approximately 70% of the maximum torque output constitutes being "substantially less" than the maximum torque output. *Id.* The Board found that this limitation was shown in Ibaraki, relying on the explanation of Dr. Davis that it would be "clear" to a person of skill, based upon a "simple visual inspection" of Figure 11, "that setpoint SP [along curve B_1] is substantially less than point C_1 [along curve C]," and therefore substantially less than the maximum torque output (which, for reasons already noted, is at or above curve C). J.A. 16157–58; *see IPR 722 Final Written Decision*, 2016 WL 5636817, at *10, *15.

Paice argues that Dr. Davis's reliance on visual inspection of Figure 11 is improper under *Hockerson-Halberstadt, Inc. v. Avia Group International, Inc.*, in which this court explained "that patent drawings do not define the precise proportions of the elements and may

not be relied on to show particular sizes if the specification is completely silent on the issue." 222 F.3d 951, 956 (Fed. Cir. 2000); *see also In re Olson*, 212 F.2d 590, 592 (C.C.P.A. 1954) ("Ordinarily drawings which accompany an application for a patent are merely illustrative of the principles embodied in the alleged invention claimed therein and do not define the precise proportions of elements relied upon to endow the claims with patentability."). The *Hockerson-Halberstadt* case involved a rudimentary drawing that portrayed a central groove bisecting the heel on the sole of a shoe to create fins flanking the groove, 22 F.3d at 953, and there was no indication that the groove and fins were drawn to scale, *id.* at 956. That drawing, this court held, could not rebut statements in the prosecution history that clarified the relative measurements because "the inventor necessarily defined the central longitudinal groove as requiring a width that must be less than the combined width of the two fins." *Id.* at 956.

This case is not controlled by *Hockerson-Halberstadt*. Unlike the drawing at issue there, Figure 11 of Ibaraki provides some scale information—which expert evidence reasonably found telling on the point at issue. It specifies 0 at the intersection of the x- and y-axes, both of which run continuously, without indication of omission of portions of the range, from 0 to higher levels; and consistent with the shape of each curve (a rectangular hyperbola), the parties' experts both treated the scale of the axes as linear—allowing Dr. Davis to make rough estimates based on relative comparisons between the torque values located on the B and C curves.[8] In any event, the visual

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[8] At oral argument, counsel for Paice suggested that it was unclear whether the curves were plotted along a linear or logarithmic scale. But Paice's own expert assumed that the scales of the x- and y-axes were linear

inspection of the curves is not the sole support for the Board's finding. The Board also found that, based on Dr. Davis's declaration, a person of skill would understand the B curve to be "substantially less" than the maximum torque output because, otherwise, the controller would rarely select the engine alone to propel the vehicle. *IPR 722 Final Written Decision*, 2016 WL 5636817, at *15. According to Dr. Davis, it would not make sense to a person of skill for a hybrid vehicle to "hardly" operate the engine as the primary drive source. J.A. 16154–55. Ibaraki's Figure 11, in combination with the understanding of a person of skill, thus provides substantial evidence for the Board's finding that Ibaraki teaches the "substantially less" claim element at issue.

C

For those reasons, and having considered Paice's remaining arguments and found them insufficient to disturb the Board's rulings, we affirm the final written decisions of the Board.

AFFIRMED

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for the power curves in Figure 11. *See* J.A. 16492. That makes sense mathematically: as Dr. Davis explained, the curves "'represent[] a predetermined relationship between the vehicle drive torque and running speed V,'" J.A. 16131 (quoting Ibaraki, col. 20, lines 49–53)—namely, "Power = Torque * Rotational Speed," J.A. 16133. A linear scale along both axes would produce the rectangular hyperbola curves—for constant power level P = x * y—as depicted in Figure 11.

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1263, 2017-1264, 2017-1308, 2017-1309, 2017-1310, 2017-1311

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00722, IPR2015-00784, IPR2015-00787, IPR2015-00790, IPR2015-00791, IPR2015-00800.

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1442, 2017-1443

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794, IPR2015-00795.

O'MALLEY, *Circuit Judge*, dissenting in part.

I agree with the majority that substantial evidence supports the Board's finding that the Bumby references render obvious certain claims of the '634 and '347 patents, and I therefore join the majority opinion as it relates to those references. *See* Maj. Op. at 6 n.5. I disagree, however, with the majority's conclusion that substantial evidence supports the Board's finding that Ibaraki discloses a torque-based control algorithm, and I dissent from the portion of the majority opinion affirming the Board's obviousness determinations based on Ibaraki. *See id.* at 7–14.

Ibaraki discloses a *power*-based control algorithm, not a *torque*-based one. Figure 10 of Ibaraki depicts that algorithm and shows, in steps Q8 and Q9, that the system compares the vehicle's instantaneous power, "P_L," with power thresholds "B" and "C" to determine which operating mode to select:

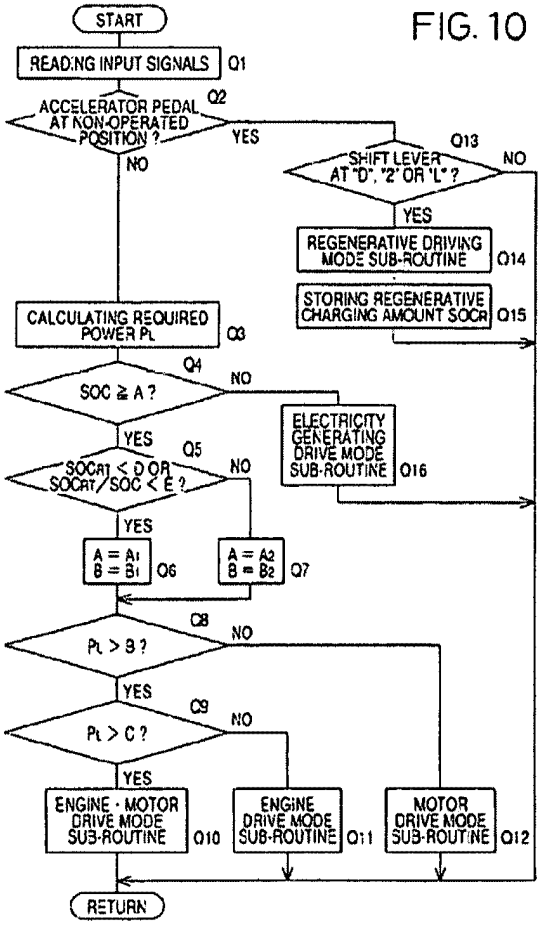
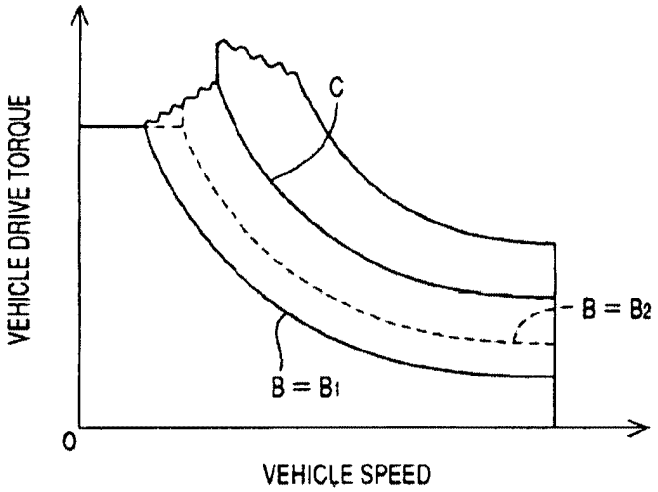


FIG. 10

Ibaraki, Fig. 10 (steps Q8, Q9); *id.* col. 23, line 66 through col. 24, line 38 (stating that the driving mode of the vehicle is selected "depending upon the required drive power P_L"); *see also* No. 17-1263, J.A. 16,467–68 (Paice's expert describing Ibaraki's Figure 10). This is consistent with Ibaraki's Figure 11, which shows a series of power curves corresponding to the threshold values depicted in Figure 10, plotted against the vehicle drive torque (y-axis) and vehicle speed (x-axis), as shown below:

FIG. 11



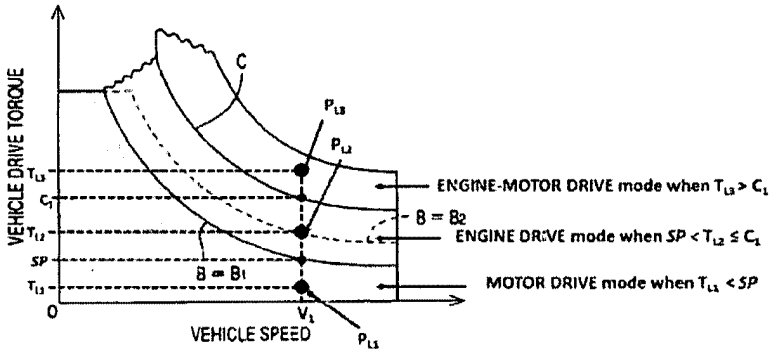
Ibaraki, Fig. 11. Each curve has a non-zero slope and delineates operating modes. As Paice's expert testified—and as the majority acknowledges, *see* Maj. Op. at 8–9—the curves represent constant levels of power, not set-points of constant torque. *See* No. 17-1263, J.A. 16,471–72; Ibaraki, col. 20, line 38 through col. 21, line 4.

As Paice's expert explained, the difference between Ibaraki's power-based system and the '634 and '347 patents' torque-based system is significant. *See* No. 17-1263, J.A. 16,470–71. A single power value can be derived from multiple combinations of torque and speed, as Ibaraki's Figure 11 plainly shows. Indeed, because power is the product of torque and speed, a large number of unique torque-speed pairs can be used to calculate the same power. For example, a vehicle requiring a large torque to maintain a low speed might have the same power requirement as a vehicle requiring a small torque to maintain a high speed. Because Ibaraki is concerned only with power, its algorithm would presumably select the *same* operating mode in both instances. This is in stark contrast to the '634 and '347 patents, which require

the claimed vehicle to operate in *different* modes when the vehicle's torque requirements are different. *See* '634 patent, col. 12, line 49 through col. 13, line 4; *id.* col. 17, lines 45–50; *id.* col. 18, lines 35–40; *id.* col. 19, lines 45–57; *id.* col. 35, lines 63 through col. 36, line 43; *id.* col. 38, lines 9–22, 51–54.

In reaching a contrary conclusion, the Board placed significant weight on Ford's expert's testimony that, *at a particular speed*, Ibaraki determines which operating mode to select based solely on torque. *See Ford Motor Co. v. Paice LLC*, IPR2015-00722, 2016 WL 5636817, at *9 (P.T.A.B. Sept. 26, 2016) (*IPR 722 Final Written Decision*). In his declaration, Ford's expert selected an arbitrary speed in Ibaraki's Figure 11, "V_1," and determined the torque value, "SP," of Ibaraki's power curve B_1 corresponding to that speed:

FIG. 11



Id.; *see also* No. 17-1263, J.A. 7255 (Ford's expert testifying that B_1 is "one particular setpoint . . . at [a] particular vehicle speed"). Ford's expert then concluded that Ibaraki teaches which operating mode to select at the designated speed based on whether the torque is greater than or less than the corresponding "SP" torque value. In other words, Ford's expert's analysis—which the Board adopted as its own—was predicated on his evaluating Ibaraki's Figure 11 at a particular speed. This analysis is flawed

for several reasons, and thus lends no support to the Board's findings with regard to Ibaraki.

First, it is not grounded in—and, in fact, is inconsistent with—Ibaraki's disclosure. Nothing in Ibaraki suggests that its controller makes operating mode decisions by considering the torque at a particular speed. To the contrary, as described above, Ibaraki discloses making such determinations by considering power. The Board's analysis, which attempts to separate out the torque and speed components from Ibaraki's power parameter, finds insufficient support in Ibaraki itself.

Second, the Board's analysis is inconsistent with the '634 and '347 patent claims and specifications. Neither the claims nor the specifications justify comparing road load to the setpoint at a particular speed. In fact, the claims at issue are silent as to speed, which makes sense in view of the patents' statements that road load is "independent of vehicle speed." '634 patent, col. 12, lines 55–61; *see also id.* col. 65, lines 16–30 (claim 80 referring to "*a* setpoint" and "*the* setpoint," not multiple setpoints to account for different speeds).[1] Further, the patents' Figure 7(a) shows that the operating mode decisions are based only on

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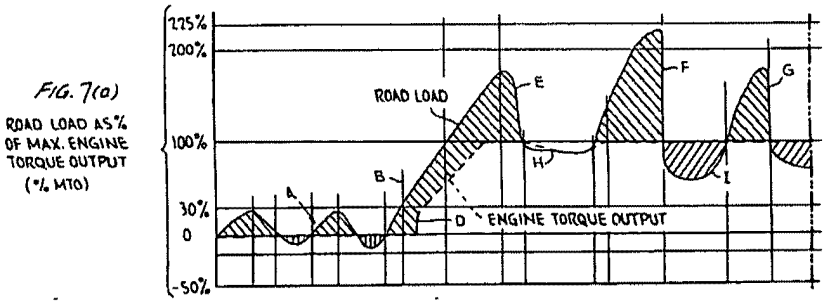
[1] Claim 12 of the '634 patent and claim 5 of the '347 patent specify that the setpoint may be varied "as a function of speed of the engine," '634 patent, col. 59, lines 3–5, but the claims at issue lack such a limitation, suggesting that the setpoints in the claims are *not* varied as a function of speed.

the road load torque, and not on speed:



Id. at Fig. 7; *id.* col. 38, line 62 through col. 39, line 40; *see also id.* Fig. 9. This figure shows that the electric-motor-only mode is selected when the road load is between 0 and 30% of maximum torque output, the engine-only mode is selected when the road load is between 30% and 100% of maximum torque output, and the hybrid mode is selected when the road load is above 100% maximum torque output. Noticeably missing from the figure and accompanying description in the specifications is any reference to speed's role in the algorithm. Thus, Ford's expert's analysis of whether Ibaraki renders the claims at issue obvious is inconsistent with the '634 and '347 patent claims and specifications, and, as such, is not entitled to deference. *See Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (noting, in an appeal from an IPR, that "we must disregard the testimony of an expert that is plainly inconsistent with the record, or based on an incorrect understanding of the claim[s]" (citations and internal quotation marks omitted)).

Third, the Board's analysis is circular. By holding speed constant, the Board removed speed from the analysis altogether and concluded—unsurprisingly—that torque is the relevant input parameter in Ibaraki's control

algorithm.[2] The Board's analysis is therefore results-oriented to the extent it assumes the very conclusion it purports to reach.

Finally, the Board found that, because "'power' is determined as the multiplicative product of 'torque' and 'speed,'" Ibaraki's power-based comparison "necessarily makes a comparison with regard to the torque value associated with the selected power point . . . , regardless of whether a comparison also is made with respect to speed." *IPR 722 Final Written Decision*, 2016 WL 5636817, at *13; *see also id.* at *14 ("[T]he point corresponding to the required drive power P_L of Figure 11 . . . satisfies the claimed road load, because P_L includes torque."). This quasi-inherency finding is unsupported by substantial evidence. The mere fact that power and torque are mathematically related does not imply that a comparison with one involves a comparison with the other. While the Board's constructions of "road load" and "setpoint" do not exclude *independently* making comparisons based on torque *and* speed, those constructions do not include making a comparison based on power—a parameter that is entirely different from torque, as Ford itself admits, *see* Appellee's Br. 46—merely because power can be derived from torque.

Indeed, the patents emphasize that their torque-based algorithm is the crux of the invention and is what distinguishes the invention over the prior art. *See* '634 patent, col. 13, lines 13–21 (stating that the prior art fails to "recognize[] that the desired vehicle operational mode should preferably be controlled in response to the vehicle's actual torque requirements, i.e., the road load" so as to

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[2] As Paice's expert testified, one could just as easily hold torque constant and conclude that Ibaraki's control system determines which mode to select at that torque based solely on speed. *See* No. 17-1263, J.A. 16,473–74.

"provide[] superior performance[] . . . under the widely-varying conditions encountered in 'real world' driving situations"). The Board's obviousness analysis, however, effectively reads the torque-based nature of the invention out of the claims altogether. To the extent the Board's obviousness determination is predicated on constructions of "road load" and "setpoint" that permit comparisons involving power demand, those constructions are unreasonably broad. *See In re Smith Int'l, Inc.*, 871 F.3d 1375, 1382–83 (Fed. Cir. 2017) (stating that "the Board cannot construe the claims so broadly that its constructions are *unreasonable* under general claim construction principles," and that giving claims terms "a strained breadth in the face of . . . otherwise different description in the specification [is] unreasonable" (internal quotation marks omitted)); *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016) ("While the broadest reasonable interpretation standard is broad, it does not give the Board an unfettered license to interpret the words in a claim without regard for the full claim language and the written description.").

For these reasons, I believe that the Board's finding that Ibaraki discloses a torque-based control system is unreasonable and unsupported by substantial evidence. And, because the Board did not make an alternative finding that a torque-based system would be an obvious modification of a power-based system, I would reverse the Board's obviousness determinations as to all claims for which Ibaraki was used as the primary reference. I respectfully dissent from the majority's contrary holding.

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Questions and Answers

Petitions for Rehearing (Fed. Cir. R. 40) and Petitions for Hearing or Rehearing En Banc (Fed. Cir. R. 35)

Q. When is a petition for rehearing appropriate?

A. Petitions for panel rehearing are rarely successful because they most often fail to articulate sufficient grounds upon which to grant them. For example, a petition for panel rehearing should not be used to reargue issues already briefed and orally argued; if a party failed to persuade the court on an issue in the first instance, a petition for panel rehearing should not be used as an attempt to get a second "bite at the apple." This is especially so when the court has entered a judgment of affirmance without opinion under Fed. Cir. R. 36. Such dispositions are entered if the court determines the judgment of the trial court is based on findings that are not clearly erroneous, the evidence supporting the jury verdict is sufficient, the record supports the trial court's ruling, the decision of the administrative agency warrants affirmance under the appropriate standard of review, or the judgment or decision is without an error of law.

Q. When is a petition for hearing or rehearing en banc appropriate?

A. En banc decisions are extraordinary occurrences. To properly answer the question, one must first understand the responsibility of a three-judge merits panel of the court. The panel is charged with deciding individual appeals according to the law of the circuit as established in the court's precedential opinions. While each merits panel is empowered to enter precedential opinions, the ultimate duty of the court en banc is to set forth the law of the Federal Circuit, which merit panels are obliged to follow.

Thus, as a usual prerequisite, a merits panel of the court must have entered a precedential opinion in support of its judgment for a suggestion for rehearing en banc to be appropriate. In addition, the party seeking rehearing en banc must show that either the merits panel has failed to follow identifiable decisions of the U.S. Supreme Court or Federal Circuit precedential opinions or that the merits panel has followed circuit precedent, which the party seeks to have overruled by the court en banc.

Q. How frequently are petitions for rehearing granted by merits panels or petitions for rehearing en banc accepted by the court?

A. The data regarding petitions for rehearing since 1982 shows that merits panels granted some relief in only three percent of the more than 1900 petitions filed. The relief granted usually involved only minor corrections of factual misstatements, rarely resulting in a change of outcome in the decision.

En banc petitions were accepted less frequently, in only 16 of more than 1100 requests. Historically, the court itself initiated en banc review in more than half (21 of 37) of the very few appeals decided en banc since 1982. This sua sponte, en banc review is a by-product of the court's practice of circulating every precedential panel decision to all the judges of the Federal Circuit before it is published. No count is kept of sua sponte, en banc polls that fail to carry enough judges, but one of the reasons that virtually all of the more than 1100 petitions made by the parties since 1982 have been declined is that the court itself has already implicitly approved the precedential opinions before they are filed by the merits panel.

Q. Is it necessary to have filed either of these petitions before filing a petition for certiorari in the U.S. Supreme Court?

A. No. All that is needed is a final judgment of the Court of Appeals. As a matter of interest, very few petitions for certiorari from Federal Circuit decisions are granted. Since 1982, the U.S. Supreme Court has granted certiorari in only 31 appeals heard in the Federal Circuit. Almost 1000 petitions for certiorari have been filed in that period.

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

INFORMATION SHEET

FILING A PETITION FOR A WRIT OF CERTIORARI

There is no automatic right of appeal to the Supreme Court of the United States from judgments of the Federal Circuit. You must file a petition for a writ of certiorari which the Supreme Court will grant only when there are compelling reasons. (See Rule 10 of the Rules of the Supreme Court of the United States, hereinafter called Rules.)

Time. The petition must be filed in the Supreme Court of the United States within 90 days of the entry of judgment in this Court or within 90 days of the denial of a timely petition for rehearing. The judgment is entered on the day the Federal Circuit issues a final decision in your case. [The time does not run from the issuance of the mandate, which has no effect on the right to petition.] (See Rule 13 of the Rules.)

Fees. Either the $300 docketing fee or a motion for leave to proceed in forma pauperis with an affidavit in support thereof must accompany the petition. (See Rules 38 and 39.)

Authorized Filer. The petition must be filed by a member of the bar of the Supreme Court of the United States or by the petitioner representing himself or herself.

Format of a Petition. The Rules are very specific about the order of the required information and should be consulted before you start drafting your petition. (See Rule 14.) Rules 33 and 34 should be consulted regarding type size and font, paper size, paper weight, margins, page limits, cover, etc.

Number of Copies. Forty copies of a petition must be filed unless the petitioner is proceeding in forma pauperis, in which case an original and ten copies of the petition for writ of certiorari and of the motion for leave to proceed in forma pauperis. (See Rule 12.)

Where to File. You must file your documents at the Supreme Court.

Clerk
Supreme Court of the United States
1 First Street, NE
Washington, DC 20543
(202) 479-3000

No documents are filed at the Federal Circuit and the Federal Circuit provides no information to the Supreme Court unless the Supreme Court asks for the information.

Access to the Rules. The current rules can be found in Title 28 of the United States Code Annotated and other legal publications available in many public libraries.

Revised December 16, 1999

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

2017-1442, 2017-1443

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794, IPR2015-00795, Administrative Patent Judge Sally C. Medley, Administrative Patent Judge Kalyan K. Deshpande, Administrative Patent Judge Carl M. DeFranco.

MANDATE

In accordance with the judgment of this Court, entered February 1, 2018, and pursuant to Rule 41(a) of the Federal Rules of Appellate Procedure, the formal mandate is hereby issued.

FOR THE COURT

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

cc: Frank A. Angileri
Gabriel Bell
Ruffin B. Cordell
Linda Kordziel
Brian James Livedalen
Matthew J. Moore
Timothy W. Riffe
John P. Rondini
Daniel Tishman
Andrew B. Turner
United States Patent and Trademark Office

Nos. 2017-1442, 2017-1443

United States Court Of Appeals
for the Federal Circuit

PAICE LLC & THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

APPEALS FROM THE UNITED STATES PATENT AND TRADEMARK OFFICE,
PATENT TRIAL AND APPEAL BOARD IN
NOS. IPR2015-00794 AND IPR2015-00795

ADMINISTRATIVE PATENT JUDGES SALLY C. MEDLEY, KALYAN K. DESHPANDE, AND CARL M. DEFRANCO

APPELLANTS' PETITION FOR REHEARING EN BANC

Ruffin B. Cordell
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901 15th Street, 7th Floor
Washington, DC 20005

ATTORNEYS FOR APPELLANTS,
PAICE LLC & THE ABELL
FOUNDATION, INC.

Certificate of Interest

Pursuant to Federal Circuit Rule 47.4, counsel for the Appellants Paice LLC and the Abell Foundation, Inc. certifies the following:

1. The full name of every party or amicus represented by me is:

   Paice LLC and the Abell Foundation, Inc.

2. The name of the real party in interest represented by me is:

   Paice LLC and the Abell Foundation, Inc.

2. The parent corporation or publicly held companies that own 10 percent or more of the stock of the parties or amicus curiae represented by me is: None.

3. The names of all law firms and the partners or associates that appeared for the parties or amicus now represented by me in the trial court or are expected to appear in this court are:

   Ruffin B. Cordell, Linda Liu Kordziel*, Timothy W. Riffe, Kevin E. Greene*, Brian J. Livedalen, Daniel A. Tishman, and W. Peter Guarnieri++ of Fish & Richardson P.C.

   * no longer with the Firm

   ++ walled from this case and will not enter an appearance

Date: March 5, 2018

/s/ Ruffin B. Cordell
Ruffin B. Cordell

Table of Contents

TABLE OF AUTHORITIES

Page(s)

Cases

STATEMENT OF COUNSEL
UNDER FEDERAL CIRCUIT RULE 35(B)(2)

Based on my professional judgment, I believe the panel decision is contrary to the following decision of the Supreme Court of the United States: *Dickinson v. Zurko*, 527 U.S. 150, 162, 119 S. Ct. 1816, 1823 (1999); *McCormick Harvesting Machine Co. v. C. Aultman & Co.*, 169 U.S. 606 (1898); *United States v. American Bell Telephone Co.*, 128 U.S. 315 (1888); *Stern v. Marshall*, 564 U.S. 462, 484 (2011).[1]

/s/ Ruffin B. Cordell
Ruffin B. Cordell
Attorney for Appellants
Paice LLC and Abell Foundation, Inc.

PRELIMINARY STATEMENT

Expert testimony that runs counter to the record evidence gets no weight. As this Court recently noted in an IPR appeal, "we must disregard the testimony of an expert that is plainly inconsistent with the record..." *Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (citation omitted)). Yet,

[1] So the Court does not duplicate effort, Paice notes that this Petition matches the *en banc* petition filed this same day in Docket No. 2017-1263 *et al.*, which involves the same appellants and appellee. The legal issues in the two petitions are the same.

the panel here found substantial evidence supported the Board's decision where the ***only*** supporting evidence was result-oriented expert testimony that disregarded the key patented feature and the prior art teaching. Despite the hallmark of the '347 Patent's invention being its use of torque to control a hybrid electric vehicle, the expert looked to a prior art reference that uses power as its control variable. Compensated expert witnesses should not be free to ignore the record evidence and rewrite the prior art, but this revisionist history is exactly what the panel credited here as substantial evidence.

Moreover, the PTO should be ordered to dismiss the IPR because of the reasoning presented in *Oil States*.

STATEMENT OF THE CASE

A. The '347 Patent—Determining When to Turn on an Engine in a Hybrid Car By Comparing Road Load to a Setpoint

The '347 Patent is about hybrid vehicle control. It determines when to run the gas engine, the electric motor, or both, to provide high performance and good fuel economy. The prior art lacked that ability because it used the wrong input parameters, such as vehicle speed and accelerator pedal position, which did not take into account varying conditions. [Appx824 (4:42-57), Appx829 (13:1-17) (describing various prior art control systems).] For example, a particular pedal position or speed could vary greatly relative to what a driver needs based on whether

the car is going uphill or downhill, is driving in snow, or is at high altitudes. [Appx829 (13:11-17).]

The '347 Patent was first to recognize that "widely varying conditions encountered in 'real world' driving situations" create an ever-changing environment for a control system and the inventors discovered that the "current torque requirement" at the wheels best encapsulates those conditions into a single value that will always indicate when the engine should and should not be run. [Appx829 (13:11-17).] And notably, the '347 Patent touts that the "instantaneous torque necessary to propel the vehicle" is "independent of vehicle speed." [Appx828 (12:51-57).]

The Patent thus claims triggering hybrid operating mode transitions based on "road load"—i.e., "the amount of instantaneous torque required to propel the vehicle, be it positive or negative." To determine when to turn the engine on, the Patent compares this road load torque to a setpoint. If the required "road load" torque is below the setpoint, the '347 Patent runs on the electric motor. And if the required "road load" is above the setpoint, the '347 Patent turns the engine on.

B. Prior Art—Ibaraki—Determining Operating Modes by Comparing Drive Power to a Power-Based Setpoint

Ibaraki[2] discloses a power-based, not road load-based, control system. The prior art Ibaraki patent, in contrast, has a control system that looks to power rather than torque. It compares power to a power threshold to determine when to use the electric motor or gas engine. Ibaraki does not use road load or a torque-based setpoint in its control algorithm. [Appx2015 (12:54-64); Appx21683-21686 (¶¶ 37-40).] This is a critical difference because as a matter of simple math and physics, power is not torque and certainly not road load (the instantaneous torque required to propel the vehicle). Power is directly proportional to speed (power = torque * rotational speed) whereas torque is not. [Appx21688 (¶ 46); Appx22756-22757 (¶ 204).] Indeed, the '347 Patent states that the "instantaneous torque necessary to propel the vehicle" is "independent of vehicle speed." [Appx828 (12:51-57).]

Speed intrinsically influences a power-based system like Ibaraki, which causes Ibaraki to select operating modes under different conditions than the '347 Patent's control scheme. Using power as a control variable yields different outcomes for the algorithm than when road load torque is used. For example, Ibaraki would select "Engine Drive Mode" under conditions of high vehicle speed and low

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[2] U.S. Patent 5,789,882. [Appx2000-2024.]

torque due to the relationship between power and speed whereas the '347 Patent's torque-based system would not. [Appx21688 (¶ 46).] Conversely, under conditions of low vehicle speed and relatively high torque, Ibaraki's power-based system would select "Motor Drive Mode" whereas the '347 Patent would select the gas engine propulsion mode. [*Id.*]

C. The IPR Proceedings

The Board found the '347 Patent claims obvious over Ibaraki, either alone or in combination with other references. Ibaraki uses power instead of road load torque, and Appellants presented expert testimony explaining the numerous differences between switching modes based on road load torque versus switching modes based on power.[3] The Board construed the claims to make clear that both road load and setpoint—the basis of comparison—are torque values and that the claims specifically require a comparison between the two. [*See, e.g.*, Appx8-13.] Nonetheless, the Board found that Ibaraki renders the claims obvious merely because power and torque are mathematically related.

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[3] Appellants relied on the declaration of its technical expert, Mr. Hannemann. [Appx21666-21732; Appx22420-22480.]

ARGUMENT

A. Expert Testimony That is Inconsistent with the Record Evidence Cannot Be Substantial Evidence

The panel erred by relying on improper expert testimony that amounted to little more than result-oriented analysis attempting to convert Ibaraki's power-based control algorithm into the '347 Patent's torque based algorithm. Both the majority and dissent agreed that Ibaraki compares the "instantaneous drive power" "PL" to a ***constant*** power threshold to determine when to turn the engine on, as opposed to comparing road load torque to a predetermined torque value (*i.e.*, a "setpoint") as the challenged claims require. *Paice LLC v. Ford Motor Co.*, Nos. 2017-1263 *et al.*, 2017-1442 *et al.*,, -- Fed. Appx. --, op. at *8 (Fed. Cir. Feb. 2, 2017); dis. op. at *2-4. The majority's opinion (and the Board's before it) does not rest on the teachings of Ibaraki, only mere expert opinion. Such testimony, when lacking in any factual support, cannot support the panel's decision. The panel erred by relying on this expert testimony because it is inconsistent with the record evidence and cannot amount to substantial evidence.

Ford's expert testimony is improper because it confuses power for torque even though there is no dispute that power and torque are not the same thing. Power and torque are two different measures, and although they can be associated the way voltage and power are associated in electric circuitry, they represent very different

things in an operating automobile. Power = torque * rotational speed. Thus, power increases proportionally with increases in torque ***and*** speed. That is why racecar drivers would look to an engine's horsepower because they want to be able to pull work out of the engine at high speeds. Ranchers and tow truck drivers, however, care more about torque because torque is independent of speed. This explains why a tractor or tow truck can deliver significant force even at low speeds. In short, power is dependent on speed while torque is not.

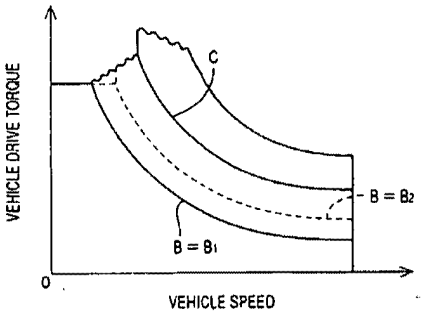
The panel erred by relying on faulty and unsupported expert testimony, which eliminated the important distinction between power and torque by removing the speed component from the analysis altogether. By ignoring the influence of speed, the expert unsurprisingly found torque in a power-based control algorithm (power being the product of speed and torque). Such result-oriented analysis, however, cannot amount to substantial evidence, especially where Ibaraki makes no mention of looking at torque.

1. Ibaraki Compares Instantaneous Drive Power to a Power-Based Threshold

Ibaraki discloses a power-based control algorithm, not a torque based algorithm like the '347 Patent. Ibaraki does not use road load—the instantaneous ***torque*** required to propel the vehicle—as its control variable. Ibaraki uses the "instantaneous drive power" "P_L" as the control variable [Appx2015 (12:54-64);

Appx21683-21686 (¶¶ 37-40)], and at step Q8 compares the "instantaneous drive power" to power-based threshold "B" to determine when to turn the engine on. [Appx2019 (20:38-47); Appx2021 (24:6-22); Appx21684-21686 (¶ 40).] Ibaraki does not make any torque comparisons. Moreover, as both the majority and dissent recognized, the threshold "B" is "a constant level of power." *Paice LLC*, Nos. 2017-1263 et al.,2017-1442 *et al.*, op. at *8.[4]

FIG. 11



[Appx2009.] And as Figure 11 demonstrates, there are many combinations of torque and speed that result in the same power value, *i.e.*, the value set by threshold "B." As the dissent noted:

> A single power value can be derived from multiple combinations of torque and speed, as Ibaraki's Figure 11 plainly shows. Indeed, because power is the product of torque and speed, a large number of unique

[4] *See also* op. at *9 ("It is undisputed that the relationship between the required drive power PL, torque, and speed is PL = torque x speed, which makes each of curve B and C in Figure 11's graph of torque x speed a constant power level."); dis. op. at *4 ("As Paice's expert testified—and as the majority acknowledges, *see* Maj. Op. at 8–9—the curves represent constant levels of power, not setpoints of constant torque.").

> torque-speed pairs can be used to calculate the same power. For example, a vehicle requiring a large torque to maintain a low speed might have the same power requirement as a vehicle requiring a small torque to maintain a high speed. Because Ibaraki is concerned only with power, its algorithm would presumably select the same operating mode in both instances.

Paice LLC, Nos. 2017-1263 et al.,2017-1442 *et al.*, dis. op. at *4.

A simple example illustrates the dissent's point that a power-based comparison (like Ibaraki's comparison of "P*L*" to power-based threshold "B") does not compare torque. Because both torque and speed are independent variables, there is no fixed relationship between power and torque. Assuming, for example, that threshold "B" is 10.5 kW, Ibaraki will select operating modes regardless of any constituent torque value. [Appx21684 (¶ 39).] As shown in the example below, the torque component of a 10.5 kW power setpoint varies widely (from 20 to 100 Nm) as the result of the varying speed component.

10.5 kw of power	
Speed (RPMs)	**Torque (Nm)**
1000	100
2000	50
3000	33.33333
4000	25
5000	20

[Appx21684 (¶ 39).][5] Thus, Ibaraki could select Engine-Drive Mode when the "instantaneous driver power" exceeds 10.5 kW at very low torques (and high speeds) or very high torques (and low speeds). No particular torque value (no matter how high) will cause Ibaraki to select "Engine-Drive Mode" because torque is not compared to a torque-based setpoint. As discussed below, Ford's expert testimony—which the panel deemed substantial evidence—provides no justification (whether in Ibaraki or elsewhere) for finding torque comparisons in a power-based system.

2. Result-Oriented Expert Testimony Cannot Bridge the Gap Between Ibaraki and the '347 Patent Claims

The panel was wrong to find that Ford's expert's testimony constituted substantial evidence. The panel, like the Board before it, placed significant weight on Ford's expert's testimony that Ibaraki determines which operating mode to select based on torque by holding speed constant. *Paice LLC*, Nos. 2017-1263 et al.,2017-1442 *et al.*, op. at *9-10; Appx19. In other words, Ford's expert impermissibly bridged the gap between Ibaraki's power-based strategy and the '347 Patent's torque-based strategy by ignoring the fundamental difference between their

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[5] P (watts) = τ (Nm) * ω (radians/sec), where $\omega = (2 \cdot \pi \cdot \text{rpm})/60$.

underlying control variables: power = torque * rotational speed such that power is dependent on speed but torque is not. By negating the speed component, Ford's expert impermissibly rewrote Ibaraki to find torque. Such expert testimony is inconsistent with the record and cannot amount to substantial evidence. *See Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (noting, in the context of IPR, that "we must disregard the testimony of an expert that is plainly inconsistent with the record…" (citation omitted)).[6] Indeed, as the dissent noted, "remov[ing] speed from the analysis altogether" is "results-oriented to the extent it assumes the very conclusion it purports to reach." *Paice LLC*, Nos. 2017-1263 et al.,2017-1442 *et al.*, dis. op. at *7.

Ford's expert's analysis is flawed for several reasons. First, Ibaraki says nothing about holding the speed constant to identify the corresponding torque value. As the marked up version of Figure 11 shows, Ford's expert held the speed constant in order to eliminate the influence of speed in Ibaraki's control algorithm. By selecting an arbitrary speed "V_1" (thereby eliminating the speed component in Ibaraki's Figure 11), Ford's expert found a torque value, "SP," (identified on the Y

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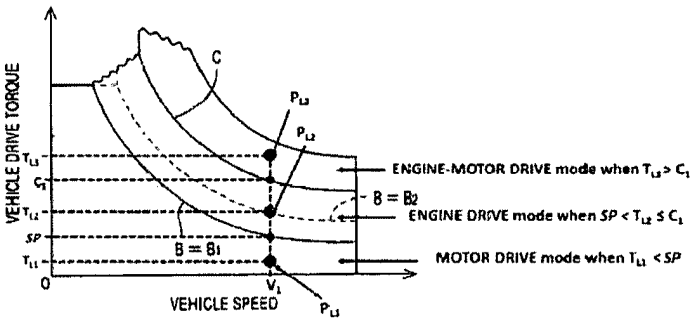
[6] *See also Dickinson v. Zurko*, 527 U.S. 150, 162, (1999) ("'substantial evidence' standard … require[es] a court to ask whether a 'reasonable mind might accept' a particular evidentiary record as 'adequate to support a conclusion.'" (citations omitted).

axis) on Ibaraki's power curve "B." Moving up and down speed "V_1," Ford's expert proceeded to compare the torque component (T_{L2}) of the "instantaneous driver power" to the "SP" value.

FIG. 11



Paice LLC, Nos. 2017-1263 et al.,2017-1442 *et al.*, op. at *10; Appx22787-90.

The fact that Ford's expert was able to locate torque points in Ibaraki by ignoring speed is unsurprising given that power equals torque times speed. Ibaraki, however, does not teach fixing the speed to identify a torque value. Ibaraki compares the "instantaneous drive power" to power-based threshold "B." [Appx2019 (20:38-47); Appx2021 (24:6-22); Appx21684-21686 (¶ 40).] And as Figure 11 demonstrates, power-based threshold "B" is a line of constant power. In other words, threshold "B" has the same power value (in kilowatts) across all speeds (shown in the X axis). Ibaraki does not say anything about parsing out the speed component in order to compare torque.

More importantly, Ford's expert's analysis fails to demonstrate that Ibaraki actually uses the identified torque values to select operating modes. Merely pointing to a torque value on power-based threshold "B" is a far cry from demonstrating that Ibaraki's control algorithm makes decisions based on torque. The fact that Ford's expert could identify the torque component of the overall power-based threshold "B" does not mean that torque serves any purpose in the control algorithm. Indeed, the same illustration—setting the power-based threshold "B" at 10.5 kW—demonstrates that identifying a torque value and controlling for torque are two separate things. For example, one can select a torque value of 20 Nm from the table below. But identifying the 20 Nm torque value does reveal any useful information about how Ibaraki actually operates.

10.5 kw of power	
Speed (RPMs)	**Torque (Nm)**
1000	100
2000	50
3000	33.33333
4000	25
5000	20

[Appx21684 (¶ 39).] In other words, Ford's expert testimony—which is more concerned with identifying a torque value whether by coincidence or otherwise—fails to establish that the torque value drives the decision making process. The panel's reliance on this testimony is flawed for this additional reason.

The panel's finding that the Board's decision is supported by substantial evidence vis-à-vis Ford's expert testimony is even more troubling given that the Board relied on this testimony to support an inherency finding—that "[a] comparison directed to a selected power point on Figure 11 of Ibaraki '882 ***necessarily*** makes a comparison with regard to the torque value associated with the selected power point on the figure." [Appx21-22 (emphasis added); Appx61-62.] The Board did not find that Ibaraki's power-based control algorithm renders obvious the '347 Patent's torque-based control algorithm. It found that the former necessarily includes the latter. But "[t]he mere fact that power and torque are mathematically related does not imply that a comparison with one involves a comparison with the other." *Paice LLC*, Nos. 2017-1263 et al.,2017-1442 *et al.*, dis. op. at *8.[7] As noted previously, pointing out the unremarkable fact that power has both a speed and torque component does not establish that a power-based control algorithm makes decisions based on torque.

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[7] As this Court recently noted, "use of inherency in the context of obviousness must be carefully circumscribed because '[t]hat which may be inherent is not necessarily known' and that which is unknown cannot be obvious." ... While '[w]e have recognized that inherency may supply a missing claim limitation in an obviousness analysis,' ... we have emphasized that 'the limitation at issue necessarily must be present" in order to be inherently disclosed by the reference." *Southwire Co. v. Cerro Wire LLC*, 870 F.3d 1306, 1310-11 (Fed. Cir. 2017) (citations omitted).

Because the only record evidence supporting the Board's finding is expert testimony that conflicts with the record itself, the panel was wrong to find substantial evidence supported the Board's opinion.

B. Constitutionality Of The IPR Process

Once a patent is granted, it "is not subject to be revoked or canceled by the president, or any other officer of the Government" because "[i]t has become the property of the patentee, and as such is entitled to the same legal protection as other property." *McCormick Harvesting Mach. Co. v. C. Aultman & Co.*, 169 U.S. 606, 608-09 (1898).[8]

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[8] The petition as to this issue is timely. It is axiomatic that challenges to a court's or agency's basic power to hear a case can never be forfeited or waived. *Gonzalez v. Thaler*, 565 U.S. 134, 141 (2012). Moreover, the Board could not address the Constitutional issues here, so the issues could not have been raised practically below. *See, e.g., Beard v. General Services Admin.*, 801 F.2d 1318, 1321 (Fed. Cir. 1986) (failure to make Constitutional challenge at agency not waived where it did not require development of a factual record, the application of agency expertise, or the exercise of administrative discretion, and raising it at the agency would have been futile); *see also Hayes v. Dept. of Navy*, 727 F.2d 1535, 1539 (Fed. Cir. 1984); *Sullivan v. Dept. of Navy*, 720 F.2d 1266 (Fed. Cir. 1983). Similarly, the panel here could not reverse the binding *MCM Portfolio* decision, and an *en banc* request to a panel is optional. *See* Federal Circuit Rule 35 ("[A] party ***may*** argue . . . to overrule binding precedent without petitioning for rehearing *en banc*."). Moreover, Appellants addressed the Constitutional issue before the panel. *See* Yellow Br. at fn. 2.

The Petitioner in *Oil States Energy Services, LLC v. Greene's Energy Group, LLC*, 639 F. App'x 639 (Fed. Cir. 2016) *cert. granted* 137 S. Ct. 2239 (U.S. June 12, 2017) (No. 16-712) ("*Oil States*") explained how this proposition originated from the Supreme Court's statement that the Court has "long recognized that, in general, Congress may not 'withdraw from judicial cognizance any matter which, from its nature, is the subject of a suit at the common law, or in equity, or admiralty.'" *Stern v. Marshall*, 564 U.S. 462, 484 (2011) (citations omitted). The question is whether the case "is made of 'the stuff of the traditional actions at common law tried by the courts at Westminster in 1789.'" *Id.* The *Oil States* Petitioner pointed out that "[p]atent infringement cases are" made of such stuff, because such suits were "raised in England during the Eighteenth Century either in actions at law or suits in equity." *Id.* at 16-17 (citations omitted).

The Supreme Court responded to these arguments by granting review. This Court should, therefore, grant *en banc* review in this case to revisit the reasoning in *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284 (Fed. Cir. 2015) or at least to hold back final disposition of this appeal so that it can be aligned with the result in *Oil States*, and so that the Supreme Court can avoid the additional work of reviewing a petition for certiorari in the present appeal.

CONCLUSION

Because the panel attributed substantial evidence to inconsistent and results-oriented expert testimony and because the constitutionality of the IPR process is in question, Appellants respectfully request rehearing *en banc*.

Date: March 5, 2018

Respectfully submitted,

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Addendum

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1263, 2017-1264, 2017-1308, 2017-1309, 2017-1310, 2017-1311

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00722, IPR2015-00784, IPR2015-00787, IPR2015-00790, IPR2015-00791, IPR2015-00800.

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1442, 2017-1443

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794, IPR2015-00795.

Decided: February 1, 2018

RUFFIN B. CORDELL, Fish & Richardson, PC, Washington, DC, argued for appellants. Also represented by TIMOTHY W. RIFFE, BRIAN JAMES LIVEDALEN, DANIEL TISHMAN.

MATTHEW J. MOORE, Latham & Watkins LLP, Washington, DC, argued for appellee. Also represented by GABRIEL BELL; FRANK A. ANGILERI, JOHN P. RONDINI, ANDREW B. TURNER, Brooks Kushman PC, Southfield, MI.

Before LOURIE, O'MALLEY, and TARANTO, *Circuit Judges.*

Opinion for the court filed by *Circuit Judge* TARANTO.

Opinion dissenting in part filed by *Circuit Judge* O'MALLEY.

TARANTO, *Circuit Judge.*

U.S. Patent Nos. 7,237,634 and 7,104,347, which are owned by Paice LLC and The Abell Foundation (collectively, Paice), describe and claim asserted improvements in a hybrid vehicle—a vehicle that has available for propulsion both a battery-powered electric motor and an internal combustion (gas) engine. At Ford's request, the Patent and Trademark Office instituted inter partes reviews of various claims of the two patents under 35 U.S.C. §§ 311–19. The Patent Trial and Appeal Board

ultimately held numerous claims of the two patents unpatentable. Paice appeals. We affirm.

I

The '634 and '347 patents describe a control strategy, based on the torque needed for propulsion, for switching between different modes of operating a hybrid vehicle—use of (one or more) electric motors, a gas engine, or both. The subject matter has been discussed in previous decisions of this court. *See Paice LLC v. Ford Motor Co.*, 681 F. App'x 885, 887–88 (Fed. Cir. 2017) (*Paice I*) (involving Paice's related U.S. Patent No. 7,559,388); *Paice LLC v. Ford Motor Co.*, 681 F. App'x 904, 908–09 (Fed. Cir. 2017) (*Paice II*) (involving the '347 patent); *Paice LLC v. Ford Motor Co.*, 685 F. App'x 940, 943 (Fed. Cir. 2017) (*Paice III*) (involving Paice's related U.S. Patent No. 8,214,097); *see also Paice LLC v. Ford Motor Co.*, 685 F. App'x 950 (Fed. Cir. 2017) (*Paice IV*) (summary affirmance of Board decisions involving the '634 patent).[1] We recite here only the background necessary to resolve the issues on appeal.

The common specification explains that the control strategy bases selection decisions on instantaneous torque demand, or "road load." '634 patent, col. 13, lines 12–21, 44–65.[2] Because the gas engine runs most efficiently when it produces torque near its maximum torque output,

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[1] Related subject matter is also at issue in appeals 17-1387, 17-1388, 17-1390, 17-1457, 17-1458, and 17-1406, which were argued in tandem with the present appeals.

[2] The '634 patent issued from a divisional application, under 35 U.S.C. § 121, of the application that issued as the '347 patent. Because the patent specifications are identical in all material respects, this opinion cites only to the '634 patent, and to the materials submitted in appeal 17-1263, unless specifically noted otherwise.

the control strategy is designed to operate the engine "only under circumstances where the engine will be loaded so as to require at least 30% of its maximum torque output ('MTO') (it being understood throughout this specification and the appended claims that this 30% figure [setpoint] is arbitrary and can be varied)." *Id.*, col. 13, lines 14–29, 44–65; *see also id.*, col. 2, lines 58–60. Generally, the electric motor alone is used to run the vehicle below the 30% setpoint, the gas engine is used to run the vehicle in the "efficien[t]" range of 30% to 100% of the engine's maximum torque output, and both propulsion sources are used to run the engine when more than 100% of the gas engine's maximum torque output is required (the electric motor providing the additional torque required). *Id.*, col. 41, line 59 through col. 43, line 25 & Fig. 9.

The relevant claims of the Paice patents require two comparisons—of the vehicle's road load to a setpoint, and of the vehicle's road load to the gas engine's maximum torque output—for the decision whether to operate the electric motor, the gas engine, or both. Independent claim 80 of the '634 patent is representative.[3] That claim reads:

> 80. A method for controlling a hybrid vehicle, comprising:
>
> determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;
>
> monitoring the RL over time;

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[3] In appeals 17-1442 and 17-1443, the parties treat claims 1 and 23 of the '347 patent as representative. Those claims are materially identical to claim 80 of the '634 patent. *Compare* '634 patent, col. 65, lines 11–33 *with* '347 patent, col. 58, lines 13–37 *and id.*, col. 60, lines 22–54.

operating the at least one electric motor to propel the hybrid vehicle when the RL required to do so is less than a setpoint (SP);

operating the internal combustion engine of the hybrid vehicle to propel the hybrid vehicle when the RL required to do so is between the SP and a maximum torque output (MTO) of the engine, wherein the engine is operable to efficiently produce torque above the SP, and wherein the SP is substantially less than the MTO; and

wherein said operating the internal combustion engine to propel the hybrid vehicle is performed when:

the RL>the SP for at least a predetermined time; or

the RL>a second setpoint (SP2), wherein the SP2 is a larger percentage of the MTO than the SP; and

operating both the at least one electric motor and the engine to propel the hybrid vehicle when the torque RL required to do so is more than the MTO.

'634 patent, col. 65, lines 11–33.[4]

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[4] In IPR2015-00791, the Board dismissed the challenge to claim 80 from the inter partes review because that claim had been held unpatentable in an earlier Board decision, *Ford Motor Co. v. Paice LLC*, No. IPR2014-01416, 2016 WL 932948, at *1 (P.T.A.B. Mar. 10, 2016), *aff'd*, *Paice IV*, 685 F. App'x 950. Though not at issue here, claim 80 contains the relevant limitations and is representative of the claims on appeal.

In the final written decisions in seven inter partes reviews, the Board determined that the following claims—claims 2–4, 6–13, 15, 17, 19, 23, 25, 27–30, 32, 66–67, 79, 94, 96, 106–08, 113, 128, 140–41, 146, 173, 229, 231, 238–41, 252–56, 259, 261–62, 267, 281–82, 285, and 287–88 of the '634 patent; and claims 3–5, 14, 16, 19–20, 22, 25–30, 32, and 39–41 of the '347 patent—are unpatentable for obviousness over U.S. Patent No. 5,789,882 (Ibaraki), either alone or in combination with other references.[5] The Board's decision in IPR2015-00722, on appeal here in 17-1263, is representative. *Ford Motor Co. v. Paice LLC*, IPR2015-00722, 2016 WL 5636817 (P.T.A.B. Sept. 26, 2016) (*IPR 722 Final Written Decision*).

On appeal pursuant to 35 U.S.C. § 319, Paice challenges those Board decisions, under 5 U.S.C. § 706(2)(E), as not supported by substantial evidence. We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

II

We review the Board's factual findings underlying its obviousness determinations for substantial evidence, which "means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1061 (Fed.

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[5] In the eighth Board decision on appeal (involving IPR2015-00800), the Board determined that claims 172, 226, 230, and 234 of the '634 patent are unpatentable for obviousness over a series of articles written by J.R. Bumby. We are unpersuaded by Paice's arguments on appeal challenging that determination. We affirm the decision without further discussion, except to note that in *Paice II*, 681 F. App'x at 917–18, we affirmed the Board's determination of unpatentability of similar claims in Paice's '347 patent based on obviousness over the Bumby references.

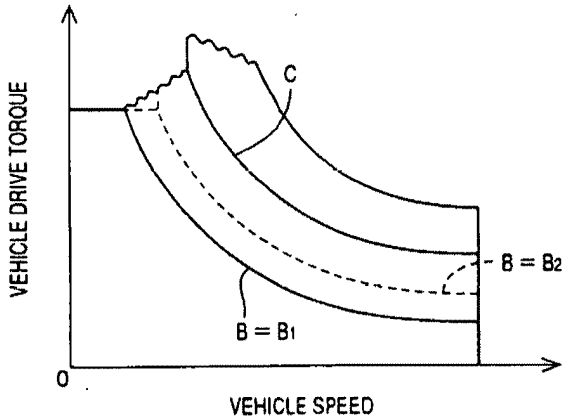
Cir. 2016) (quoting *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938)).

A

Paice's main argument is that the Board's finding that Ibaraki discloses torque-based comparisons is not supported by substantial evidence. We disagree.

As the Board correctly found, *IPR 722 Final Written Decision*, 2016 WL 5636817, at *7, Ibaraki describes a hybrid vehicle with "a drive control apparatus" (controller) that, like the microprocessor in the '634 and '347 patents, "includes drive source selecting means" for selecting the engine, motor, or both. Ibaraki, col. 1, lines 10–13; *id.*, col. 20, lines 38–43. The controller makes the selection "according to a drive source selecting data map," illustrated in Figure 11 (below), "which represents a predetermined relationship between the vehicle drive torque and running speed V and the . . . three drive modes" of motor drive (electric motor only), engine drive (gas engine only), and engine-motor drive (both). *Id.*, col. 20, lines 38–53.

FIG. 11



"[W]hen the vehicle running condition as represented by the current vehicle drive torque and speed" falls in the area below curve B, the controller selects motor drive

mode. *Id.*, col. 20, line 55–62; *see also id.*, col. 21, lines 2–4 (B can be shifted from B_1 to B_2 to enlarge the motor drive range, if such a condition is desired). Similarly, the controller selects engine drive mode when the running condition falls in the area between curve B and curve C, and engine-motor drive mode in the area above curve C. *Id.*, col. 20, line 55 through col. 21, line 1; *id.*, col. 24, lines 16–21 & Fig. 10.[6]

Paice does not dispute the finding that Ibaraki teaches comparisons to setpoints to select engine, motor, or engine-motor operation. In Figure 11, curve B and curve C each is a constant level of power, and the flowchart in Ibaraki's Figure 10 expressly refers to a power comparison ("P_L > B?"; "P_L > C?") for selecting the mode of operation. Precisely because that comparison employs power, however, Paice argues that Ibaraki's controller does not base mode selection on comparisons to torque, as required by the patent claims.

The question before us is not whether the Board might properly have accepted Paice's contention about the teachings of Ibaraki. The question is whether the Board had an adequate evidentiary basis for its contrary finding. The Board found that Ibaraki teaches reliance on *both* power *and* torque; it thus rejected Paice's contention that one teaching excludes the other. *IPR 722 Final Written*

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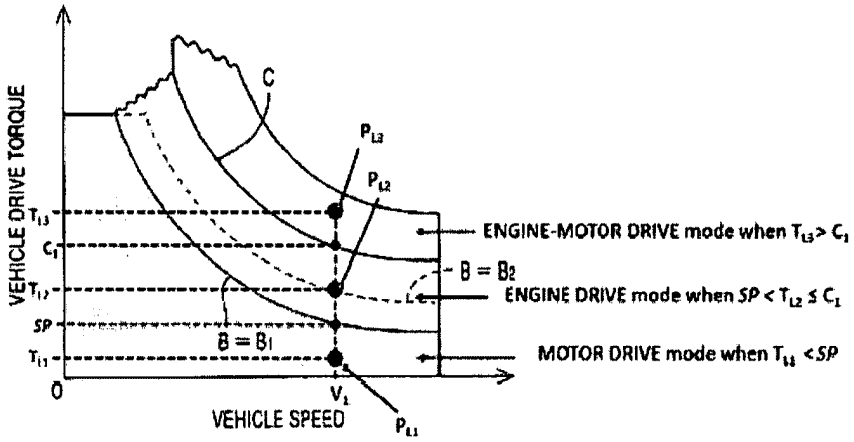
[6] Ibaraki at col. 20 line 66 through col. 21, line 1, states that "[w]hen the vehicle running condition is in the range above the second boundary line C, the drive source selecting means [] selects the ENGINE-DRIVE mode." Based on context and Figure 10, that appears to be a typographical error: the passage should say "ENGINE-MOTOR DRIVE mode." Paice does not dispute that Ibaraki discloses that if the power level is greater than curve C, "the vehicle is driven in 'Engine-Motor Drive Mode.'" Paice Br. 20.

Decision, 2016 WL 5636817, at *7–12. We conclude that the Board's finding is reasonable on this record.

Ford's expert Dr. Gregory Davis pointed out that "Ibaraki [] states that the 'vehicle drive torque and speed' determine 'a point corresponding to the required drive power P_L." J.A. 16133 (quoting Ibaraki, col. 23, line 66 through col. 24, line 2 (explaining that in Figure 10's flowchart of controller decisionmaking, step Q8 is where the controller "determine[s] whether a point corresponding to the required drive power P_L (determined by the current vehicle drive torque and speed V) is located above the first boundary line B.")). It is undisputed that the relationship between the required drive power P_L, torque, and speed is P_L = torque x speed, which makes each of curve B and C in Figure 11's graph of torque x speed a constant power level. Dr. Davis explained that any particular point on one of the Figure 11 curves (*e.g.*, on B or on C) relates to a "required drive power P_L at a given vehicle drive torque and vehicle speed." J.A. 16133 (internal quotation marks omitted).

To show how Ibaraki's controller makes operation decisions based on torque comparisons at a given speed, Dr. Davis provided an annotated version of Figure 11, shown at *IPR 722 Final Written Decision*, 2016 WL 5636817, at *8:

FIG. 11



That figure illustrates Dr. Davis's reading of Ibaraki as teaching selection decisions based on torque. At a given speed (V_1), the selection decision is based on where on the torque axis the desired torque is: Ibaraki selects motor drive mode at T_{L1}, engine drive mode at T_{L2}, and engine-motor drive mode at T_{L3}. The comparisons of desired torque are to the torque levels on curves B and C at speed V_1, *i.e.*, SP (set point) on curve B and C_1 on curve C.

The Board relied on Ibaraki and the knowledge of a person of skill in the art, as explained by Dr. Davis, to find that power is directly related to torque, that Ibaraki's controller determines the required drive power based on the current vehicle drive torque and speed, and that Ibaraki teaches selection decisions dependent on torque (though not only on torque)—specifically, on torque levels at a given speed. *See IPR 722 Final Written Decision*, 2016 WL 5636817, at *8–9, *13–14.[7] The Board had a

[7] Similarly, in the '634 patent, as the Board pointed out, speed may also be "considered in determining the mode of operation of the vehicle": the patent "contemplates including not just the torque value in the [setpoint] comparison, but also speed." *IPR 722 Final Written*

sufficient basis for rejecting Paice's reading of Ibaraki as not teaching torque-based comparisons.

The Board also had a sufficient basis for rejecting a related contention made by Paice—that, even if Ibaraki shows torque-based comparisons, it does not show comparing the vehicle's required torque to the engine's "maximum torque output" and using both propulsion sources when the required torque exceeds that level, as required by the patent claims. Dr. Davis explained that a person of skill in the art would know the following: curve C of Ibaraki's Figure 11 is less than or equal to the engine's maximum torque output (the engine, alone, is running just below that curve); the motor is turned on to provide additional torque above curve C; and "'a hybrid vehicle control strategy would at some point allow the [internal combustion] engine to provide output torque near and potentially including its [maximum torque output]. Otherwise, the system would be artificially limiting the performance of the vehicle.'" *Id.* at *11 (quoting Dr. Davis's declaration). The Board was persuaded. It found that Ibaraki, combined with the knowledge of a person of ordinary skill in the art, taught the Paice claim limitation

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Decision, 2016 WL 5636817, at *14 (citing '634 patent, Fig. 4 & col. 59, lines 3–5 (dependent claim 12 recites "the hybrid vehicle of claim 1, wherein the controller is operable to vary the SP as a function of speed of the engine"); *cf.* '634 patent, col. 58, lines 19–27 (claim 1 requirement that the controller, among other things, "is operable to operate the engine when torque . . . is at least equal to a setpoint (SP) above which the torque produced by the engine is efficiently produced"). *See also id.*, col. 19, lines 63–65 ("The vehicle is operated in different modes, depending on its instantaneous torque requirements, and the state of charge of the battery, and other operating parameters.").

that both the engine and motor be used to propel the vehicle above the engine's maximum torque output. *Id.* at *11–12. Dr. Davis's testimony supplies an adequate basis for that finding.

We note that, in the alternative, the Board found that "operating the engine and motor when the torque [road load] required to do so is more than the [maximum torque output] . . . would have been an obvious modification to make to the Ibaraki [] control system." *Id.* at *14 (internal quotation marks omitted). We agree with that determination on the evidence-supported facts found by the Board.

B

Paice also challenges the Board's finding that Ibaraki discloses the claim requirement of a setpoint that is "substantially less" than the engine's maximum torque output—the engine alone operating when the required torque is between those figures. *See IPR 722 Final Written Decision*, 2016 WL 5636817, at *10. It is undisputed, based on claim 15 of the '634 patent, that approximately 70% of the maximum torque output constitutes being "substantially less" than the maximum torque output. *Id.* The Board found that this limitation was shown in Ibaraki, relying on the explanation of Dr. Davis that it would be "clear" to a person of skill, based upon a "simple visual inspection" of Figure 11, "that setpoint SP [along curve B_1] is substantially less than point C_1 [along curve C]," and therefore substantially less than the maximum torque output (which, for reasons already noted, is at or above curve C). J.A. 16157–58; *see IPR 722 Final Written Decision*, 2016 WL 5636817, at *10, *15.

Paice argues that Dr. Davis's reliance on visual inspection of Figure 11 is improper under *Hockerson-Halberstadt, Inc. v. Avia Group International, Inc.*, in which this court explained "that patent drawings do not define the precise proportions of the elements and may

not be relied on to show particular sizes if the specification is completely silent on the issue." 222 F.3d 951, 956 (Fed. Cir. 2000); *see also In re Olson*, 212 F.2d 590, 592 (C.C.P.A. 1954) ("Ordinarily drawings which accompany an application for a patent are merely illustrative of the principles embodied in the alleged invention claimed therein and do not define the precise proportions of elements relied upon to endow the claims with patentability."). The *Hockerson-Halberstadt* case involved a rudimentary drawing that portrayed a central groove bisecting the heel on the sole of a shoe to create fins flanking the groove, 22 F.3d at 953, and there was no indication that the groove and fins were drawn to scale, *id.* at 956. That drawing, this court held, could not rebut statements in the prosecution history that clarified the relative measurements because "the inventor necessarily defined the central longitudinal groove as requiring a width that must be less than the combined width of the two fins." *Id.* at 956.

This case is not controlled by *Hockerson-Halberstadt*. Unlike the drawing at issue there, Figure 11 of Ibaraki provides some scale information—which expert evidence reasonably found telling on the point at issue. It specifies 0 at the intersection of the x- and y-axes, both of which run continuously, without indication of omission of portions of the range, from 0 to higher levels; and consistent with the shape of each curve (a rectangular hyperbola), the parties' experts both treated the scale of the axes as linear—allowing Dr. Davis to make rough estimates based on relative comparisons between the torque values located on the B and C curves.[8] In any event, the visual

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[8] At oral argument, counsel for Paice suggested that it was unclear whether the curves were plotted along a linear or logarithmic scale. But Paice's own expert assumed that the scales of the x- and y-axes were linear

inspection of the curves is not the sole support for the Board's finding. The Board also found that, based on Dr. Davis's declaration, a person of skill would understand the B curve to be "substantially less" than the maximum torque output because, otherwise, the controller would rarely select the engine alone to propel the vehicle. *IPR 722 Final Written Decision*, 2016 WL 5636817, at *15. According to Dr. Davis, it would not make sense to a person of skill for a hybrid vehicle to "hardly" operate the engine as the primary drive source. J.A. 16154–55. Ibaraki's Figure 11, in combination with the understanding of a person of skill, thus provides substantial evidence for the Board's finding that Ibaraki teaches the "substantially less" claim element at issue.

C

For those reasons, and having considered Paice's remaining arguments and found them insufficient to disturb the Board's rulings, we affirm the final written decisions of the Board.

AFFIRMED

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for the power curves in Figure 11. *See* J.A. 16492. That makes sense mathematically: as Dr. Davis explained, the curves "'represent[] a predetermined relationship between the vehicle drive torque and running speed V,'" J.A. 16131 (quoting Ibaraki, col. 20, lines 49–53)—namely, "Power = Torque * Rotational Speed," J.A. 16133. A linear scale along both axes would produce the rectangular hyperbola curves—for constant power level P = x * y—as depicted in Figure 11.

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1263, 2017-1264, 2017-1308, 2017-1309, 2017-1310, 2017-1311

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00722, IPR2015-00784, IPR2015-00787, IPR2015-00790, IPR2015-00791, IPR2015-00800.

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1442, 2017-1443

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794, IPR2015-00795.

O'MALLEY, *Circuit Judge*, dissenting in part.

I agree with the majority that substantial evidence supports the Board's finding that the Bumby references render obvious certain claims of the '634 and '347 patents, and I therefore join the majority opinion as it relates to those references. *See* Maj. Op. at 6 n.5. I disagree, however, with the majority's conclusion that substantial evidence supports the Board's finding that Ibaraki discloses a torque-based control algorithm, and I dissent from the portion of the majority opinion affirming the Board's obviousness determinations based on Ibaraki. *See id.* at 7–14.

Ibaraki discloses a *power*-based control algorithm, not a *torque*-based one. Figure 10 of Ibaraki depicts that algorithm and shows, in steps Q8 and Q9, that the system compares the vehicle's instantaneous power, "P_L," with power thresholds "B" and "C" to determine which operating mode to select:

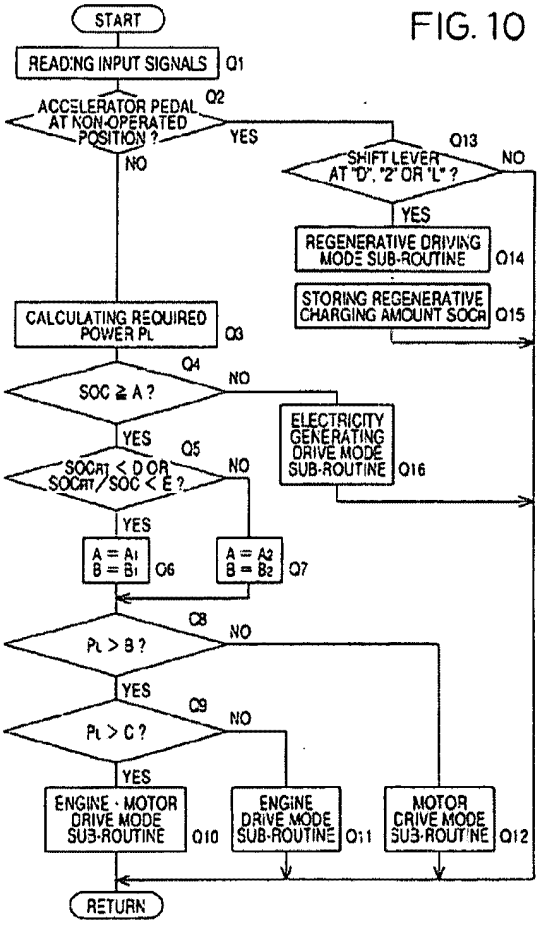
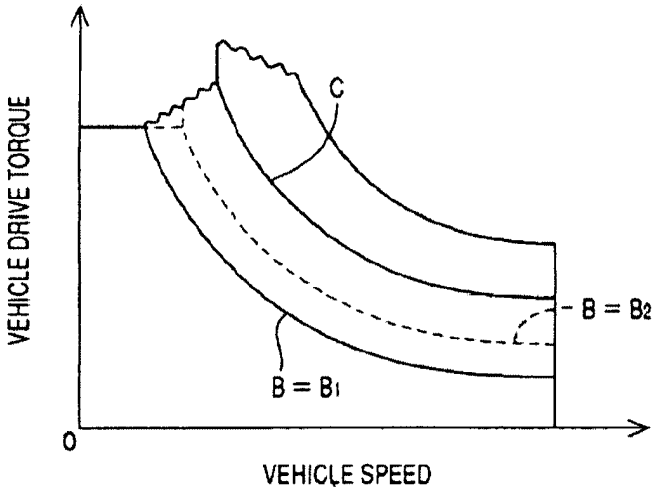


FIG. 10

Ibaraki, Fig. 10 (steps Q8, Q9); *id.* col. 23, line 66 through col. 24, line 38 (stating that the driving mode of the vehicle is selected "depending upon the required drive power P_L"); *see also* No. 17-1263, J.A. 16,467–68 (Paice's expert describing Ibaraki's Figure 10). This is consistent with Ibaraki's Figure 11, which shows a series of power curves corresponding to the threshold values depicted in Figure 10, plotted against the vehicle drive torque (y-axis) and vehicle speed (x-axis), as shown below:

FIG. 11



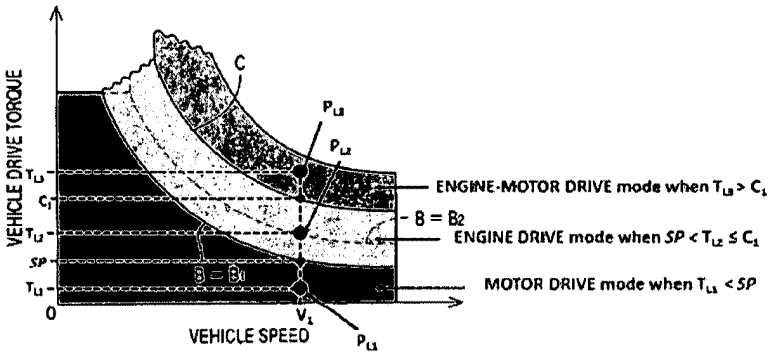
Ibaraki, Fig. 11. Each curve has a non-zero slope and delineates operating modes. As Paice's expert testified—and as the majority acknowledges, *see* Maj. Op. at 8–9—the curves represent constant levels of power, not set-points of constant torque. *See* No. 17-1263, J.A. 16,471–72; Ibaraki, col. 20, line 38 through col. 21, line 4.

As Paice's expert explained, the difference between Ibaraki's power-based system and the '634 and '347 patents' torque-based system is significant. *See* No. 17-1263, J.A. 16,470–71. A single power value can be derived from multiple combinations of torque and speed, as Ibaraki's Figure 11 plainly shows. Indeed, because power is the product of torque and speed, a large number of unique torque-speed pairs can be used to calculate the same power. For example, a vehicle requiring a large torque to maintain a low speed might have the same power requirement as a vehicle requiring a small torque to maintain a high speed. Because Ibaraki is concerned only with power, its algorithm would presumably select the *same* operating mode in both instances. This is in stark contrast to the '634 and '347 patents, which require

the claimed vehicle to operate in *different* modes when the vehicle's torque requirements are different. *See* '634 patent, col. 12, line 49 through col. 13, line 4; *id.* col. 17, lines 45–50; *id.* col. 18, lines 35–40; *id.* col. 19, lines 45–57; *id.* col. 35, lines 63 through col. 36, line 43; *id.* col. 38, lines 9–22, 51–54.

In reaching a contrary conclusion, the Board placed significant weight on Ford's expert's testimony that, *at a particular speed*, Ibaraki determines which operating mode to select based solely on torque. *See Ford Motor Co. v. Paice LLC*, IPR2015-00722, 2016 WL 5636817, at *9 (P.T.A.B. Sept. 26, 2016) (*IPR 722 Final Written Decision*). In his declaration, Ford's expert selected an arbitrary speed in Ibaraki's Figure 11, "V_1," and determined the torque value, "SP," of Ibaraki's power curve B_1 corresponding to that speed:

FIG. 11



Id.; *see also* No. 17-1263, J.A. 7255 (Ford's expert testifying that B_1 is "one particular setpoint . . . at [a] particular vehicle speed"). Ford's expert then concluded that Ibaraki teaches which operating mode to select at the designated speed based on whether the torque is greater than or less than the corresponding "SP" torque value. In other words, Ford's expert's analysis—which the Board adopted as its own—was predicated on his evaluating Ibaraki's Figure 11 at a particular speed. This analysis is flawed

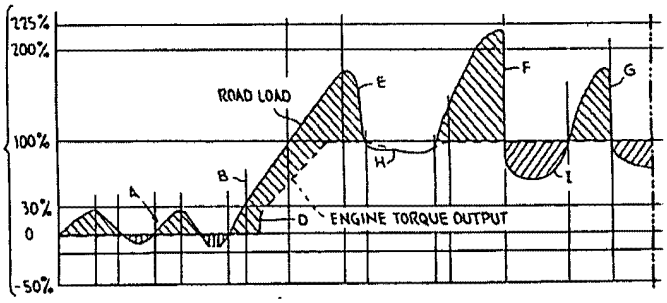
for several reasons, and thus lends no support to the Board's findings with regard to Ibaraki.

First, it is not grounded in—and, in fact, is inconsistent with—Ibaraki's disclosure. Nothing in Ibaraki suggests that its controller makes operating mode decisions by considering the torque at a particular speed. To the contrary, as described above, Ibaraki discloses making such determinations by considering power. The Board's analysis, which attempts to separate out the torque and speed components from Ibaraki's power parameter, finds insufficient support in Ibaraki itself.

Second, the Board's analysis is inconsistent with the '634 and '347 patent claims and specifications. Neither the claims nor the specifications justify comparing road load to the setpoint at a particular speed. In fact, the claims at issue are silent as to speed, which makes sense in view of the patents' statements that road load is "independent of vehicle speed." '634 patent, col. 12, lines 55–61; *see also id.* col. 65, lines 16–30 (claim 80 referring to "*a* setpoint" and "*the* setpoint," not multiple setpoints to account for different speeds).[1] Further, the patents' Figure 7(a) shows that the operating mode decisions are

FIG. 7(a)

ROAD LOAD AS % OF MAX. ENGINE TORQUE OUTPUT (% MTO)



[1] Claim 12 of the '634 patent and claim 5 of the '347 patent specify that the setpoint may be varied "as a function of speed of the engine," '634 patent, col. 59, lines 3–5, but the claims at issue lack such a limitation, suggesting that the setpoints in the claims are *not* varied as a function of speed.

based only on the road load torque, and not on speed:

Id. at Fig. 7; *id.* col. 38, line 62 through col. 39, line 40; *see also id.* Fig. 9. This figure shows that the electric-motor-only mode is selected when the road load is between 0 and 30% of maximum torque output, the engine-only mode is selected when the road load is between 30% and 100% of maximum torque output, and the hybrid mode is selected when the road load is above 100% maximum torque output. Noticeably missing from the figure and accompanying description in the specifications is any reference to speed's role in the algorithm. Thus, Ford's expert's analysis of whether Ibaraki renders the claims at issue obvious is inconsistent with the '634 and '347 patent claims and specifications, and, as such, is not entitled to deference. *See Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (noting, in an appeal from an IPR, that "we must disregard the testimony of an expert that is plainly inconsistent with the record, or based on an incorrect understanding of the claim[s]" (citations and internal quotation marks omitted)).

Third, the Board's analysis is circular. By holding speed constant, the Board removed speed from the analysis altogether and concluded—unsurprisingly—that torque is the relevant input parameter in Ibaraki's control algorithm.[2] The Board's analysis is therefore results-oriented to the extent it assumes the very conclusion it purports to reach.

Finally, the Board found that, because "'power' is determined as the multiplicative product of 'torque' and 'speed,'" Ibaraki's power-based comparison "necessarily

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[2] As Paice's expert testified, one could just as easily hold torque constant and conclude that Ibaraki's control system determines which mode to select at that torque based solely on speed. *See* No. 17-1263, J.A. 16,473–74.

makes a comparison with regard to the torque value associated with the selected power point . . . , regardless of whether a comparison also is made with respect to speed." *IPR 722 Final Written Decision*, 2016 WL 5636817, at *13; *see also id.* at *14 ("[T]he point corresponding to the required drive power P_L of Figure 11 . . . satisfies the claimed road load, because P_L includes torque."). This quasi-inherency finding is unsupported by substantial evidence. The mere fact that power and torque are mathematically related does not imply that a comparison with one involves a comparison with the other. While the Board's constructions of "road load" and "setpoint" do not exclude *independently* making comparisons based on torque *and* speed, those constructions do not include making a comparison based on power—a parameter that is entirely different from torque, as Ford itself admits, *see* Appellee's Br. 46—merely because power can be derived from torque.

Indeed, the patents emphasize that their torque-based algorithm is the crux of the invention and is what distinguishes the invention over the prior art. *See* '634 patent, col. 13, lines 13–21 (stating that the prior art fails to "recognize[] that the desired vehicle operational mode should preferably be controlled in response to the vehicle's actual torque requirements, i.e., the road load" so as to "provide[] superior performance[] . . . under the widely-varying conditions encountered in 'real world' driving situations"). The Board's obviousness analysis, however, effectively reads the torque-based nature of the invention out of the claims altogether. To the extent the Board's obviousness determination is predicated on constructions of "road load" and "setpoint" that permit comparisons involving power demand, those constructions are unreasonably broad. *See In re Smith Int'l, Inc.*, 871 F.3d 1375, 1382–83 (Fed. Cir. 2017) (stating that "the Board cannot construe the claims so broadly that its constructions are *unreasonable* under general claim construction princi-

ples," and that giving claims terms "a strained breadth in the face of . . . otherwise different description in the specification [is] unreasonable" (internal quotation marks omitted)); *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016) ("While the broadest reasonable interpretation standard is broad, it does not give the Board an unfettered license to interpret the words in a claim without regard for the full claim language and the written description.").

For these reasons, I believe that the Board's finding that Ibaraki discloses a torque-based control system is unreasonable and unsupported by substantial evidence. And, because the Board did not make an alternative finding that a torque-based system would be an obvious modification of a power-based system, I would reverse the Board's obviousness determinations as to all claims for which Ibaraki was used as the primary reference. I respectfully dissent from the majority's contrary holding.

CERTIFICATE OF SERVICE AND FILING

I certify that I electronically filed the foregoing Appellants' Petition For Rehearing En banc and served a copy on counsel of record on March 5, 2018 using the Court's CM/ECF filing system.

Date: March 5, 2018

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CERTIFICATE OF COMPLIANCE

Appellant's Petition for Rehearing en Banc is submitted in accordance with the type volume limitation of Federal Rules of Appellate Procedure 35. The Brief contains 3,447 words as determined by Microsoft Word.

Dated: March 5, 2018

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NOTE: This order is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1442, 2017-1443

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794, IPR2015-00795.

ON PETITION FOR REHEARING EN BANC

Before PROST, *Chief Judge*, NEWMAN, LOURIE, DYK, O'MALLEY, REYNA, WALLACH, TARANTO, CHEN, HUGHES, and STOLL, *Circuit Judges*.*

PER CURIAM.

ORDER

Appellants Paice LLC and Abell Foundation, Inc. filed a petition for rehearing en banc. The petition was first referred as a petition for rehearing to the panel that

heard the appeal, and thereafter the petition for rehearing en banc was referred to the circuit judges who are in regular active service.

Upon consideration thereof,

IT IS ORDERED THAT:

The petition for panel rehearing is denied.

The petition for rehearing en banc is denied.

The mandate of the court will issue on April 12, 2018.

FOR THE COURT

April 5, 2018
Date

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

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* Circuit Judge Moore did not participate.

(12) **INTER PARTES REVIEW CERTIFICATE** (1040th)
United States Patent
Louckes et al.

(10) **Number: US 7,104,347 K1**
(45) **Certificate Issued: Jul. 25, 2018**

(54) **HYBRID VEHICLES**

(75) Inventors: **Theodore Louckes**; **Alex J. Severinsky**

(73) Assignee: **PAICE LLC**

Trial Numbers:

IPR2014-00571 filed Apr. 4, 2014
IPR2014-00579 filed Apr. 4, 2014
IPR2014-00884 filed Jun. 5, 2014

Inter Partes Review Certificate for:

Patent No.: **7,104,347**
Issued: **Sep. 12, 2006**
Appl. No.: **10/382,577**
Filed: **Mar. 7, 2003**

The results of IPR2014-00571, IPR2014-00579 and IPR2014-00884 are reflected in this inter partes review certificate under 35 U.S.C. 318(b).

AS A RESULT OF THE INTER PARTES REVIEW PROCEEDING, IT HAS BEEN DETERMINED THAT:

Claim **24** is found patentable.

Claims **1**, **6-10**, **15**, **18**, **21**, **23**, **36** and **37** are cancelled.

* * * * *

(12) **INTER PARTES REVIEW CERTIFICATE** (1355th)
United States Patent
Louckes et al.

(10) **Number: US 7,104,347 K2**
(45) **Certificate Issued: Sep. 20, 2019**

(54) **HYBRID VEHICLES**

(75) Inventors: **Theodore Louckes**; **Alex J. Severinsky**

(73) Assignees: **PAICE LLC**; **THE ABELL FOUNDATION, INC.**

Trial Numbers:

IPR2015-00794 filed Feb. 23, 2015
IPR2015-00795 filed Feb. 23, 2015

Inter Partes Review Certificate for:

Patent No.: **7,104,347**
Issued: **Sep. 12, 2006**
Appl. No.: **10/382,577**
Filed: **Mar. 7, 2003**

The results of IPR2015-00794 and IPR2015-00795 are reflected in this inter partes review certificate under 35 U.S.C. 318(b).

AS A RESULT OF THE INTER PARTES REVIEW PROCEEDING, IT HAS BEEN DETERMINED THAT:

Claims **3-5**, **14**, **16**, **19**, **20**, **22**, **25-30**, **32** and **39-41** are cancelled.

* * * * *