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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 IPR2015-00722
Patent 7,237,634 B2

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

MEDLEY, *Administrative Patent Judge*.

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

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we dismiss the *inter partes* review with respect to claims 161, 215, 228, 233, 235, 236, and 237, and determine that Petitioner has shown by a preponderance of the evidence

that claims 173, 239, and 240 of U.S. Patent No. 7,237,634 B2 are unpatentable.

A. Procedural History

Petitioner, Ford Motor Company, filed a Petition requesting an *inter partes* review of claims 33, 36, 42–44, 46, 50–52, 55, 78, 161, 173, 215, 228, 233, 235–237, 239, and 240 of U.S. Patent No. 7,237,634 B2 (Ex. 1260, "the '634 patent"). Paper 1 ("Pet."). Patent Owner, Paice LLC & The Abell Foundation, Inc., filed a Preliminary Response in both unredacted and redacted forms. Papers 10, 11 ("Prelim. Resp."). Upon consideration of the Petition and Preliminary Response, on October 26, 2015, we instituted an *inter partes* review of claims 161, 173, 215, 228, 233, 235–237, 239, and 240, pursuant to 35 U.S.C. § 314. Paper 13 ("Dec.").

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 18 ("PO Resp.")) and Petitioner filed a Reply (Paper 26 ("Pet. Reply")).[1] An oral hearing was held on June 28, 2016, and a transcript of the hearing is included in the record (Paper 35 ("Tr.")).

B. Related Proceedings

The '634 patent is involved in *Paice LLC v. Ford Motor Co.*, No. 1-14-cv-00492, filed on February 19, 2014, in the United States District Court for the District of Maryland. Pet. 2. Petitioner twice filed an earlier Petition for *inter partes* review of the '634 patent, and we instituted trial in both proceedings and subsequently entered final written decisions. *Ford*

[1] In addition, Patent Owner filed a Motion for Observation on Cross-Examination (Paper 28) and Petitioner filed a Response to Motion for Observation on Cross-Examination (Paper 31), both of which have been considered.

Motor Co. v. Paice LLC & The Abell Foundation, Inc., Case IPR2014-00904 (Papers 13 and 41), and *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-01416 (Papers 9 and 26). The '634 patent also is involved in the following *inter partes* review proceedings: IPR2015-00606, IPR2015-00758, IPR2015-00784, IPR2015-00785, IPR2015-00787, IPR2015-00790, IPR2015-00791, IPR2015-00799, IPR2015-00800, and IPR2015-00801.

C. The '634 Patent (Ex. 1260)

The '634 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 directs torque transfer between the engine, the motor, and the drive wheels of the vehicle. Ex. 1260, 17:17–56, Fig. 4. The microprocessor compares the vehicle's torque requirements and the engine's torque output against a predefined setpoint and uses the results of the comparison to control the vehicle's mode of operation, e.g., straight-electric, engine-only, or hybrid. *Id*. at 40:16–49. The microprocessor utilizes a hybrid control strategy that operates the engine only in a range of high fuel efficiency, which occurs when the instantaneous 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 20:61–67; *see also id*. at 13:64–65 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently"). Operating the engine in a range above the setpoint but substantially less than the maximum torque output maximizes fuel efficiency and reduces pollutant emissions of the vehicle. *Id*. at 15:55–58.

D. Illustrative Claims

Petitioner challenges independent claim 161 and dependent claim 173, which depends directly from claim 161. Petitioner also challenges independent claim 215 and dependent claims 228, 233, 235–237, 239, and 240, which depend directly or indirectly from claim 215.

Claims 161 and 215 are reproduced below:

> 161. A method for controlling a hybrid vehicle, comprising:
>
> determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;
>
> wherein the hybrid vehicle is operated in a plurality of operating modes corresponding to values for the RL and setpoint (SP);
>
> operating at least one first electric motor to propel the hybrid vehicle when the RL required to do so is less than a the SP;
>
> wherein said operating the at least one first electric motor to drive the hybrid vehicle composes a low-load operation mode I;
>
> operating an 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;

> wherein said operating the internal combustion engine of the hybrid vehicle to propel the hybrid vehicle composes a high-way cruising operation mode IV;
>
> 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;
>
> wherein said operating both the at least one first electric motor and the engine to propel the hybrid vehicle composes an acceleration operation mode V;
>
> receiving operator input specifying a change in required torque to be applied to wheels of the hybrid vehicle; and
>
> if the received operator input specifies a rapid increase in the required torque, changing operation from operating mode I directly to operating mode V.

Ex. 1260, 73:42–74:9.

> 215. A method for controlling a hybrid vehicle, comprising:
>
> determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;
>
> operating at least one electric motor to propel the hybrid vehicle when the RL required to do so is less than a setpoint (SP);
>
> operating an 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
>
> 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; and
>
> regeneratively charging a battery of the hybrid vehicle when instantaneous torque output of the engine>the RL, when the RL is negative, and/or when braking is initiated by an operator of the hybrid vehicle.

Id. at 79:10–31.

E. Grounds of Unpatentability

We instituted an *inter partes* review of claims 161, 173, 215, 228, 233, 235–237, 239, and 240 on the following grounds:

Reference[s]	**Basis**	**Challenged Claim(s)**
Ibaraki '882 [2] and the general knowledge of a person of ordinary skill in the art ("POSA")	§ 103	161, 215, 228, 233, and 235–237
Ibaraki '882, Ibaraki '626 [3], and the general knowledge of a POSA	§ 103	239
Ibaraki '882, Suga [4], and the general knowledge of a POSA	§ 103	173 and 240

II. ANALYSIS

A. Petitioner Estoppel

On March 10, 2016, we rendered a final written decision of claims 161, 215, 228, 233, and 235–237 of the '634 patent in IPR2014-01416. *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-01416 (PTAB March 10, 2016) (Paper 26). Patent Owner argues that, pursuant to 35 U.S.C. § 315(e)(1), Petitioner may not maintain its challenge of claims 161, 215, 228, 233, and 235–237. PO Resp. 17–18. Petitioner responds that it is not estopped because it was necessary for it to file

[2] U.S. Patent No. 5,789,882, issued Aug. 4, 1998 (Ex. 1262) ("Ibaraki '882").
[3] U.S. Patent No. 6,003,626, issued Dec. 21, 1999 (Ex. 1263) ("Ibaraki '626").
[4] U.S. Patent No. 5,623,104, issued Apr. 22, 1997 (Ex. 1264) ("Suga").

multiple petitions to address dependent claims 173, 239, and 240. Pet. Reply 4.

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 March 10, 2016, a final written decision was entered in IPR2014-01416, in which we determined that claims 161, 215, 228, 233, and 235–237 of the '634 patent are unpatentable. Petitioner in this proceeding is the same Petitioner in IPR2014-01416. The grounds raised by Petitioner in IPR2014-01416 against claims 161, 215, 228, 233, and 235–237 were not the same as the grounds raised against those claims in this proceeding. Nonetheless, Ibaraki '882 was cited during prosecution that led to the '634 patent and is listed on the face of the '634 patent. Ex. 1260. Petitioner does not argue that it reasonably could not have raised its challenge to claims 161, 215, 228, 233, and 235–237 based on Ibaraki '882 in IPR2014-01416. Pet. Reply 4. We determine that Petitioner reasonably could have raised this challenge in IPR2014-01416. Accordingly, Petitioner is estopped under 35 U.S.C. § 315(e)(1) from maintaining the grounds based on Ibaraki '882 against

claims 161, 215, 228, 233, and 235–237. We dismiss the *inter partes* review with respect to claims 161, 215, 228, 233, and 235–237.

Although we determine it is necessary to address the parties' contentions with respect to independent claims 161 and 215 because claim 173 depends from claim 161 and claims 239 and 240 depend from claim 215, we do not otherwise provide a final written decision on the merits with respect to claims 161, 215, 228, 233, and 235–237, or again hold those claims to be unpatentable.

B. 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). Under the broadest reasonable construction standard, claim terms are generally 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). Any special definition for a claim term must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Petitioner proposes constructions for the following claim terms: "road load," "mode I," "low-load operation mode I," "high-way cruising operation mode IV," "acceleration operation mode V," and "abnormal and transient conditions." Pet. 10, 12–13. In our Decision to Institute, we interpreted these terms. Dec. 9, 11–15. Neither party has indicated that our interpretations were improper and we do not perceive any reason or evidence that now compels any deviation from our initial interpretations. Accordingly, the following constructions apply to this Decision:

Claim Term	Construction
road load or RL	the amount of instantaneous torque required to propel the vehicle, be it positive or negative
mode I or low-load operation mode I	a mode of operation of the vehicle, in which all torque provided to the wheels is supplied by an electric motor
high-way cruising operation mode IV	a mode of operation in which all torque provided to the wheels is supplied by the internal combustion engine
acceleration operation mode V	a mode of operation in which torque provided to the wheels is supplied by the internal combustion engine and at least one electric motor
abnormal and transient conditions	include starting the engine and stopping the engine

For purposes of this decision, we find it necessary to construe "setpoint" and the "operating limitations" found in claims 173, 239, and 240.

Setpoint (SP)

The term "setpoint" or "SP" is recited in independent claims 161 and 215, and, thus, necessarily is included in dependent claims 173, 239, and 240. Petitioner proposes that "setpoint" or "SP" be construed, in the context of these claims, as "predetermined torque value." Pet. 10–12. Patent Owner argues that "setpoint" or "SP" be construed as "a definite, but potential

variable value at which a transition between operating modes may occur." PO Resp. 8.[5]

We agree with Petitioner that the claims compare the setpoint either to an engine torque value or a torque based "road load" value. Pet. 10–12. Each of claims 161 and 215 recites a condition "when the RL required to do so is less than a setpoint (SP)." Ex. 1260, 73:51–52, 79:16–17. Each of claims 161 and 215 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 RL required to do so is between the SP and a maximum torque output (MTO) of the engine." *Id*. at 73:57–59, 79:19–21.

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 '634 patent "make clear that a 'setpoint' is not simply a numerical value divorced from the context of the rest 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. 8. The argument is misplaced. Although such use of a setpoint is described by

[5] 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. 11. Petitioner agrees with that interpretation, while Patent Owner does not. Pet. Reply 2–3; PO Resp. 7–11.

other language in the 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 Specification of the '634 patent, 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. 1260, 19:67–20:6 (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. 1260, 40:18–26 (emphasis added). This argument also is misplaced. As we noted above, each independent claim 161 and 215 requires a comparison of the setpoint either to an engine torque value or a torque based "road load" value. Thus, in the context of these claims, 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."

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. 11–17. The assertion is based on the requirements in

claim 161 of (1) operating at least one first electric motor to propel the hybrid vehicle "when the RL required to do so is less than the SP," (2) operating an 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," and (3) operating both the at least one first electric motor and the engine to propel the hybrid vehicle "when the torque RL required to do so is more than the MTO." Claim 215 includes essentially the same recitations.

In the above discussion of the construction of setpoint, we already noted that claims 161 and 215 each require a comparison of road load to a setpoint because of the claim recitations "when the RL required to do so is less than the SP" and "when the RL required to do so is between the SP and a maximum torques output (MTO) of the engine." For similar reasons, claims 161 and 215 each require a comparison of road load to a maximum torque output (MTO) because of the recitation "when the torque RL required to do so is more than the 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 setpoint (SP) and also to a maximum torque output (MTO). That, however, does not mean the claims exclude the comparison of other parameters.

C. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter 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 to which said

subject matter pertains. *KSR Int'l Co. v. Teleflex Inc*., 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

In that regard, an obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418; *see Translogic*, 504 F.3d at 1259.

The level of ordinary skill in the art is reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc*., 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

D. Claims 161 and 215

As discussed above, we dismiss the *inter partes* review with respect to claims 161, 215, 228, 233, and 235–237. Only dependent claims 173, 239, and 240 are before us. Each of claims 239 and 240, however, depends from claim 215 and necessarily includes all of the limitations of claim 215. Similarly, claim 173 depends from claim 161 and necessarily includes all of the limitations of claim 161. Accordingly, we first address the contentions made by Petitioner as to how Ibaraki '882 renders obvious claims 161 and 215.

Petitioner contends that claims 161 and 215 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and the general knowledge

of a person of ordinary skill in the art. Pet. 45–48. To support its contentions, Petitioner provides detailed explanations as to how the prior art meets each claim limitation of claims 161 and 215. *Id*. Petitioner also relies upon a Declaration of Dr. Gregory W. Davis, who has been retained as an expert witness by Petitioner for the instant proceeding. Ex. 1265. For the reasons that follow, and notwithstanding Patent Owner's arguments, which we address below, we are persuaded by Petitioner's showing, which we adopt as our own, that claims 161 and 215 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882 and the general knowledge of a person of ordinary skill in the art.

Ibaraki '882

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. 1262, 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

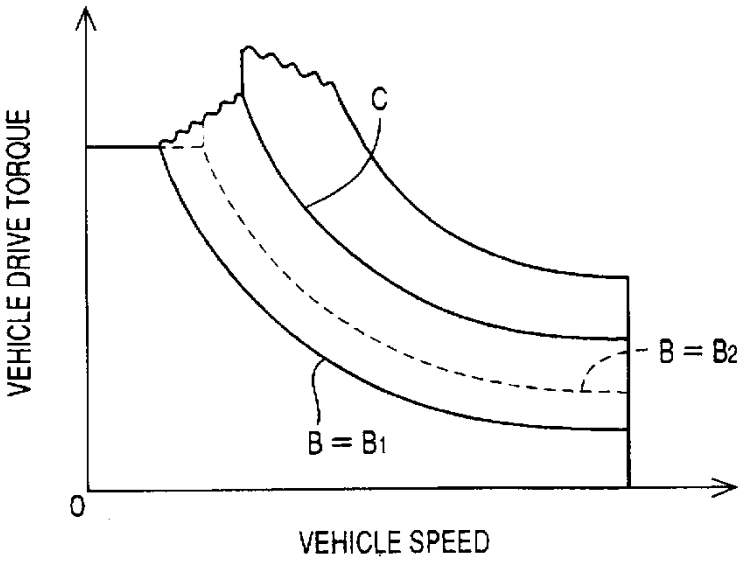


Figure 11 shows a graph which represents a predetermined relationship between the vehicle drive torque and running speed.

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.

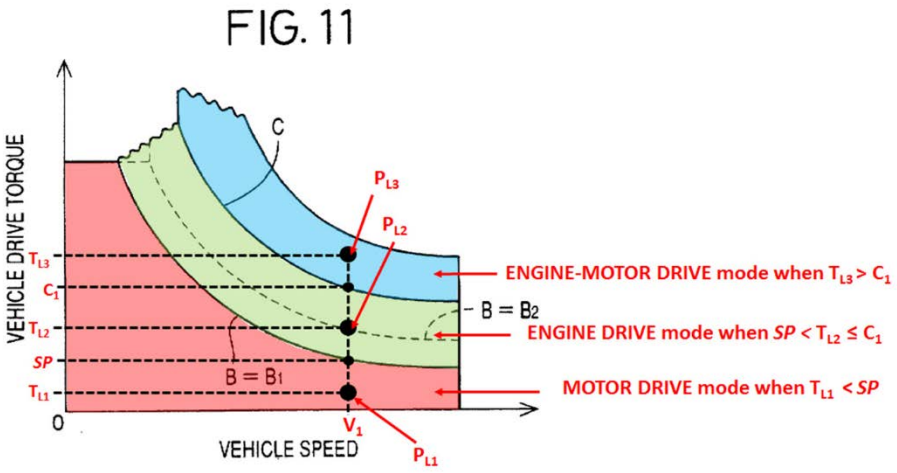
Claim 161

Claim 161 recites a method for controlling a hybrid vehicle. Petitioner contends that Ibaraki '882 describes a drive control apparatus for controlling a hybrid vehicle that may be propelled by an internal engine and electric motor. Pet. 14, 46; Ex. 1262, 1:9–14; Ex. 1265 ¶¶ 148–160, 383. We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882 describes this limitation.

Claim 161 recites "determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command." 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. 18, 46; Ex. 1265 ¶¶ 384, 161–173. We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882 describes this limitation.

Claim 161 further recites that the hybrid vehicle is operated in a plurality of operating modes corresponding to values for the RL and a setpoint (SP). For that recitation, Petitioner contends that Ibaraki '882 describes a plurality of operating modes based on the vehicle running condition as represented by current vehicle drive torque and speed. Pet. 38, 46. Petitioner further contends, with supporting evidence, that a person

having ordinary skill in the art would have understood that a setpoint value would have been known at a given vehicle speed along boundary line B from Figure 11. Directing attention to an annotated Figure 11 from Ibaraki '882, Petitioner further contends that the vehicle operates in a plurality of operating modes corresponding to values based on the current vehicle drive torque (T_{L1}, T_{L2}, T_{L3}), or road load, and a setpoint. Figure 11, annotated by Petitioner, is reproduced below, and explained by Dr. Davis. Pet. 38; Ex. 1265 ¶¶ 305–306.



Ibaraki '882 Figure 11 as annotated in the Petition

Dr. Davis explains that a torque setpoint along boundary B would have been known at the current vehicle speed and this setpoint marks a transition between the MOTOR DRIVE mode and the ENGINE DRIVE MODE. Ex. 1265 ¶ 305. Dr. Davis further explains that Ibaraki '882 uses the exemplary data map of Figure 11 to determine when to operate the vehicle in a plurality of operating modes and that the operating modes are based on the determined road load (corresponding to T_{L1}, T_{L2}, T_{L3}) and the

setpoint SP along boundary line B. We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882 describes that the hybrid vehicle is operated in a plurality of operating modes corresponding to values for the RL and the setpoint (SP).

Claim 161 recites "operating at least one first electric motor to propel the hybrid vehicle when the RL required to do so is less than the SP." Petitioner relies on annotated graphs similar to the one above, for example, along with Dr. Davis' testimony, explaining that Ibaraki '882 describes different operating modes, where the vehicle is operated by motor alone (MOTOR DRIVE mode), when the road load (RL) is less than the setpoint (SP) along boundary B. Pet. 19–21, 46; Ex. 1262, 19:55–20:9, 20:43–62; Ex. 1265 ¶¶ 386, 177–188. We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882 describes operating at least one first electric motor to propel the hybrid vehicle when the road load required to do so is less than the set point.

Claim 161 recites "wherein said operating the at least one first electric motor to drive the hybrid vehicle composes a low-load operation mode I." For that recitation, Petitioner cites to Ibaraki '882, and also Dr. Davis' declaration, explaining that the MOTOR DRIVE mode of Iabaraki '882 is used when the determined road load (vehicle drive torque) at a given speed is below the setpoint along boundary line B. Pet. 38, 46; Ex. 1262, 24:21–24, 24:6–12, 20:39–45; Ex. 1265 ¶¶ 387, 308–312. We have construed "mode I" as "a mode of operation of the vehicle, in which all torque provided to the wheels are supplied by an electric motor." We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882 describes

wherein said operating the at least one first electric motor to drive the hybrid vehicle composes a low-load operation mode I.

Claim 161 recites "operating an 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." Petitioner contends that Ibaraki '882 describes an internal combustion engine (engine 112 in Fig. 8) that may be operated to propel the hybrid vehicle during an ENGINE DRIVE mode in which engine 112 is selected as the drive power source. Pet. 21; Ex. 1262, 20:43–53; 19:18–27; Ex. 1265 ¶¶ 194–197. As illustrated in the annotated Figure 11 reproduced above, the engine drive mode lies between the two boundary lines B and C. Ibaraki '882 describes that the controller uses the data map of Figure 11 to select ENGINE DRIVE mode when the vehicle running condition as represented by the current vehicle drive torque and speed V is held within the range between boundary lines B and C. Petitioner explains, with supporting evidence, that at a given vehicle speed (annotated as V_1 from above), a given setpoint (annotated as SP from above) along boundary B is known, and that the setpoint marks the transition between the MOTOR DRIVE mode and the ENGINE DRIVE mode. As long as the current vehicle drive torque and vehicle speed are below torque point C_1 (annotated above), Petitioner contends, the vehicle will operate in the ENGINE DRIVE mode. Pet. 22–23; Ex. 1262, 20:55–62; 23:66–24:30; Ex. 1265 ¶¶ 200–201.

With respect to the maximum torque output limitation, Petitioner contends, with supporting evidence, that a person having ordinary skill in the art would have recognized that an IC engine, like that described in Ibaraki '882, necessarily has a maximum torque output (MTO), above which

the IC engine cannot produce additional torque. Pet. 23–24, 46, 47; Ex. 1265 ¶¶ 388, 397, 192–203. Petitioner further contends that because the range of torque setpoints along boundary B represents the lower-bound of the ENGINE DRIVE mode, a person having ordinary skill in the art would have understood that the maximum torque output must be greater than any setpoint along boundary line B, and that the MTO would be equal to or greater than torque point C_1. Pet. 24; Ex. 1265 ¶¶ 201–203. We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882 describes operating an 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.

Claim 161 further recites "wherein the engine is operable to efficiently produce torque above the SP." Petitioner contends, with supporting evidence, that at the time of the invention, it was known that for hybrid vehicles, a key point is to operate the IC engine at more efficient operating points. Pet. 24; Ex. 1273, 12; Ex. 1265 ¶¶ 128–130. Petitioner also points out that Ibaraki '882 itself describes that an object of its invention is to provide a drive control apparatus for a hybrid vehicle which permits effective reduction in the fuel consumption amount or exhaust gas amount of the engine, and in the context of the ENGINE DRIVE mode. Pet. 24; Ex. 1262, 2:52–56, 25:1–10. Petitioner contends that a person having ordinary skill in the art would have known that reduced fuel consumption is characteristic of improved IC engine efficiency. Pet. 25; Ex. 1265 ¶¶ 128–130, 208; Ex. 1274, 2. We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882, based on the relevant

knowledge at the time of the invention, meets the recitation that the engine is operable to efficiently produce torque above the SP.

Claim 161 recites "wherein the SP is substantially less than the MTO." Petitioner asserts that, based on a description in the '634 patent (claim 15), "substantially less than the MTO" includes a SP which is less than approximately 70% of the MTO. Pet. 25. Petitioner further contends, with supporting evidence, that since an IC engine cannot operate or provide torque above its MTO, the setpoints used to delineate the start of the ENGINE DRIVE mode are substantially less than the MTO of the engine. Pet. 25; Ex. 1265 ¶ 217. Dr. Davis explains that the points along curve B of Figure 11 would have been understood by a person of ordinary skill in the art to be setpoints below the MTO. Ex. 1265 ¶ 222. Dr. Davis further explains that a person having ordinary skill in the art would have understood that the MTO at vehicle speed must at least be equal to point C_1 (from annotated Figure 11 above), and if it were not, then the IC engine could not alone drive the vehicle within the entire ENGINE DRIVE mode range. *Id.* ¶¶ 222–223. Dr. Davis further explains why a person having ordinary skill in the art would have understood that the setpoint (from the annotated figure above shown as B_1 or SP) is substantially less than point C_1, since SP is no more than half of the vehicle drive torque of C_1. *Id.* We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882, based on the relevant knowledge at the time of the invention, meets the recitation that the SP is substantially less than the MTO.

Claim 161 recites "wherein said operating the internal combustion engine of the hybrid vehicle to propel the hybrid vehicle composes a high-way cruising operation mode IV." We have construed "high-way cruising

operation mode IV" as "a mode of operation in which all torque provided to the wheels are supplied by the internal combustion engine." Petitioner contends that the ENGINE DRIVE mode of Ibaraki '882 meets the limitation. Pet. 39, 46; Ex. 1262, 24:26–30; Ex. 1265 ¶¶ 319–325. We are persuaded that Ibaraki '882 meets this limitation.

Claim 161 recites "operating both the at least one first electric motor and the engine to propel the hybrid vehicle when the torque RL required to do so is more than the MTO." For this limitation, Petitioner relies on the ENGINE-MOTOR DRIVE mode of Ibaraki '882, and explains that the "current vehicle drive torque" (T_{L3}) is the "instantaneous torque required to propel the vehicle" (or road load) at this "vehicle running condition." Pet. 29. Petitioner further explains, with supporting evidence, 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. 29–30; Ex. 1262, 20:55–62, 26:28–33; Ex. 1265 ¶¶236–244.

In particular, Dr. Davis testifies:

> 238. It is also my opinion that a person having ordinary skill in the art would have understood the torque point C_1 along the predetermined "boundary line C" would be equal to or possibly less than the maximum torque output (MTO) at that given vehicle speed (V_1). First, an IC engine **cannot** operate above the engine's MTO. Because the IC engine alone operates in the "ENGINE DRIVE mode" when the vehicle drive torque is between "boundary line B" and "boundary line C" the MTO cannot be less than the torque point C_1 at that given vehicle speed. It follows that the maximum torque output (MTO) of the engine is at a minimum equal to the torque point C_1 when

> operated at a vehicle speed V_1, because the engine is still operating alone until the torque exceeds the point C_1.
>
> 239. Ibaraki '882 states that the "ENGINE-MOTOR DRIVE mode" is selected "when the vehicle load is comparatively high." (Ex. 1262 [Ibaraki '882] at 26:28–33.)
>
> 240. It is my opinion that a person of ordinary skill in the art would have understood that high "vehicle loads" would include vehicle drive torques above the engine's maximum torque output (MTO). It is also my opinion that a person having ordinary skill would have understood that a hybrid vehicle control strategy would at some point allow the IC engine to provide output torque near and potentially including its MTO. Otherwise, the system would be artificially limiting the performance of the vehicle. In other words, the hybrid vehicle would not be providing the full output capabilities of the IC engine and the motor under high loads. Thus, within the ENGINE-MOTOR DRIVE mode the system would eventually allow the IC engine to provide torque at its MTO and also allow the additional supplemental torque to be provided from the electric motor.
>
> 241. A person of ordinary skill in the art would have understood that it would be 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 discussed above in the State of the Art in ¶¶ 128–134 the control techniques for using the motor above the engine's MTO were well known.

Ex. 1265 ¶¶ 238–241.

Ibaraki '882 describes that the ENGINE-MOTOR drive mode is selected when the "vehicle load is comparatively high." Ex. 1262, 26:28–33. We give substantial weight to Dr. Davis's testimony that the torque point C_1 along the predetermined "boundary line C" would be equal to or possibly less than the maximum torque output (MTO) at vehicle speed (V_1).

Ex. 1265 ¶ 238. We further give substantial weight to Dr. Davis's testimony that at such high vehicle load situations it would have been obvious to use the electric motor to provide additional output torque above the engine's maximum torque output. *Id.* at ¶ 241. Dr. Davis's testimony is consistent with the teachings of Ibaraki '882 and the state of the art at the time of the invention. *See, e.g.*, Ex. 1273, 3. We are persuaded by Petitioner's showing, and adopt it as our own, that Ibaraki '882, based on the relevant knowledge a person of ordinary skill in the art would have had at the time of the invention, meets the recitation of operating both the at least one first electric motor and the engine to propel the hybrid vehicle when the torque RL required to do so is more than the MTO.

Claim 161 recites "wherein said operating both the at least one first electric motor and the engine to propel the hybrid vehicle composes an acceleration operation mode V." We have construed "acceleration operation mode V" as "a mode of operation in which torque provided to the wheels is supplied by the internal combustion engine and at least one electric motor." Petitioner contends that the ENGINE-MOTOR DRIVE mode of Ibaraki '882 meets the limitation. Pet. 39, 46; Ex. 1262, 24:16–21, 20:43–53; Ex. 1265 ¶¶ 319–325, 391. We are persuaded that Ibaraki '882 meets this limitation.

Claim 161 recites "receiving operator input specifying a change in required torque to be applied to wheels of the hybrid vehicle." Petitioner contends that Ibaraki '882 describes that the controller receives signals including an accelerator signal indicative of an operating amount θ_A and rate of change of an accelerator pedal of the vehicle and that the accelerator signal is used to determine the point corresponding to the required drive power P_L. Pet. 40–41, 46; Ex. 1262, 20:23–33, 23:2–4, 23:66–24:6; Ex.

1265 ¶¶ 336–343, 392. We are persuaded by Petitioner's showing, which we adopt as our own, that Ibaraki '882 meets this limitation.

Claim 161 recites "if the received operator input specifies a rapid increase in the required torque, changing operation from operating mode I directly to operating mode V." Petitioner accounts for this limitation by directing attention to Figure 10 of Ibaraki '882 that depicts a flow chart of the three different drive modes and when each is engaged. Pet. 41–42. Petitioner contends that the point of required drive power P_L is determined at step Q3 based on accelerator pedal position and rate of change (step Q1), such that when a rapid increase in the required torque is requested by the driver using the accelerator pedal, the control strategy can proceed directly from the MOTOR DRIVE mode to the ENGINE-MOTOR DRIVE mode. Pet. 41–43; Ex. 1265 ¶¶ 344–351. We are persuaded by Petitioner's showing, which we adopt, that Ibaraki '882 meets this limitation.

Claim 215

Independent claim 215 is similar in scope to claim 161 except it does not include the changing operation from mode I (electric motor operating) to mode V (both electric motor and engine operating) if received operator input specifies a rapid increase in required torque. Instead, claim 215 adds regeneratively charging a battery of the vehicle when the instantaneous torque output of the engine is greater than RL, when RL is negative, and/or when braking is initiated by an operator of the vehicle. Ex. 1260, 79:10–31. Petitioner accounts for the regeneratively charging a battery language, by citing to a description in Ibaraki '882 of 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. Pet. 47; Ex. 1262, 23:1–30; Ex. 1265 ¶ 399. We are persuaded by Petitioner's showing, which we adopt, that claim 215 would have been obvious in view of Ibaraki '882.

Patent Owner's Contentions

Patent Owner makes three arguments with respect to claims 161 and 215: (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. 18–46. We address each argument in the order presented by Patent Owner.

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 18–34. 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. 1265 ¶ 166; Ex. 2257 ¶ 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. 1262, 20:60–62 (emphasis added). Thus, a comparison ("*when*

the vehicle running condition *as represented by*") is made based on 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. 1262, 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 torque. Ex. 1265 ¶¶ 165–169. 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.* ¶¶ 305–307. 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 '634 patent specification describes that the instantaneous torque necessary to propel the vehicle is independent of vehicle speed. PO Resp. 21; Ex. 1260, 12:55–61. But that passage is in the "DISCUSSION OF THE PRIOR ART" section of the '634 patent. Patent Owner has not shown that that description applies to every embodiment described in the '634 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 '634 also contemplates including not just the torque value in the comparison, but also speed. *See*, *e.g.*, Ex. 1260, Fig. 4, 59:3–5.

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. 34–45. Patent Owner argues that Ibaraki '882 does not mention MTO, or use MTO in mode selection control strategy. *Id.* at 35. 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. 29–30; Ex. 1262, 20:55–62, 26:28–33; Ex. 1265 ¶¶ 236–244. 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. 1265 ¶ 241. 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. 36–38. But as Petitioner points out, the 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 6–11. Patent Owner's proposed Figure 11, which Mr. Hennemann 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 8. 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. 1265 ¶ 238.

Patent Owner argues that Ibaraki '882 does not disclose a setpoint that is substantially less than MTO. PO Resp. 46–49. 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 48 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 paragraph 217 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. 1265 ¶ 217. 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. 48. But, as explained previously above, substantially less includes anything less than 70% of MTO. Thus, we are not persuaded by Patent Owner's argument.

E. Claim 239

Petitioner contends that claim 239 is unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki '882, the general knowledge of a POSA, and Ibaraki '626. Pet. 49–54. To support its contention, Petitioner provides detailed explanations as to how the prior art meets each claim limitation of claim 239. *Id*. Petitioner also relies upon the Declaration of Dr. Davis for support. Ex. 1265.

Ibaraki '626

Ibaraki '626 describes a hybrid drive system for driving a motor vehicle, which includes an engine and an electric motor. Ex. 1263, 1:9–12. If the electric motor fails to function as the drive power source a special control routine is executed. *Id.* at 5:25–48. In particular, if the electric motor is not normally functioning, the hybrid drive system is placed in the engine drive mode and the engine operates so as to provide the required power PL for driving the motor vehicle, regardless of the current running condition of the vehicle as represented by the drive torque and speed, that is, regardless of the current running load of the vehicle. *Id.* at 7:62–8:1.

Analysis

Claim 239 depends directly from independent claim 215 and recites "operating the engine at torque levels less than the SP under abnormal and transient conditions to satisfy drivability and/or safety considerations." Petitioner relies on Ibaraki '626 for its description of the special control routine that is executed in the event of a failure of the electric motor. Pet. 52. Petitioner explains, with supporting evidence, that when operating in the special control routine, the Ibaraki '626 hybrid vehicle calculates the required drive power P_L and associated torque value such that the engine is

operated with the calculated required power P_L for driving the vehicle, irrespective of the magnitude of the required power P_L. *Id.* at 53 (citing Ex. 1263, 7:50–61).

Petitioner further explains, with supporting evidence, that a person having ordinary skill in the art would have understood that when the special control routine is executed, the IC engine is started and operates at all torque levels, including levels that lie below the SP in order to satisfy drivability and/or safety considerations. *Id.* Lastly, Petitioner argues that it would have been obvious to use the special control routine from Ibaraki '626 in the Ibaraki '882 system, since doing so would have required nothing more than applying the basic control routines of Figures 2–4 of Ibaraki '626 into the nearly identical known vehicle design and control routines of Ibaraki '882 to achieve the predictable result of preventing the undesirable change in the running performance of the vehicle in the event of a failure of the electronic motor. *Id.* at 50.

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 Ibaraki '626 reasonably would have suggested the limitations of claim 239, and that the combination would have been obvious for the reasons provided by Petitioner. Indeed, in *KSR Int'l Co. v. Teleflex Inc.*, the Court explained that if a feature has been used to improve one device, and a person of ordinary skill in the art would have recognized that it would improve a similar device in that field or another, implementing that feature on the similar device is likely obvious. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Here, a person of ordinary skill in the art would have recognized that the special control routine from

Ibaraki ’626 would have improved the control routine of Ibaraki ’882 to achieve the predictable result of preventing the undesirable change in the running performance of a hybrid vehicle in the event of a failure of the electronic motor.

Patent Owner’s Contentions

Patent Owner argues that Ibaraki ’626, like Ibaraki ’882, discloses a power-based system and does not disclose a torque-based setpoint, let alone a comparison of road load to a setpoint to determine whether to operate the motor, the engine, or both. PO Resp. 49–50. As explained above, the scope of the claims does not mandate that the only comparison made is with respect to torque, and that no other types of comparisons are involved. Thus, we are not persuaded by Patent Owner’s power-based arguments.

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.* at 50–51. 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. 50–51.

F. Claims 173 and 240

Petitioner contends that claims 173 and 240 are unpatentable under 35 U.S.C. § 103(a) as obvious over Ibaraki ’882, Suga, and the general knowledge of a person of ordinary skill in the art. Pet. 54–58. To support its contention, Petitioner provides detailed explanations as to how the prior art meets each claim limitation of claims 173 and 240. *Id*. Petitioner also relies upon the Declaration of Dr. Davis for support. Ex. 1265.

Claim 173 depends directly from independent claim 161 and claim 240 depends directly from independent claim 215. Claim 173 recites "wherein said at least one electric motor is sufficiently powerful to provide acceleration of said vehicle sufficient to conform to the Federal urban cycle driving fuel mileage test without use of torque from the engine to propel the vehicle." Ex. 1260, 75:4–8. Claim 240 recites a similar limitation.

Petitioner explains that a person having ordinary skill in the art at the time of the invention would have understood that the claimed "Federal urban cycle" refers to the "Federal Urban Driving Schedule (FUDS)," which was more commonly known as the "LA4 driving schedule" to test the exhaust gas emissions of an IC engine. Pet. 54 (citing Ex. 1265 ¶¶ 454–458). Petitioner further explains, with supporting evidence, that by 1998 a person having ordinary skill in the art still recognized FUDS as being the LA4 drive cycle even when testing the exhaust gas emissions of a hybrid vehicle. *Id.* (citing Ex. 1265 ¶¶ 459–461).

Petitioner contends, with supporting evidence, that Suga describes a test apparatus and procedure that determines the electric motor's operating power performance and efficiency. Pet. 56; Ex. 1265 ¶¶ 473–484. Petitioner further contends that Suga discloses providing such information by testing the electric motor according to the LA4 drive cycle where acceleration data from moment to moment is based on vehicle speed pattern data. Ex. 1264, 4:6–17. Directing attention to Figure 6 of Suga, which illustrates a two dimensional map of the electric motor output and efficiency, Petitioner argues that that figure illustrates that electric motors existed that were sufficiently powerful to provide the acceleration to conform to the LA4 (FUDS) drive cycle without use of torque from an engine to propel a

vehicle. Pet. 57. Petitioner reasons that a person having ordinary skill in the art would have been motivated to use the teachings of Suga to select an electric motor that could efficiently provide the power requirements necessary to provide the vehicle drive torque during Ibaraki '882's MOTOR DRIVE mode. *Id.*; Ex. 1265 ¶¶ 482–485.

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 Suga reasonably would have suggested the limitations of claims 173 and 240, and that the combination would have been obvious for the reasons provided by Petitioner.

Patent Owner's Contentions

Patent Owner argues that Petitioner fails to establish that Suga's teaching with respect to electric vehicles would somehow inform a person of skill in the art anything about how to choose the power capabilities of the motor in a hybrid system. PO Resp. 51–55. This argument is unpersuasive. As discussed above, Petitioner explains how the vehicle described in Ibaraki '882 has a MOTOR DRIVE mode, in which the electric motor provides the entire torque required to propel the vehicle. Also as discussed above, Petitioner explains that the Federal urban cycle driving fuel mileage test recited in claims 173 and 240 is a test for urban driving. Thus, for its MOTOR DRIVE mode, the hybrid vehicle of Ibaraki '882 is like the all-electric vehicle of Suga, at least insomuch as the FUDS standard or test is concerned.

We are not persuaded by Patent Owner's arguments that the Ibaraki '882 drive control apparatus is designed to operate in MOTOR DRIVE mode only when doing so would minimize the fuel consumption

amount, and not designed to operate like an electric vehicle where the motor is sized to provide all of the power requirements. *Id.* at 53–54; Ex. 2257 ¶ 95. In support of the assertion, Mr. Hannemann testifies that Ibaraki '882's Figure 11 shows that the maximum power provided by the motor in the MOTOR DRIVE mode is less than the power provided by the engine and that a person having ordinary skill in the art would not modify Ibaraki '882 to operate like an electric vehicle where the motor is sized to provide all of the power requirements. Ex. 2257 ¶ 95. We do not give Mr. Hannemann's testimony, in that regard, substantial weight. Ibaraki '882 is not limited to a particular motor driving range for the MOTOR DRIVE mode, and describes that the motor driving range may be enlarged such that the enlarged motor driving range includes a portion of the original engine driving range. Ex. 1262, 8:59–63. Where only the electric motor is operated to drive the vehicle in the enlarged motor driving range, the "original motor driving range is enlarged so as [to] include a portion that causes an operation of the electric motor under a relatively high load." *Id.* at 9:2–8.

We agree with Petitioner, that the hybrid vehicle of Ibaraki '882 in the MOTOR DRIVE mode provides all propulsion to the vehicle without the use of torque from the engine. It would have been obvious that during such a mode, the motor be capable of providing acceleration of the vehicle just like an all-electric vehicle.

III. CONCLUSION[6]

For all of the above reasons, we dismiss the *inter partes* review with respect to claims 161, 215, 228, 233, 235, 236, and 237, and determine that Petitioner has shown by a preponderance of the evidence that claims 173, 239, and 240 are unpatentable.

IV. ORDER

It is

ORDERED that the *inter partes* review is *dismissed* with respect to claims 161, 215, 228, 233, 235, 236, and 237;

FURTHER ORDERED that claims 173, 239, and 240 of the '634 patent are unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

[6] In making the obviousness conclusions, we recognize that it is the subject matter of each claim, as a whole, that is evaluated, rather than just each individual limitation, separately. 35 U.S.C. § 103.

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