NOTE: This disposition is nonprecedential.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.

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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:
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> an internal combustion engine controllably coupled to road wheels of said vehicle;
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> a first electric motor connected to said engine [a]nd operable to start the engine responsive to a control signal;
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> 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;
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> a battery, for providing current to said motors and accepting charging current from at least said second motor; and
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> a controller for controlling the flow of electrical and mechanical power between said engine, first and second motors, and wheels,
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> 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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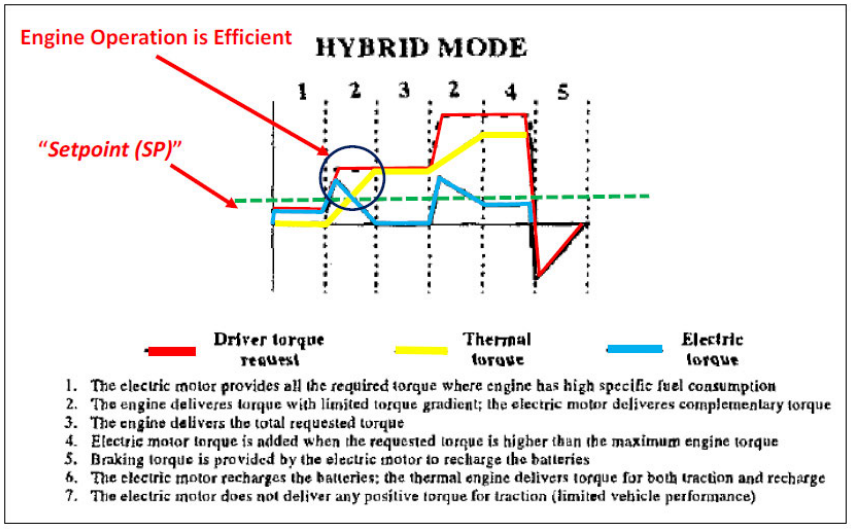
[2] Paice also contends that the Board lacks substantial evidence to support its finding that Caraceni uses a torque-based setpoint to start and operate the gas engine to charge the battery. We need not reach this argument because the broadest reasonable construction of claim 1 only requires that the 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:

[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.

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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.