NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1263, 2017-1264, 2017-1308, 2017-1309, 2017-1310, 2017-1311

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00722, IPR2015-00784, IPR2015-00787, IPR2015-00790, IPR2015-00791, IPR2015-00800.

PAICE LLC, THE ABELL FOUNDATION, INC.,
Appellants

v.

FORD MOTOR COMPANY,
Appellee

2017-1442, 2017-1443

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2015-00794, IPR2015-00795.

Decided: February 1, 2018

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

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

Before LOURIE, O'MALLEY, and TARANTO, *Circuit Judges*.

Opinion for the court filed by *Circuit Judge* TARANTO.

Opinion dissenting in part filed by *Circuit Judge* O'MALLEY.

TARANTO, *Circuit Judge*.

U.S. Patent Nos. 7,237,634 and 7,104,347, which are owned by Paice LLC and The Abell Foundation (collectively, Paice), describe and claim asserted improvements in a hybrid vehicle—a vehicle that has available for propulsion both a battery-powered electric motor and an internal combustion (gas) engine. At Ford's request, the Patent and Trademark Office instituted inter partes reviews of various claims of the two patents under 35 U.S.C. §§ 311–19. The Patent Trial and Appeal Board

ultimately held numerous claims of the two patents unpatentable. Paice appeals. We affirm.

I

The '634 and '347 patents describe a control strategy, based on the torque needed for propulsion, for switching between different modes of operating a hybrid vehicle—use of (one or more) electric motors, a gas engine, or both. The subject matter has been discussed in previous decisions of this court. *See Paice LLC v. Ford Motor Co.*, 681 F. App'x 885, 887–88 (Fed. Cir. 2017) (*Paice I*) (involving Paice's related U.S. Patent No. 7,559,388); *Paice LLC v. Ford Motor Co.*, 681 F. App'x 904, 908–09 (Fed. Cir. 2017) (*Paice II*) (involving the '347 patent); *Paice LLC v. Ford Motor Co.*, 685 F. App'x 940, 943 (Fed. Cir. 2017) (*Paice III*) (involving Paice's related U.S. Patent No. 8,214,097); *see also Paice LLC v. Ford Motor Co.*, 685 F. App'x 950 (Fed. Cir. 2017) (*Paice IV*) (summary affirmance of Board decisions involving the '634 patent).[1] We recite here only the background necessary to resolve the issues on appeal.

The common specification explains that the control strategy bases selection decisions on instantaneous torque demand, or "road load." '634 patent, col. 13, lines 12–21, 44–65.[2] Because the gas engine runs most efficiently when it produces torque near its maximum torque output,

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[1] Related subject matter is also at issue in appeals 17-1387, 17-1388, 17-1390, 17-1457, 17-1458, and 17-1406, which were argued in tandem with the present appeals.

[2] The '634 patent issued from a divisional application, under 35 U.S.C. § 121, of the application that issued as the '347 patent. Because the patent specifications are identical in all material respects, this opinion cites only to the '634 patent, and to the materials submitted in appeal 17-1263, unless specifically noted otherwise.

the control strategy is designed to operate the engine "only under circumstances where the engine will be loaded so as to require at least 30% of its maximum torque output ('MTO') (it being understood throughout this specification and the appended claims that this 30% figure [setpoint] is arbitrary and can be varied)." *Id.*, col. 13, lines 14–29, 44–65; *see also id.*, col. 2, lines 58–60. Generally, the electric motor alone is used to run the vehicle below the 30% setpoint, the gas engine is used to run the vehicle in the "efficien[t]" range of 30% to 100% of the engine's maximum torque output, and both propulsion sources are used to run the engine when more than 100% of the gas engine's maximum torque output is required (the electric motor providing the additional torque required). *Id.*, col. 41, line 59 through col. 43, line 25 & Fig. 9.

The relevant claims of the Paice patents require two comparisons—of the vehicle's road load to a setpoint, and of the vehicle's road load to the gas engine's maximum torque output—for the decision whether to operate the electric motor, the gas engine, or both. Independent claim 80 of the '634 patent is representative.[3] That claim reads:

> 80. A method for controlling a hybrid vehicle, comprising:
>
> determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;
>
> monitoring the RL over time;

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[3] In appeals 17-1442 and 17-1443, the parties treat claims 1 and 23 of the '347 patent as representative. Those claims are materially identical to claim 80 of the '634 patent. *Compare* '634 patent, col. 65, lines 11–33 *with* '347 patent, col. 58, lines 13–37 *and id.*, col. 60, lines 22–54.

> operating the at least one electric motor to propel the hybrid vehicle when the RL required to do so is less than a setpoint (SP);
>
> operating the internal combustion engine of the hybrid vehicle to propel the hybrid vehicle when the RL required to do so is between the SP and a maximum torque output (MTO) of the engine, wherein the engine is operable to efficiently produce torque above the SP, and wherein the SP is substantially less than the MTO; and
>
> wherein said operating the internal combustion engine to propel the hybrid vehicle is performed when:
>
> the RL>the SP for at least a predetermined time; or
>
> the RL>a second setpoint (SP2), wherein the SP2 is a larger percentage of the MTO than the SP; and
>
> operating both the at least one electric motor and the engine to propel the hybrid vehicle when the torque RL required to do so is more than the MTO.

'634 patent, col. 65, lines 11–33.[4]

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[4] In IPR2015-00791, the Board dismissed the challenge to claim 80 from the inter partes review because that claim had been held unpatentable in an earlier Board decision, *Ford Motor Co. v. Paice LLC*, No. IPR2014-01416, 2016 WL 932948, at *1 (P.T.A.B. Mar. 10, 2016), *aff'd*, *Paice IV*, 685 F. App'x 950. Though not at issue here, claim 80 contains the relevant limitations and is representative of the claims on appeal.

In the final written decisions in seven inter partes reviews, the Board determined that the following claims—claims 2–4, 6–13, 15, 17, 19, 23, 25, 27–30, 32, 66–67, 79, 94, 96, 106–08, 113, 128, 140–41, 146, 173, 229, 231, 238–41, 252–56, 259, 261–62, 267, 281–82, 285, and 287–88 of the '634 patent; and claims 3–5, 14, 16, 19–20, 22, 25–30, 32, and 39–41 of the '347 patent—are unpatentable for obviousness over U.S. Patent No. 5,789,882 (Ibaraki), either alone or in combination with other references.[5] The Board's decision in IPR2015-00722, on appeal here in 17-1263, is representative. *Ford Motor Co. v. Paice LLC*, IPR2015-00722, 2016 WL 5636817 (P.T.A.B. Sept. 26, 2016) (*IPR 722 Final Written Decision*).

On appeal pursuant to 35 U.S.C. § 319, Paice challenges those Board decisions, under 5 U.S.C. § 706(2)(E), as not supported by substantial evidence. We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

II

We review the Board's factual findings underlying its obviousness determinations for substantial evidence, which "means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1061 (Fed.

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[5] In the eighth Board decision on appeal (involving IPR2015-00800), the Board determined that claims 172, 226, 230, and 234 of the '634 patent are unpatentable for obviousness over a series of articles written by J.R. Bumby. We are unpersuaded by Paice's arguments on appeal challenging that determination. We affirm the decision without further discussion, except to note that in *Paice II*, 681 F. App'x at 917–18, we affirmed the Board's determination of unpatentability of similar claims in Paice's '347 patent based on obviousness over the Bumby references.

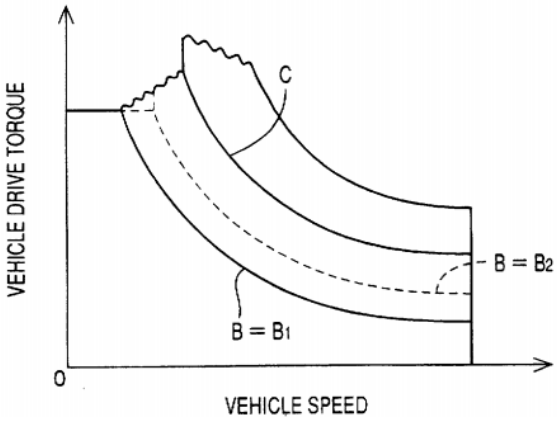
Cir. 2016) (quoting *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938)).

A

Paice's main argument is that the Board's finding that Ibaraki discloses torque-based comparisons is not supported by substantial evidence. We disagree.

As the Board correctly found, *IPR 722 Final Written Decision*, 2016 WL 5636817, at *7, Ibaraki describes a hybrid vehicle with "a drive control apparatus" (controller) that, like the microprocessor in the '634 and '347 patents, "includes drive source selecting means" for selecting the engine, motor, or both. Ibaraki, col. 1, lines 10–13; *id.*, col. 20, lines 38–43. The controller makes the selection "according to a drive source selecting data map," illustrated in Figure 11 (below), "which represents a predetermined relationship between the vehicle drive torque and running speed V and the . . . three drive modes" of motor drive (electric motor only), engine drive (gas engine only), and engine-motor drive (both). *Id.*, col. 20, lines 38–53.

FIG. 11



"[W]hen the vehicle running condition as represented by the current vehicle drive torque and speed" falls in the area below curve B, the controller selects motor drive

mode. *Id.*, col. 20, line 55–62; *see also id.*, col. 21, lines 2–4 (B can be shifted from B_1 to B_2 to enlarge the motor drive range, if such a condition is desired). Similarly, the controller selects engine drive mode when the running condition falls in the area between curve B and curve C, and engine-motor drive mode in the area above curve C. *Id.*, col. 20, line 55 through col. 21, line 1; *id.*, col. 24, lines 16–21 & Fig. 10.[6]

Paice does not dispute the finding that Ibaraki teaches comparisons to setpoints to select engine, motor, or engine-motor operation. In Figure 11, curve B and curve C each is a constant level of power, and the flowchart in Ibaraki's Figure 10 expressly refers to a power comparison ("P_L > B?"; "P_L > C?") for selecting the mode of operation. Precisely because that comparison employs power, however, Paice argues that Ibaraki's controller does not base mode selection on comparisons to torque, as required by the patent claims.

The question before us is not whether the Board might properly have accepted Paice's contention about the teachings of Ibaraki. The question is whether the Board had an adequate evidentiary basis for its contrary finding. The Board found that Ibaraki teaches reliance on *both* power *and* torque; it thus rejected Paice's contention that one teaching excludes the other. *IPR 722 Final Written*

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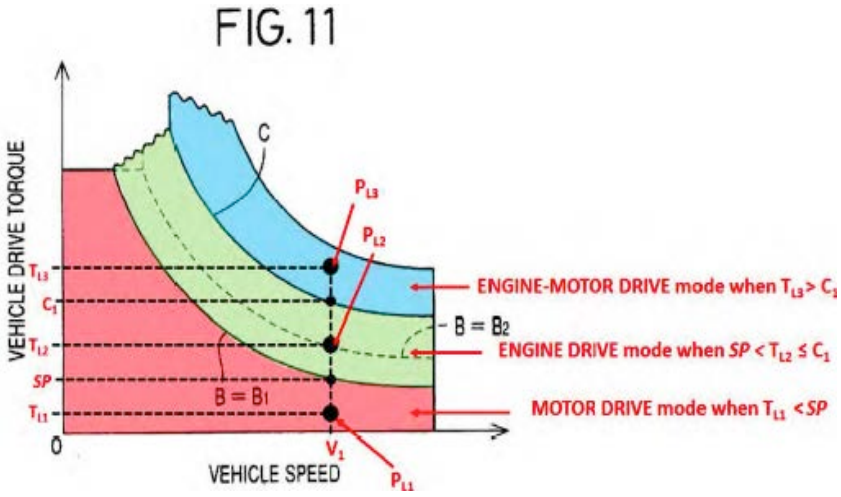
[6] Ibaraki at col. 20 line 66 through col. 21, line 1, states that "[w]hen the vehicle running condition is in the range above the second boundary line C, the drive source selecting means [] selects the ENGINE-DRIVE mode." Based on context and Figure 10, that appears to be a typographical error: the passage should say "ENGINE-MOTOR DRIVE mode." Paice does not dispute that Ibaraki discloses that if the power level is greater than curve C, "the vehicle is driven in 'Engine-Motor Drive Mode.'" Paice Br. 20.

Decision, 2016 WL 5636817, at *7–12. We conclude that the Board's finding is reasonable on this record.

Ford's expert Dr. Gregory Davis pointed out that "Ibaraki [] states that the 'vehicle drive torque and speed' determine 'a point corresponding to the required drive power P_L." J.A. 16133 (quoting Ibaraki, col. 23, line 66 through col. 24, line 2 (explaining that in Figure 10's flowchart of controller decisionmaking, step Q8 is where the controller "determine[s] whether a point corresponding to the required drive power P_L (determined by the current vehicle drive torque and speed V) is located above the first boundary line B.")). It is undisputed that the relationship between the required drive power P_L, torque, and speed is P_L = torque x speed, which makes each of curve B and C in Figure 11's graph of torque x speed a constant power level. Dr. Davis explained that any particular point on one of the Figure 11 curves (*e.g.*, on B or on C) relates to a "required drive power P_L at a given vehicle drive torque and vehicle speed." J.A. 16133 (internal quotation marks omitted).

To show how Ibaraki's controller makes operation decisions based on torque comparisons at a given speed, Dr. Davis provided an annotated version of Figure 11, shown at *IPR 722 Final Written Decision*, 2016 WL 5636817, at *8:



That figure illustrates Dr. Davis's reading of Ibaraki as teaching selection decisions based on torque. At a given speed (V_1), the selection decision is based on where on the torque axis the desired torque is: Ibaraki selects motor drive mode at T_{L1}, engine drive mode at T_{L2}, and engine-motor drive mode at T_{L3}. The comparisons of desired torque are to the torque levels on curves B and C at speed V_1, *i.e.*, SP (set point) on curve B and C_1 on curve C.

The Board relied on Ibaraki and the knowledge of a person of skill in the art, as explained by Dr. Davis, to find that power is directly related to torque, that Ibaraki's controller determines the required drive power based on the current vehicle drive torque and speed, and that Ibaraki teaches selection decisions dependent on torque (though not only on torque)—specifically, on torque levels at a given speed. *See IPR 722 Final Written Decision*, 2016 WL 5636817, at *8–9, *13–14.[7] The Board had a

[7] Similarly, in the '634 patent, as the Board pointed out, speed may also be "considered in determining the mode of operation of the vehicle": the patent "contemplates including not just the torque value in the [setpoint] comparison, but also speed." *IPR 722 Final Written*

sufficient basis for rejecting Paice's reading of Ibaraki as not teaching torque-based comparisons.

The Board also had a sufficient basis for rejecting a related contention made by Paice—that, even if Ibaraki shows torque-based comparisons, it does not show comparing the vehicle's required torque to the engine's "maximum torque output" and using both propulsion sources when the required torque exceeds that level, as required by the patent claims. Dr. Davis explained that a person of skill in the art would know the following: curve C of Ibaraki's Figure 11 is less than or equal to the engine's maximum torque output (the engine, alone, is running just below that curve); the motor is turned on to provide additional torque above curve C; and "'a hybrid vehicle control strategy would at some point allow the [internal combustion] engine to provide output torque near and potentially including its [maximum torque output]. Otherwise, the system would be artificially limiting the performance of the vehicle.'" *Id.* at *11 (quoting Dr. Davis's declaration). The Board was persuaded. It found that Ibaraki, combined with the knowledge of a person of ordinary skill in the art, taught the Paice claim limitation

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Decision, 2016 WL 5636817, at *14 (citing '634 patent, Fig. 4 & col. 59, lines 3–5 (dependent claim 12 recites "the hybrid vehicle of claim 1, wherein the controller is operable to vary the SP as a function of speed of the engine"); *cf.* '634 patent, col. 58, lines 19–27 (claim 1 requirement that the controller, among other things, "is operable to operate the engine when torque . . . is at least equal to a setpoint (SP) above which the torque produced by the engine is efficiently produced"). *See also id.*, col. 19, lines 63–65 ("The vehicle is operated in different modes, depending on its instantaneous torque requirements, and the state of charge of the battery, and other operating parameters.").

that both the engine and motor be used to propel the vehicle above the engine's maximum torque output. *Id.* at *11–12. Dr. Davis's testimony supplies an adequate basis for that finding.

We note that, in the alternative, the Board found that "operating the engine and motor when the torque [road load] required to do so is more than the [maximum torque output] . . . would have been an obvious modification to make to the Ibaraki [] control system." *Id.* at *14 (internal quotation marks omitted). We agree with that determination on the evidence-supported facts found by the Board.

B

Paice also challenges the Board's finding that Ibaraki discloses the claim requirement of a setpoint that is "substantially less" than the engine's maximum torque output—the engine alone operating when the required torque is between those figures. *See IPR 722 Final Written Decision*, 2016 WL 5636817, at *10. It is undisputed, based on claim 15 of the '634 patent, that approximately 70% of the maximum torque output constitutes being "substantially less" than the maximum torque output. *Id.* The Board found that this limitation was shown in Ibaraki, relying on the explanation of Dr. Davis that it would be "clear" to a person of skill, based upon a "simple visual inspection" of Figure 11, "that setpoint SP [along curve B_1] is substantially less than point C_1 [along curve C]," and therefore substantially less than the maximum torque output (which, for reasons already noted, is at or above curve C). J.A. 16157–58; *see IPR 722 Final Written Decision*, 2016 WL 5636817, at *10, *15.

Paice argues that Dr. Davis's reliance on visual inspection of Figure 11 is improper under *Hockerson-Halberstadt, Inc. v. Avia Group International, Inc.*, in which this court explained "that patent drawings do not define the precise proportions of the elements and may

not be relied on to show particular sizes if the specification is completely silent on the issue." 222 F.3d 951, 956 (Fed. Cir. 2000); *see also In re Olson*, 212 F.2d 590, 592 (C.C.P.A. 1954) ("Ordinarily drawings which accompany an application for a patent are merely illustrative of the principles embodied in the alleged invention claimed therein and do not define the precise proportions of elements relied upon to endow the claims with patentability."). The *Hockerson-Halberstadt* case involved a rudimentary drawing that portrayed a central groove bisecting the heel on the sole of a shoe to create fins flanking the groove, 22 F.3d at 953, and there was no indication that the groove and fins were drawn to scale, *id.* at 956. That drawing, this court held, could not rebut statements in the prosecution history that clarified the relative measurements because "the inventor necessarily defined the central longitudinal groove as requiring a width that must be less than the combined width of the two fins." *Id.* at 956.

This case is not controlled by *Hockerson-Halberstadt*. Unlike the drawing at issue there, Figure 11 of Ibaraki provides some scale information—which expert evidence reasonably found telling on the point at issue. It specifies 0 at the intersection of the x- and y-axes, both of which run continuously, without indication of omission of portions of the range, from 0 to higher levels; and consistent with the shape of each curve (a rectangular hyperbola), the parties' experts both treated the scale of the axes as linear—allowing Dr. Davis to make rough estimates based on relative comparisons between the torque values located on the B and C curves.[8] In any event, the visual

[8] At oral argument, counsel for Paice suggested that it was unclear whether the curves were plotted along a linear or logarithmic scale. But Paice's own expert assumed that the scales of the x- and y-axes were linear

inspection of the curves is not the sole support for the Board's finding. The Board also found that, based on Dr. Davis's declaration, a person of skill would understand the B curve to be "substantially less" than the maximum torque output because, otherwise, the controller would rarely select the engine alone to propel the vehicle. *IPR 722 Final Written Decision*, 2016 WL 5636817, at *15. According to Dr. Davis, it would not make sense to a person of skill for a hybrid vehicle to "hardly" operate the engine as the primary drive source. J.A. 16154–55. Ibaraki's Figure 11, in combination with the understanding of a person of skill, thus provides substantial evidence for the Board's finding that Ibaraki teaches the "substantially less" claim element at issue.

C

For those reasons, and having considered Paice's remaining arguments and found them insufficient to disturb the Board's rulings, we affirm the final written decisions of the Board.

AFFIRMED

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for the power curves in Figure 11. *See* J.A. 16492. That makes sense mathematically: as Dr. Davis explained, the curves "'represent[] a predetermined relationship between the vehicle drive torque and running speed V,'" J.A. 16131 (quoting Ibaraki, col. 20, lines 49–53)—namely, "Power = Torque * Rotational Speed," J.A. 16133. A linear scale along both axes would produce the rectangular hyperbola curves—for constant power level P = x * y—as depicted in Figure 11.

NOTE: This disposition is nonprecedential.

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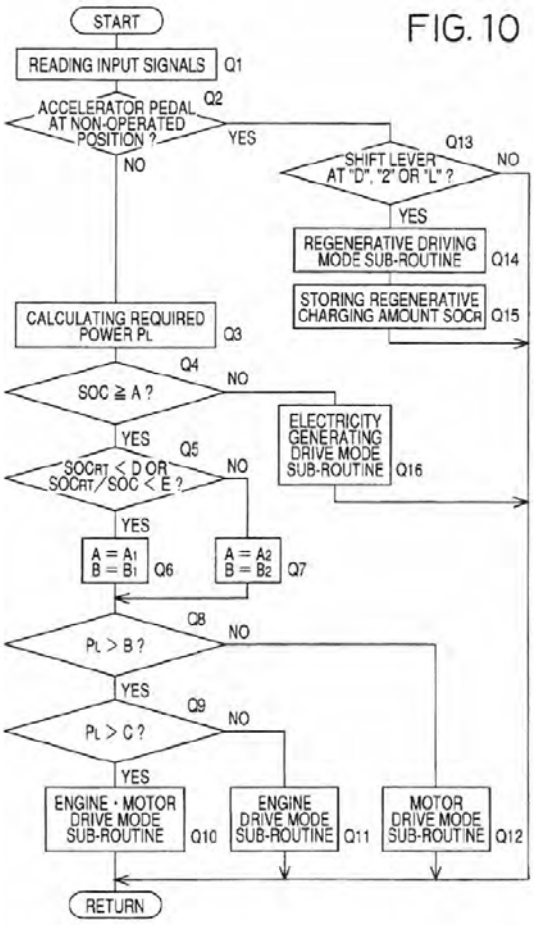
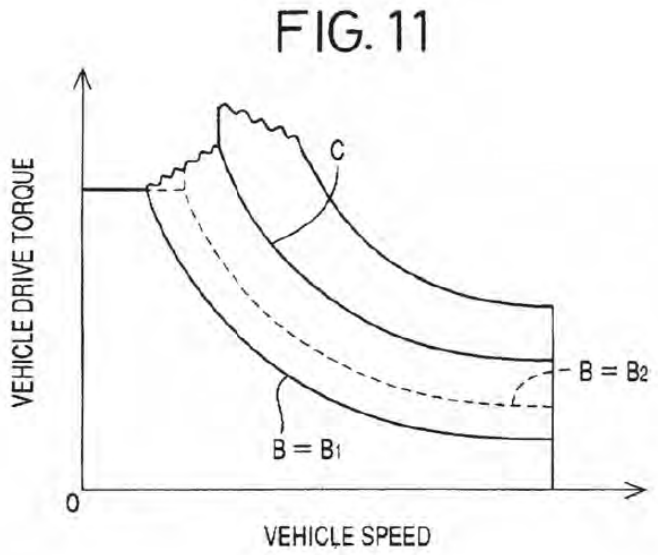
O'MALLEY, *Circuit Judge*, dissenting in part.

I agree with the majority that substantial evidence supports the Board's finding that the Bumby references render obvious certain claims of the '634 and '347 patents, and I therefore join the majority opinion as it relates to those references. *See* Maj. Op. at 6 n.5. I disagree, however, with the majority's conclusion that substantial evidence supports the Board's finding that Ibaraki discloses a torque-based control algorithm, and I dissent from the portion of the majority opinion affirming the Board's obviousness determinations based on Ibaraki. *See id.* at 7–14.

Ibaraki discloses a *power*-based control algorithm, not a *torque*-based one. Figure 10 of Ibaraki depicts that algorithm and shows, in steps Q8 and Q9, that the system compares the vehicle's instantaneous power, "P_L," with power thresholds "B" and "C" to determine which operating mode to select:



Ibaraki, Fig. 10 (steps Q8, Q9); *id.* col. 23, line 66 through col. 24, line 38 (stating that the driving mode of the vehicle is selected "depending upon the required drive power P_L"); *see also* No. 17-1263, J.A. 16,467–68 (Paice's expert describing Ibaraki's Figure 10). This is consistent with Ibaraki's Figure 11, which shows a series of power curves corresponding to the threshold values depicted in Figure 10, plotted against the vehicle drive torque (y-axis) and vehicle speed (x-axis), as shown below:

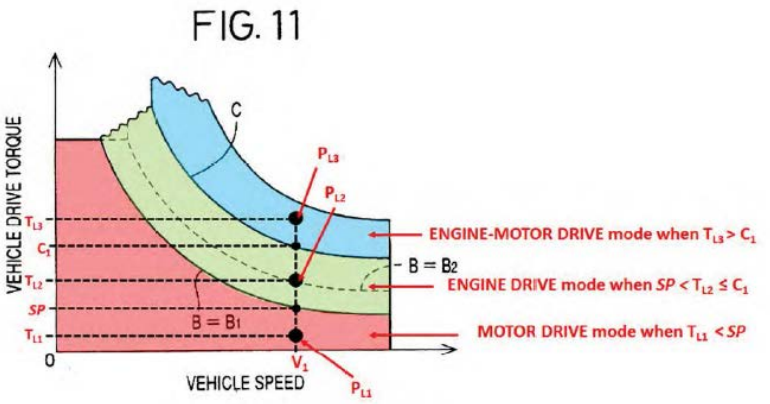


Ibaraki, Fig. 11. Each curve has a non-zero slope and delineates operating modes. As Paice's expert testified—and as the majority acknowledges, *see* Maj. Op. at 8–9—the curves represent constant levels of power, not set-points of constant torque. *See* No. 17-1263, J.A. 16,471–72; Ibaraki, col. 20, line 38 through col. 21, line 4.

As Paice's expert explained, the difference between Ibaraki's power-based system and the '634 and '347 patents' torque-based system is significant. *See* No. 17-1263, J.A. 16,470–71. A single power value can be derived from multiple combinations of torque and speed, as Ibaraki's Figure 11 plainly shows. Indeed, because power is the product of torque and speed, a large number of unique torque-speed pairs can be used to calculate the same power. For example, a vehicle requiring a large torque to maintain a low speed might have the same power requirement as a vehicle requiring a small torque to maintain a high speed. Because Ibaraki is concerned only with power, its algorithm would presumably select the *same* operating mode in both instances. This is in stark contrast to the '634 and '347 patents, which require

the claimed vehicle to operate in *different* modes when the vehicle's torque requirements are different. *See* '634 patent, col. 12, line 49 through col. 13, line 4; *id.* col. 17, lines 45–50; *id.* col. 18, lines 35–40; *id.* col. 19, lines 45–57; *id.* col. 35, lines 63 through col. 36, line 43; *id.* col. 38, lines 9–22, 51–54.

In reaching a contrary conclusion, the Board placed significant weight on Ford's expert's testimony that, *at a particular speed*, Ibaraki determines which operating mode to select based solely on torque. *See Ford Motor Co. v. Paice LLC*, IPR2015-00722, 2016 WL 5636817, at *9 (P.T.A.B. Sept. 26, 2016) (*IPR 722 Final Written Decision*). In his declaration, Ford's expert selected an arbitrary speed in Ibaraki's Figure 11, "V_1," and determined the torque value, "SP," of Ibaraki's power curve B_1 corresponding to that speed:



Id.; *see also* No. 17-1263, J.A. 7255 (Ford's expert testifying that B_1 is "one particular setpoint . . . at [a] particular vehicle speed"). Ford's expert then concluded that Ibaraki teaches which operating mode to select at the designated speed based on whether the torque is greater than or less than the corresponding "SP" torque value. In other words, Ford's expert's analysis—which the Board adopted as its own—was predicated on his evaluating Ibaraki's Figure 11 at a particular speed. This analysis is flawed

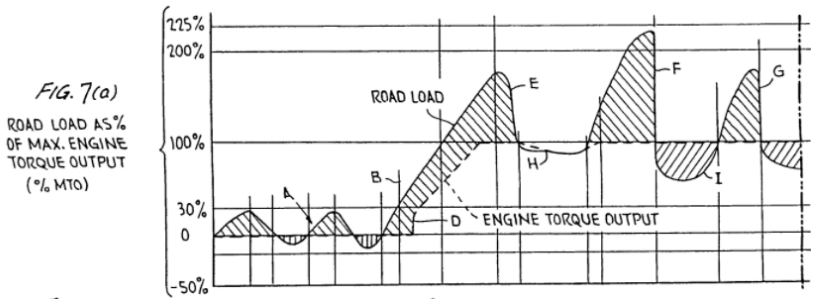
for several reasons, and thus lends no support to the Board's findings with regard to Ibaraki.

First, it is not grounded in—and, in fact, is inconsistent with—Ibaraki's disclosure. Nothing in Ibaraki suggests that its controller makes operating mode decisions by considering the torque at a particular speed. To the contrary, as described above, Ibaraki discloses making such determinations by considering power. The Board's analysis, which attempts to separate out the torque and speed components from Ibaraki's power parameter, finds insufficient support in Ibaraki itself.

Second, the Board's analysis is inconsistent with the '634 and '347 patent claims and specifications. Neither the claims nor the specifications justify comparing road load to the setpoint at a particular speed. In fact, the claims at issue are silent as to speed, which makes sense in view of the patents' statements that road load is "independent of vehicle speed." '634 patent, col. 12, lines 55–61; *see also id.* col. 65, lines 16–30 (claim 80 referring to "*a* setpoint" and "*the* setpoint," not multiple setpoints to account for different speeds).[1] Further, the patents' Figure 7(a) shows that the operating mode decisions are based only on

[1] Claim 12 of the '634 patent and claim 5 of the '347 patent specify that the setpoint may be varied "as a function of speed of the engine," '634 patent, col. 59, lines 3–5, but the claims at issue lack such a limitation, suggesting that the setpoints in the claims are *not* varied as a function of speed.

the road load torque, and not on speed:



Id. at Fig. 7; *id.* col. 38, line 62 through col. 39, line 40; *see also id.* Fig. 9. This figure shows that the electric-motor-only mode is selected when the road load is between 0 and 30% of maximum torque output, the engine-only mode is selected when the road load is between 30% and 100% of maximum torque output, and the hybrid mode is selected when the road load is above 100% maximum torque output. Noticeably missing from the figure and accompanying description in the specifications is any reference to speed's role in the algorithm. Thus, Ford's expert's analysis of whether Ibaraki renders the claims at issue obvious is inconsistent with the '634 and '347 patent claims and specifications, and, as such, is not entitled to deference. *See Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (noting, in an appeal from an IPR, that "we must disregard the testimony of an expert that is plainly inconsistent with the record, or based on an incorrect understanding of the claim[s]" (citations and internal quotation marks omitted)).

Third, the Board's analysis is circular. By holding speed constant, the Board removed speed from the analysis altogether and concluded—unsurprisingly—that torque is the relevant input parameter in Ibaraki's control

algorithm.[2] The Board's analysis is therefore results-oriented to the extent it assumes the very conclusion it purports to reach.

Finally, the Board found that, because "'power' is determined as the multiplicative product of 'torque' and 'speed,'" Ibaraki's power-based comparison "necessarily makes a comparison with regard to the torque value associated with the selected power point . . . , regardless of whether a comparison also is made with respect to speed." *IPR 722 Final Written Decision*, 2016 WL 5636817, at *13; *see also id.* at *14 ("[T]he point corresponding to the required drive power P_L of Figure 11 . . . satisfies the claimed road load, because P_L includes torque."). This quasi-inherency finding is unsupported by substantial evidence. The mere fact that power and torque are mathematically related does not imply that a comparison with one involves a comparison with the other. While the Board's constructions of "road load" and "setpoint" do not exclude *independently* making comparisons based on torque *and* speed, those constructions do not include making a comparison based on power—a parameter that is entirely different from torque, as Ford itself admits, *see* Appellee's Br. 46—merely because power can be derived from torque.

Indeed, the patents emphasize that their torque-based algorithm is the crux of the invention and is what distinguishes the invention over the prior art. *See* '634 patent, col. 13, lines 13–21 (stating that the prior art fails to "recognize[] that the desired vehicle operational mode should preferably be controlled in response to the vehicle's actual torque requirements, i.e., the road load" so as to

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[2] As Paice's expert testified, one could just as easily hold torque constant and conclude that Ibaraki's control system determines which mode to select at that torque based solely on speed. *See* No. 17-1263, J.A. 16,473–74.

"provide[] superior performance[] . . . under the widely-varying conditions encountered in 'real world' driving situations"). The Board's obviousness analysis, however, effectively reads the torque-based nature of the invention out of the claims altogether. To the extent the Board's obviousness determination is predicated on constructions of "road load" and "setpoint" that permit comparisons involving power demand, those constructions are unreasonably broad. *See In re Smith Int'l, Inc.*, 871 F.3d 1375, 1382–83 (Fed. Cir. 2017) (stating that "the Board cannot construe the claims so broadly that its constructions are *unreasonable* under general claim construction principles," and that giving claims terms "a strained breadth in the face of . . . otherwise different description in the specification [is] unreasonable" (internal quotation marks omitted)); *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016) ("While the broadest reasonable interpretation standard is broad, it does not give the Board an unfettered license to interpret the words in a claim without regard for the full claim language and the written description.").

For these reasons, I believe that the Board's finding that Ibaraki discloses a torque-based control system is unreasonable and unsupported by substantial evidence. And, because the Board did not make an alternative finding that a torque-based system would be an obvious modification of a power-based system, I would reverse the Board's obviousness determinations as to all claims for which Ibaraki was used as the primary reference. I respectfully dissent from the majority's contrary holding.