Trials@uspto.gov
571-272-7822

Paper 41
Entered: December 10, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner,

v.

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

Case IPR2014-00904
Patent 7,237,634 B2

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

DEFRANCO, *Administrative Patent Judge.*

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

I. INTRODUCTION

Ford Motor Company ("Ford") filed a Petition ("Pet.") for *inter partes* review of claims 1, 14, 16, 18, and 24 of U.S. Patent No. 7,237,634 B2 ("the '634 patent"), which is owned by Paice LLC & The Abell Foundation, Inc. (collectively, "Paice"). In a preliminary proceeding, we decided to institute trial ("Dec. Inst.") because Ford demonstrated a reasonable likelihood that the challenged claims are unpatentable under 35 U.S.C. § 103. In due course, Paice filed a Patent Owner Response ("PO Resp."), and Ford followed with a Reply ("Reply"). Having heard oral argument on this matter,[1] and pursuant to our jurisdiction under 35 U.S.C. § 6(c), we determine Ford has proven, by a preponderance of the evidence, that claims 1, 14, 16, 18, and 24 are unpatentable

II. BACKGROUND

A. The '634 Patent [2]

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 controls the direction of torque between the engine, motor, and drive wheels of the vehicle. Ex. 1001, 17:17–56, Fig. 4. The microprocessor monitors the vehicle's instantaneous torque requirements, or road load, to determine the source of torque necessary to propel the vehicle, be it the engine, the motor, or both. *Id*. at 11:63–65.

---

[1] A transcript ("Tr.") has been entered into the record. Paper 39.

[2] The '634 patent is also the subject of co-pending district court actions, including *Paice, LLC v. Ford Motor Co.*, No. 1:14-cv-00492 (D. Md., filed Feb. 19, 2014), and *Paice LLC v. Hyundai Motor Co.*, No. 1:12-cv-00499 (D. Md., filed Feb. 16, 2012). Pet. 1; PO Resp. 6. We are informed that, in the latter action, a jury trial was completed on October 1, 2015, and the parties are currently engaged in post-trial briefing.

Aptly, the ’634 patent describes the vehicle’s various modes of operation as an engine-only mode, an all-electric mode, or a hybrid mode. *Id*. at 35:63–36:55, 37:24–38:8.

In summarizing the invention, the ’634 patent states that the microprocessor selects the appropriate mode of operation “in response to evaluation of the road load, that is, the vehicle’s instantaneous torque demands and input commands provided by the operator of the vehicle.” [3] *Id*. at 17:40–45. More specifically, “the microprocessor can effectively determine the road load by monitoring the response of the vehicle to the operator’s command for more power.” *Id*. at 37:42–49. “[T]he torque required to propel the vehicle [i.e., road load] varies as indicated by the operator’s commands.” *Id*. at 38:9–11. For example, the microprocessor “monitors the rate at which the operator depresses pedals [for acceleration and braking] as well as the degree to which [the pedals] are depressed.” *Id*. at 27:26–38. These operator input commands are provided to the microprocessor “as an indication that an amount of torque” from the engine “will shortly be required.” *Id*. at 27:41–57.

The microprocessor then compares the vehicle’s torque requirements against a predefined “setpoint” and uses the results of the comparison to determine the vehicle’s mode of operation. *Id*. at 40:16–49. The microprocessor may utilize a control strategy that runs the engine only in a range of high fuel efficiency, such as when the torque required to drive the vehicle, or road load (RL), reaches a setpoint (SP) of approximately 30% of

[3] The ’634 patent contrasts the claimed invention to prior control strategies “based solely on speed,” which are “incapable of responding to the operator’s commands, and will ultimately be unsatisfactory.” Ex. 1001, 13:39–42.

the engine's maximum torque output (MTO). *Id*. at 20:61–67, 37:24–44; *see also id*. at 13:64–65 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently"). The microprocessor also may monitor other operating parameters to control the vehicle's mode of operation, such as the battery's state of charge and the operator's driving history over time. *Id*. at 19:63–20:3; *see also id*. at 37:20–23 ("according to one aspect of the invention, the microprocessor 48 controls the vehicle's mode of operation at any given time in dependence on 'recent history,' as well as on the instantaneous road load and battery charge state"). According to the '634 patent, this microprocessor control strategy maximizes fuel efficiency and reduces pollutant emissions of the hybrid vehicle. *Id*. at 15:55–58.

B. The Challenged Claims

Of the challenged claims, claim 1 is the only independent and claims 14, 16, 18, and 24 depend therefrom. Claim 1 recites:

> 1. A hybrid vehicle, comprising:
>
> one or more wheels;
>
> an internal combustion engine operable to propel the hybrid vehicle by providing torque to the one or more wheels;
>
> a first electric motor coupled to the engine;
>
> a second electric motor operable to propel the hybrid vehicle by providing torque to the one or more wheels;
>
> a battery coupled to the first and second electric motors, operable to: provide current to the first and/or the second electric motors; and accept current from the first and second electric motors; and
>
> a controller, operable to control the flow of electrical and mechanical power between the engine, the first and the second electric motors, and the one or more wheels;
>
> *wherein the controller is operable to operate the engine when torque required from the engine to propel the hybrid*

> *vehicle and/or to drive one or more of the first or the second motors to charge the battery is at least equal to a setpoint (SP) above which the torque produced by the engine is efficiently produced*, and wherein the torque produced by the engine when operated at the SP is substantially less than the maximum torque output (MTO) of the engine.

Ex. 1001, 58:2–27 (emphasis added).

C. The Decision to Institute

In the preliminary proceeding, we instituted *inter partes* review on a single ground, determining Ford had shown a "reasonable likelihood" that claims 1, 14, 16, 18, and 24 are unpatentable as obvious over Severinsky,[4] Field,[5] and SAE 1996.[6] Dec. Inst. 9–12. We now decide whether Ford has proven the unpatentability of these claims by a "preponderance of the evidence." 35 U.S.C. § 316(e).

III. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b). This standard involves determining the ordinary and customary meaning of the claim terms as understood by one of ordinary skill in the art reading the patent's entire written disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed.

---

[4] U.S. Patent No. 5,343,970, iss. Sept. 6, 1994 (Ex. 1003, "Severinsky").
[5] PCT Int'l Pub. WO 93/23263 Nov. 25, 1993 (Ex. 1039, "Field").
[6] Kozo Yamaguchi et al., *Development of a New Hybrid System – Dual System*, SAE SPECIAL PUBLICATION SP-1156, pub. Feb. 1996 (Ex. 1025, "SAE 1996").

Cir. 2007). Here, our review centers on the construction of two claim terms—"road load (RL)" and "setpoint (SP)."[7]

1. "Road load" or "RL"

The term "road load" or "RL" does not appear in independent claim 1, but is found in dependent claims 16, 18, and 24. Both Ford and Paice agree that "road load" means the instantaneous torque required to propel the vehicle. Pet. 13–14; PO Resp. 2, 15. That proposed construction comports with the specification, which defines "road load" as "the vehicle's instantaneous torque demands, i.e., that amount of torque required to propel the vehicle at a desired speed." Ex. 1001, 12:42–46.

In further defining road load, the specification also notes that "the operator's depressing the accelerator pedal signifies an increase in desired speed, *i.e., an increase in road load*, while reducing the pressure on the accelerator or depressing the brake pedal signifies a desired reduction in vehicle speed, *indicating that the torque being supplied is to be reduced or should be negative*." *Id*. at 12:46–55 (emphases added). As such, the specification provides that road load "can be positive or negative." *Id*. at 12:55–58. Thus, consistent with the specification, we construe "road load" or "RL" as "the amount of instantaneous torque required to propel the vehicle, be it positive or negative."

2. "Setpoint" or "SP"

The term "setpoint" or "SP" is found in independent claim 1, as well as dependent claims 14, 16, and 18. Ford proposes that "setpoint" be

[7] Although Ford also proposes a construction for the terms "low-load mode I," "highway cruising mode IV," and "acceleration mode V" (Pet. 17), those terms are defined expressly by claim 16. Ex. 1001, 59:21–34. As such, they do not require further construction.

construed, in the context of the claims, as a "predetermined torque value." Pet. 14, 17. In that regard, Ford correctly notes that the claims compare the setpoint against a *torque* value. *Id*. at 16. For example, claim 1 speaks of the "setpoint" or "SP" as being the lower limit at which the engine can produce torque efficiently, i.e., "*when torque required* from the engine to propel the vehicle . . . *is at least equal to a setpoint (SP)* above which the torque produced by the engine is efficiently produced."[8] Ex. 1001, 58:19–27. Similarly, claim 14 recites that "the SP is at least approximately 30% of the MTO of the engine," where MTO stands for maximum *torque* output. *Id*. at 59:9–10. This express language suggests that "setpoint" is not just any value, but a value that—per the surrounding claim language—equates to "torque." *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) ("the claims themselves provide substantial guidance as to the meaning of particular claim terms . . . the context in which a term is used in the asserted claim can be highly instructive").

Paice, on the other hand, argues that "setpoint" is synonymous with a "transition" point, not a torque value. PO Resp. 7–10. Citing the specification, Paice urges that "setpoint" must be construed to indicate a point "at which a transition between operating modes may occur." *Id*. at 8. Paice's argument is misplaced. While Paice is correct that *sometimes* the specification describes the setpoint in terms of a "transition point" (s*ee id.* at 9–10), the claim language itself makes clear that setpoint relates simply to a torque value, without requiring that it be a transition point. Indeed, the

[8] Paice's declarant, Mr. Neil Hannemann, agreed that, given the "comparison" being made by this claim language, the "most straightforward" construction is that "setpoint is a torque value." Ex. 1041, 79:16–80:25.

specification acknowledges that the mode of operation does not always transition, or switch, at the setpoint, but instead depends on a number of parameters. For instance,

> 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. 1001, 19:67–20:6 (emphasis added). That disclosure suggests that a transition does not spring simply from the recitation of "setpoint." As such, we will not import into the meaning of "setpoint" an extraneous limitation that is supported by neither the claim language nor the specification.

Moreover, that a "setpoint" does not mean a *per se* transition between operating modes is reinforced by the fact that only the dependent claims, for example, claims 6 and 19, describe the "setpoint" in terms of a "transition" between operating modes. *See id*. at 58:41–49, 59:52–55. Where the meaning of a claim term is clear from the context of its use in an independent claim, we will not further limit the meaning of the term by its use in a dependent claim, absent justification for doing so. *See Phillips*, 415 F.3d at 1315 ("the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim"). Thus, we reject Paice's attempt to further limit the meaning of setpoint to a transition between operating modes.

We also regard as meaningful that nothing in the specification precludes a setpoint from being reset, after it has been set. The specification states that the value of a setpoint may be "reset . . . in response to a repetitive driving pattern." Ex. 1001, 40:37–59. But, just because a setpoint may be reset under certain circumstances does not foreclose it from being "set," or "fixed," at some point in time.[9] A setpoint for however short a period of time still is a setpoint. Thus, we construe "setpoint" as a "predetermined torque value that may or may not be reset."

Finally, Paice argues that any construction limiting the meaning of setpoint to a "torque value" would be "directly at odds with the construction adopted by two district courts" in related litigation.[10] PO Resp. 6–7. Although, generally, we construe claim terms under a different standard than a district court, and thus, are not bound by a district court's prior construction, Paice's emphasis on the district court's construction compels us to address it. *See Power Integrations, Inc. v. Lee*, 797 F.3d 1318, 1327 (Fed. Cir. 2015) ("Given that [patent owner's] principal argument to the board . . . was expressly tied to the district court's claim construction, we think that the board had an obligation, in these circumstances, to evaluate that construction").

In that regard, the district court held:

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

---

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

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

Ex. 1011, 10, 18. But, as discussed above, although claims are read in light of the specification, it is the use of the term "setpoint" within the context of the claims themselves that provides a firm basis for our construction. *See Phillips, supra*. Here, the claims instruct us that "setpoint," when read in the context of the surrounding language, is limited to a torque value. As for the district court's statement that the battery's state of the charge is compared to a setpoint, we note that *the claims* actually speak of comparing the "state of charge of the battery" to "a predetermined level," not a "setpoint" or "SP" as found elsewhere in the claims. *See, e.g.*, Ex. 1001, 59:40–43 (dependent claim 18). Thus, in the context of the claims, we decline to read "setpoint" as also encompassing a state of charge of the battery, as the district court did. Instead, we construe "setpoint" as representing a torque-based value.

B. The Instituted Ground—Obviousness over Severinsky, Field, and SAE

Ford challenges independent claim 1, as well as dependent claims 14, 16, 18, and 24, on the ground that the claimed invention would have been obvious over the combined teachings of Severinsky, Field, and SAE. Pet. 18–49. In challenging these claims, Ford relies primarily on Severinsky as teaching the hybrid configuration and control strategy of the contested claims.[11] *See* Pet. 25–27, 30–46, 48–49.

At the outset, we find that, like claims 1 and 16, Severinsky discloses the essential components of a hybrid vehicle, including (1) an internal combustion engine that provides propulsive torque to the wheels of the vehicle, (2) an electric motor that is also capable of providing propulsive torque to the wheels, (3) a battery that provides electrical current to the motor, and (4) a controller, or microprocessor, that determines the vehicle's

[11] Paice does not dispute that Severinsky is prior art against the '634 patent.

mode of operation, i.e., an all-electric mode, an engine-only mode, or a hybrid mode, by controlling the flow of torque between the engine, motor, and wheels of the vehicle. *Compare* Ex. 1003, Fig. 3 (Severinsky), *with* Ex. 1001, Fig. 4 (the ’634 patent).

What Severinsky lacks is the two-motor configuration of claim 1. Pet. 27. For that teaching, Ford relies on the common knowledge of skilled artisans at the time of the claimed invention, as documented by SAE and Field. *Id*. at 18–25, 27–30. Noting that Severinsky discloses only a *single* electric motor that acts as both a generator and a traction motor, Ford points to the automotive industry’s prior history of “two-motor” hybrid designs for increased efficiency in urban city driving as evidence that equipping Severinsky with a separate generator motor in order to perform “simultaneous dual-motor operability” would have been an obvious design modification in the eyes of skilled artisans. *Id*. at 21–25; *see also* Ex. 1005 ¶¶ 168–201 (describing the state-of-the-art of two-motor hybrid architectures).

As further evidence, Ford relies on SAE 1996 and Field as teaching expressly the use of dual electric motors in a hybrid vehicle for purposes of providing simultaneous propulsion and charging functions. *See* Pet. 27–30 (discussing Exs. 1025, 1039). We credit the testimony of Ford’s declarant, Dr. Davis, that a skilled artisan would have known (and been able) to modify the “one motor” hybrid vehicle of Severinsky to add a separate generator motor, either as a matter of design choice or as taught by SAE 1996 and Field, so as to gain the known advantage of increased efficiency and range that two-motor hybrid designs provide in urban city driving. Ex. 1005 ¶¶ 213–220.

In the face of the combined teachings of Severinsky, SAE 1996, and Field, Paice raises a multitude of arguments, which we address in turn. PO Resp. 12–60.

*1. Claims 1 and 1*6

Central to our analysis of claims 1 and 16 are the limitations directed to the "setpoint," or "SP," at which the controller operates the engine to propel the vehicle. Specifically, claim 1 recites that the controller operates the engine "when torque required from the engine to propel the hybrid vehicle . . . is at least equal to a setpoint (SP) above which the torque produced by the engine is efficiently produced." Ex. 1001, 58:22–24. And, claim 16 adds that "when the SP<the RL<the MTO, the engine is operable to provide torque to propel the hybrid vehicle." *Id*. at 59:24–28.

In determining whether to employ the engine or the motor or both, Severinsky teaches that the microprocessor operates the engine only when it is "efficient" to do so, and if not, the motor is used:

> the internal combustion engine is operated *only under the most efficient conditions of output power[[12]] and speed*. When the engine *can be used efficiently* to drive the vehicle forward, e.g. in highway cruising, it is so employed. Under other circumstances, e.g. in traffic, the electric motor alone drives the vehicle forward and the internal combustion engine is used only to charge the batteries as needed.

Ex. 1003, 7:8–16 (emphasis added); *see also id*. at 9:40–52 ("the internal

---

[12] Paice's declarant, Mr. Hannemann, testified that a skilled artisan would have understood that "power is a product of *torque* and speed." Ex. 1039, 32:6–13, 82:10–11 (emphasis added); *see also* Ex. 2002 ("For every engine speed, *there is an associated torque value*. Another way of defining an engine's operating range would be by its output power, which is the engine's speed multiplied by the output *torque*") (emphases added).

combustion engine operates only in its most efficient operating range"). Even more importantly, Severinsky teaches that the point at which the engine operates efficiently is based on a "torque" value, stating that the microprocessor runs the engine "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." *Id*. at 20:63–66 (emphasis added).

Paice does not dispute that Severinsky teaches operating the engine when it is efficient to do so. Rather, emblematic of its response, Paice argues that Severinsky fails to teach a setpoint because "nowhere does Severinsky disclose that road load or any other torque demand is considered when determining *when* to employ the engine or if the road load is in fact above the setpoint when the engine is employed." *Id*. at 21; *see also id*. at 13, 26 n.11, 38, 43 (arguing same). In Paice's view, "Severinsky determines *when* to turn the engine on based on the speed of the vehicle in contrast to the '634 patent, which turns the engine on based on road load." *Id*. at 19. According to Paice, "the Severinsky patent is built on a completely different control strategy where mode transitions are based on speed." *Id*. at 12; *see also id*. at 59 (Severinsky "uses speed as *the one factor* in determining whether to employ the engine") (emphasis added).

We are not persuaded by Paice's isolated reading of Severinsky, while downplaying its teaching as a whole. It is the totality of Severinsky that must be assessed, not its individual parts. Paice would have us believe that "speed" is the *sole* factor used by Severinsky's microprocessor in determining when to employ the engine. That is not the case. Although Severinsky describes the use of "speed" as a factor considered by the microprocessor, Severinsky makes clear that the microprocessor also uses the vehicle's "torque" requirements in determining when to run the engine. Importantly, Severinsky discloses that

> *at all times* the microprocessor 48 may determine the load (if any) to be provided to the engine by the motor, *responsive to the load imposed by the vehicle's propulsion requirements,* so that the engine 40 can be operated in its most fuel efficient operating range.

Ex. 1003, 17:11–15 (emphases added).

Although Severinsky does not use the term "road load" expressly, neither does claim 1. Instead, both Severinsky and claim 1 describe operation of the engine in terms similar to our construction of "road load." For example, just as claim 1 describes the controller as operating the engine in response to "torque required . . . to propel the hybrid vehicle," so too does Severinsky describe its microprocessor as operating the engine in response to "the load imposed by the vehicle's propulsion requirements." *Id*. The similarity of those descriptions provides ample support for finding that Severinsky teaches an engine control strategy that depends on the torque required to propel the vehicle, as called for by claim 1.[13]

Moreover, Severinsky teaches elsewhere that efficient operation of the engine is based on torque, not speed. In particular, Severinsky specifies that the microprocessor runs the engine "only in the near vicinity of its *most*

[13] We also are not persuaded by the testimony of Paice's declarant, Mr. Hannemann, who testifies that this passage in Severinsky relates to "providing torque *to the motor*" and "is not related to determining when to employ the engine." Ex. 2004 ¶ 95. Plainly, this passage relates to operation of *the engine*—it states that the microprocessor determines the load "to be provided *to the engine*" and responds to that load "so that *the engine 40 can be operated* in its most fuel efficient operating range." Ex. 1003, 17:7–15 (emphases added).

efficient operational point, that is, such that it produces 60–90% of its maximum torque whenever operated." *Id*. at 20:63–67 (emphasis added). Severinsky's disclosure of an "operational point" for the engine is no different than the claimed "setpoint." For instance, claim 14, which depends from claim 1, recites that the setpoint is "approximately 30% of the MTO of the engine." Ex. 1001, 59:9–10. Just as the claimed setpoint is expressed in terms of a *percentage of maximum torque*, so too is Severinsky's "operational point," which is described as "60–90% of its maximum torque." That Severinsky describes the engine's operational point in terms similar to, if not the same as, the claimed invention, i.e., a percentage of *maximum torque*, runs counter to Paice's argument that Severinsky employs the engine based on speed alone.

Paice cites a number of passages in Severinsky that purportedly evince a control strategy that is based on speed, as opposed to torque. PO Resp. 19–21, 29–31. We do not find the cited passages supportive of Paice's argument. For example, Paice argues that Ford glosses over Severinsky's disclosure that the engine is turned off during "low speed" or "traffic" situations, and turned on during "moderate speed" or "highway cruising" situations. *Id*. Those disclosures, however, do not foreclose Severinsky from teaching that the engine's torque requirements are a determinative factor of when to employ the engine. In other words, torque and speed are not mutually exclusive concepts.[14] Indeed, the '634 patent itself speaks of "speed" when describing the vehicle's various operating modes, stating that "the traction motor provides torque to propel the vehicle in *low-speed situations*" and "[d]uring substantially steady-state operation,

[14] *See supra* n.12.

e.g., during *highway cruising*, the control system operates the engine." Ex. 1001, 17:47–48, 19:45–46, respectively (emphasis added). Thus, just as "speed" plays a role in the control strategy of the '634 patent, so too does it in Severinsky.

Paice also points to Severinsky's disclosure of "speed-responsive hysteresis" and argues that it depicts a control strategy "based on speed, not road load." PO Resp. 29–30. According to Paice, "[i]t simply makes no sense for Severinsky to use 'speed responsive-hysteresis' if Severinsky uses road load to control engine starts and stops." *Id*. at 30. But Severinsky only discusses the hysteresis feature as "speed-responsive" because it is used to avoid cycling the engine on and off in "low-speed" situations where engine speed dips to "20-25 mph" while in a highway mode. Ex. 1003, 18:23–42. That discussion of low-speed hysteresis is essentially the same as the description of hysteresis in the '634 patent, which discloses that "excessive mode switching otherwise likely to be encountered in suburban traffic can be largely avoided [by] implementing this '*low-speed* hysteresis'." Ex. 1001, 43:67–44:3. In any event, that Severinsky may teach an additional hysteresis feature as a way of controlling unintended engine starts during temporary dips in speed does not preclude Severinsky from also teaching the use of a torque value, or road load, as a way to determine when to employ the engine in the first instance. We find persuasive the testimony of Ford's declarant, Dr. Davis, confirming that "[e]ven if Severinsky '970 was considering speed in this particular situation [of nuisance engine starts], it is generally, if not always, using torque/road load in its mode decisions." Ex. 1038 ¶ 19.

Generally speaking, Paice is attempting to hold Severinsky to a different standard than it holds the claimed invention. That Severinsky may discuss "speed" as one of the parameters used by the microprocessor does not negate its overall, and express, teaching of employing the engine "responsive to the load imposed by the vehicle's propulsion requirements," or road load, "so that the engine [] can be operated in its most fuel efficient operating range." Ex. 1003, 17:11–15. Thus, we reject Paice's arguments that criticize Severinsky's references to "speed," when the '634 patent itself recognizes that "speed" plays a role in a road load-responsive hybrid control strategy.[15]

Paice also faults Severinsky for disclosing that "the microprocessor receives inputs from the driver." PO Resp. 32 n.12. But, once again, Paice fails to recognize that, first, the '634 patent says the same thing, and second, claim 1 does not preclude the controller from receiving inputs from the driver as part of the engine control strategy. Indeed, claim 23, which depends from claim 1, expressly calls for the controller "to receive operator input of a desired cruising speed, and thereafter control instantaneous torque output of the engine." Ex. 1001, 60:7–10. Likewise, the '634 patent describes the controller as receiving operator input commands, stating that the microprocessor is "responsive to . . . evaluation of the road load, that is, the vehicle's instantaneous torque demands *and input commands provided by the operator of the vehicle*." *Id*. at 17:40–44. The '634 patent further explains that the "operator input commands" monitored by the

[15] Even claim 12 of the '634 patent acknowledges that "the controller is operable to vary the SP as a function of speed of the engine." Ex. 1001, 59:3–5.

microprocessor include the position of the accelerator and brake pedals. *Id*. at 27:26–38. Given that the ’634 patent itself, including the claims, call for the microprocessor to be responsive not only to the vehicle’s torque demands but also to the operator’s input commands (such as pedal position), we are not persuaded by Paice’s attack on Severinsky for teaching a microprocessor control strategy that relies on these same factors.

As another purported difference, Paice argues that Severinsky’s disclosure of “potential *output* torques of the engine” is “unrelated to input torque demands taught by the ’634 patent, for example, the instantaneous torque required to propel the vehicle (i.e., road load).” PO Resp. 15. In other words, Paice takes issue with Severinsky’s expression of road load in terms of torque output. This argument fails for the simple reason that, like Severinsky, the claims themselves express “road load” as a torque *output*, not an input. As already discussed above, claim 16 states that road load is expressed in terms of maximum torque *output*—“both the RL and the SP are expressed as percentages of the MTO of the engine.” Ex. 1001, 59:15–19. Thus, we find disingenuous Paice’s attempt to characterize “road load” as a torque “input” when the claims expressly state otherwise.

In the end, we are not persuaded by Paice’s argument that Severinsky does not teach the “setpoint” required by the claims. PO Resp. 39–44, 53–54, 58. Rather, we credit the testimony of Ford’s declarant, Dr. Davis, that a skilled artisan would have understood the lower limit of Severinsky’s range—60% of MTO—to be a predetermined setpoint that is based on torque. *See* Pet. 21 (citing Ex. 1005 ¶¶ 201–204, 279); *see also* Ex. 1005 ¶¶ 311, 398–402. Indeed, Paice admits that Severinsky’s “60% of MTO is a torque value,” but argues it is not a setpoint because there is no evidence that a transition between operating modes occurs at this torque value. PO Resp. 58. That argument, however, is premised on an improper construction of setpoint, a construction that we hold does not require a transition between operating modes. *See supra* (section III.A.2.). Thus, we find that Severinsky fulfills the claim requirement of operating the engine when the torque required to propel the vehicle is equal to a setpoint (SP) that is substantially lower than the engine's maximum torque output (MTO).

2. Claim 18

Paice also argues that Severinsky does not utilize the engine to charge the battery in the manner required by claim 18. PO Resp. 58–60. According to Paice, Severinsky "teaches a much less sophisticated approach to determining when to use the excess power from the engine to charge the battery" (*id*. at 38) that "does not consider road load," but instead looks to "the battery state of charge" (*id*. at 58–59). But the problem with that argument is that the claimed invention recites the same approach as Severinsky—using both the "state of charge of the battery" and road load to indicate when charging is necessary. Specifically, claim 18 recites that the engine is employed to recharge the battery "when the RL<the SP *and a state of charge of the battery is below a predetermined level*." Ex. 1001, 59:40–43 (emphasis added). Like claim 18, Severinsky explains that

> microprocessor 48 monitors the state of charge of batteries 22 . . . and recharges the batteries whenever the charge is depleted by more than about 10-20%. . . . Under conditions of maximum battery usage, e.g., in heavy traffic . . . internal combustion engine 40 charges the battery perhaps once per hour for a period of approximately twelve minutes.

Id. at 18:9–22. Given these plain teachings, we find that a skilled artisan would have understood Severinsky to disclose the "battery charging mode" of claim 18, which, like Severinsky, relies on the battery's "state of charge" as one of the factors in determining when to use the engine for recharging the battery.

As for Ford's combination of Severinsky with SAE and Field, Paice argues that "SAE 1996 teaches away from operating the engine efficiently during this battery charging mode such that a POSITA would not combine these references to arrive at claim 18." PO Resp. 60. But Paice's argument is premised, incorrectly so, on the exact motor in SAE 1996, i.e., a 6kW motor, being incorporated into Severinsky. That premise, however, is not the basis of Ford's combination. Rather, Ford relies on SAE 1996 for the simple teaching of modifying Severinsky to include the functionality of a two-motor series-parallel hybrid. *See* Pet. 27–30. Ford does not argue for modifying Severinsky to use the exact motor described in SAE 1996. *Id*. To the contrary, a skilled artisan would have understood that motors of various sizes and types would have been used to modify the hybrid vehicle disclosed in Severinsky. Ex. 1044 ¶¶ 31–32. The type and size of motor used would depend on the particular needs of the hybrid system, including the size needed to ensure that the engine would function in its efficient range of 60–90% of MTO. *Id.* Accordingly, Paice's argument that the 6kW motor disclosed in SAE 1996 teaches away from the proposed modification of the vehicle described in Severinsky is misplaced.

3. Claims 14 and 24

Paice does not argue dependent claims 14 and 24 separately from claim 1. We have considered the evidence and arguments presented by Ford in challenging the patentability of claims 14 and 24. Pet. 36–37, 48–49. We determine that a preponderance of the evidence weighs against patentability of claims 14 and 24 on the basis that, like claims 1, 16, and 18, they would have been obvious over the combined teachings of Severinsky, SAE 1996, and Field.

IV. CONCLUSION

In sum, after considering the parties' arguments and evidence, we conclude that Ford has demonstrated, by a preponderance of the evidence, that claims 1, 14, 16, 18, and 24 would have been obvious over the combined teachings of Severinsky, SAE 1996, and Field.

V. ORDER

Accordingly, it is hereby:

ORDERED that claims 1, 14, 16, 18, and 24 of the '634 patent are held unpatentable;

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

FOR PETITIONER:

Frank A. Angileri
John E. Nemazi
John P. Rondini
Erin K. Bowles
BROOKS KUSHMAN P.C.
FPGP010IPR1@brookskushman.com
jrondini@brookskushman.com

Lissi Mojica
Kevin Greenleaf
DENTONS US LLP
lissi.mojica@dentons.com
kevin.greenleaf@dentons.com
iptdocketchi@dentons.com

FOR PATENT OWNER:

Ruffin B. Cordell
Timothy W. Riffe
Kevin E. Greene
Linda L. Kordziel
Brian J. Livedalen
FISH & RICHARDSON P.C.
rbc@fr.com
riffe@fr.com
greene@fr.com
IPR36351-0015IP1@fr.com