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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner,

v.

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

Case IPR2014-01416
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

Paice LLC and The Abell Foundation, Inc. (collectively, "Paice") are the owners of U.S. Patent No. 7,237,634 B2 ("the '634 patent"). Ford Motor Company ("Ford") filed a Petition ("Pet.") for *inter partes* review of the '634 patent, challenging the patentability of claims 80, 93, 98, 99, 102, 109, 114, 127, 131, 132, 135, 139, 142, 161, 215, 228, 232, 233, and 235–237 under 35 U.S.C. § 103. In a preliminary proceeding, we instituted trial because Ford demonstrated a reasonable likelihood that it would prevail in proving unpatentability of the challenged claims. Once trial was instituted, Paice filed a Patent Owner Response ("PO Resp."), and Ford followed with a Reply ("Reply"). The parties waived oral argument, choosing instead to rely on arguments presented during a prior, consolidated hearing conducted in several related proceedings, namely, IPR2014-000570, -00571, -00579, -00875, -00884, and -00904.[1] Pursuant to our jurisdiction under 35 U.S.C. § 6(c), we conclude that Ford has proven, by a preponderance of the evidence, that the challenged claims are unpatentable.

II. BACKGROUND

A. Related Cases

The '634 patent was previously the subject of a final written decision in IPR2014-00904. That prior proceeding, however, involved different claims and grounds than the instant proceeding. Specifically, the -00904 proceeding resulted in a final determination that claims 1, 14, 16, 18, and 24 of the '634 patent are unpatentable under 35 U.S.C. § 103. 2015 WL 8536745 (PTAB Dec. 10, 2015). We granted institution of trial in the

[1] Transcripts have been entered into the record in those earlier proceedings.

instant proceeding in March 2015, well before our final written decision in the -00904 proceeding.

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. 1–2; PO Resp. 3 (referencing the district courts’ claim constructions).

B. The ’634 Patent

The ’634 patent describes a hybrid vehicle with an internal combustion engine, an electric motor, and a battery bank, all controlled by a microprocessor that controls the direction of torque transfer between the engine, motor, and drive wheels of the vehicle. Ex. 1101, 17:17–56, Fig. 4. The microprocessor monitors the vehicle’s instantaneous torque requirements, also known as “road load (RL),” to determine whether the engine, the electric motor, or both, will be used as a source to propel to propel the vehicle. *Id*. at 11:63–65. Aptly, the ’634 patent describes the vehicle’s various modes of operation in terms of an engine-only mode, an all-electric mode, or a hybrid mode. *Id*. at 35:63–36:55, 37:24–38:8.

As summarized in the ’634 patent, 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.”[2] *Id*. at 17:40–45. “[T]he microprocessor can effectively determine the road load by monitoring the

[2] 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. 1101, 13:39–42.

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 (SP)" and uses the results of the comparison to determine the vehicle's mode of operation. *Id*. at 40:16–49. The microprocessor utilizes a hybrid control strategy that runs the engine only in a range of high fuel efficiency, such as when the torque required to drive the vehicle, or road load (RL), reaches a setpoint (SP) of approximately 30% of the engine's maximum torque output (MTO). *Id*. at 20:61–67, 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"). Other operating parameters may also play a role in the microprocessor's choice of 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, a microprocessor control strategy that operates the engine in a range above the setpoint (SP), but substantially less than the maximum

torque output (MTO), maximizes fuel efficiency and reduces pollutant emissions of the hybrid vehicle. *Id*. at 15:55–58.

B. The Challenged Claims

Of the challenged claims, claims 80, 114, 161, and 215 are independent. Claim 161 is illustrative:

> 161. A method for controlling a hybrid vehicle, comprising:
>
> determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;
>
> wherein the hybrid vehicle is operated in *a plurality of operating modes corresponding to values for the RL and a setpoint (SP)*;
>
> *operating at least one first electric motor* to propel the hybrid vehicle when the RL required to do so is less than the SP;
>
> wherein said operating the at least one first electric motor to drive the hybrid vehicle composes *a low-load operation mode I*;
>
> *operating an internal combustion engine of the hybrid vehicle to propel the hybrid vehicle when the RL required to do so is between the SP and a maximum torque output (MTO) of the engine, wherein the engine is operable to efficiently produce torque above the SP, and wherein the SP is substantially less than the MTO*;
>
> wherein said operating the internal combustion engine of the hybrid vehicle to propel the hybrid vehicle composes *a high-way cruising operation mode IV*;
>
> *operating both the at least one first electric motor and the engine* to propel the hybrid vehicle when the torque RL required to do so is more than the MTO;
>
> wherein said operating both the at least one first electric motor and the engine to propel the hybrid vehicle composes *an acceleration operation mode V*;

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