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Paper 28
Entered: October 21, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY,
Petitioner,

v.

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

Case IPR2015-00801
Patent 7,237,634 B2

Before JAMESON LEE, SALLY C. MEDLEY, and
CARL M. DEFRANCO, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Ford Motor Company ("Petitioner") filed a Petition (Paper 1, "Pet.") for *inter partes* review of U.S. Patent No. 7,237,634 B2 ("the '634 patent"). Paper 1. The Petition challenges the patentability of claims 80, 111, 114, 144, 241, 264, 266, 267, 278–280, and 282–291 of the '634 patent. In an Initial Decision, we instituted *inter partes* review of each of these claims, except for claims 80 and 114. Paper 12 ("Dec. Inst.").

Paice LLC and The Abell Foundation, Inc. ("Patent Owner") filed a Patent Owner Response (Paper 15), and Petitioner filed a Reply (Paper 17). Oral hearing was held on June 29, 2016. A transcript of the oral hearing is included in the record. Paper 27 ("Tr."). Neither party filed a motion to exclude evidence. In addition, Patent Owner filed a Motion for Observation on Cross-Examination (Paper 21) and Petitioner filed a Response to Motion for Observation on Cross-Examination (Paper 23). Both submissions have been considered.

For reasons discussed below, we determine that Petitioner has shown by a preponderance of the evidence that each of claims 111, 144, 241, 264, 266, 267, 278–280, and 282–291 is unpatentable.

B. Related Matters

Petitioner and Patent Owner collectively identify the following civil actions in which the '634 patent has been asserted: (1) *Paice LLC et al. v. Ford Motor Company*, Case No. 1-14-cv-00492 (D. Md.); (2) *Paice LLC et al. v. Hyundai Motor America, et al.*, Case No. 1:2012-cv-00499 (D. Md.).

Papers 1, 5. The '634 patent also is the patent involved in the following *inter partes* review proceedings: IPR2014-00904, IPR2014-01416, IPR2015-00606, IPR2015-00722, IPR2015-00758, IPR2015-00784, IPR2015-00787, IPR2015-00790, IPR2015-00791, IPR2015-00799, IPR2015-00785, and IPR2015-00800.

C. The '634 Patent

The '634 patent describes a hybrid vehicle with an internal combustion engine, at least one electric motor, and a battery bank, all controlled by a microprocessor that directs torque transfer between the engine, the motor, and the drive wheels of the vehicle. Ex. 1851, 17:17–56, Fig. 4. The microprocessor compares the vehicle's torque requirements and the engine's torque output against a predefined setpoint and uses the results of the comparison to control the vehicle's mode of operation, e.g., straight-electric, engine-only, or hybrid. *Id*. at 40:16–49. The microprocessor utilizes a hybrid control strategy that operates the engine only in a range of high fuel efficiency, which occurs when the instantaneous torque required to drive the vehicle, or road load (RL), reaches a setpoint (SP) of approximately 30% of the engine's maximum torque output (MTO). *Id*. at 20:61–67; *see also id*. at 13:64–65 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently"). Operating the engine in a range above the setpoint but substantially less than the maximum torque output maximizes fuel efficiency and reduces pollutant emissions of the vehicle. *Id*. at 15:55–58.

Independent claims 80, 241, and 267 are illustrative and are reproduced below:

> 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;
>
> operating at least one electric motor to propel the hybrid vehicle when the RL required to do so is less than a setpoint (SP);
>
> operating an internal combustion engine of the hybrid vehicle to propel the hybrid vehicle when the RL required to do so is between the SP and a maximum torque output (MTO) of the engine, wherein the engine is operable to efficiently produce torque above the SP, and wherein the SP is substantially less than the MTO; and
>
> 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.

Id. at 65:11–33.

> 241. A method for controlling a hybrid vehicle, comprising:
>
> determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;
>
> operating at least one electric motor to propel the hybrid vehicle when the RL required to do so is less than a setpoint (SP);
>
> operating an internal combustion engine of the hybrid vehicle to propel the hybrid vehicle when the RL required to do so is between the SP and a maximum torque output (MTO) of the

engine, wherein the engine is operable to efficiently produce torque above the SP, and wherein the SP is substantially less than the MTO; and

operating both the at least one electric motor and the engine to propel the hybrid vehicle when the torque RL required to do so is more than the MTO;

controlling said engine such that combustion of fuel within the engine occurs substantially at a stoichiometric ratio, wherein said controlling the engine comprises limiting a rate of change of torque output of the engine; and

if the engine is incapable of supplying instantaneous torque required to propel the hybrid vehicle, supplying additional torque from the at least one electric motor.

Id. at 81:33–58.

267. A method for controlling a hybrid vehicle, comprising:

determining instantaneous road load (RL) required to propel the hybrid vehicle responsive to an operator command;

operating at least one electric motor to propel the hybrid vehicle when the RL required to do so is less than a setpoint (SP);

operating an internal combustion engine of the hybrid vehicle to propel the hybrid vehicle when the RL required to do so is between the SP and a maximum torque output (MTO) of the engine, wherein the engine is operable to efficiently produce torque above the SP, and wherein the SP is substantially less than the MTO; and

operating both the at least one electric motor and the engine to propel the hybrid vehicle when the torque RL required to do so is more than the MTO; and

rotating the engine before starting the engine such that its cylinders are heated by compression of air therein.

Id. at 83:60 to 84:11.

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