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Paper 34
Entered November 4, 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 IPR2015-00790
Patent 7,237,634 B2

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

DESHPANDE, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Ford Motor Company ("Petitioner") filed a Petition requesting an *inter partes* review of claims 4, 13–15, 25, 28, 29, 32, 67, and 79 of U.S. Patent No. 7,237,634 B2 (Ex. 1650, "the '634 patent"). Paper 1 ("Pet."). Paice LLC and The Abell Foundation, Inc. (collectively, "Patent Owner") filed a Preliminary Response in unredacted and redacted forms. Papers 10, 11 ("Prelim. Resp."). Patent Owner also filed a Motion to Seal. Paper 12 ("Motion to Seal").

Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review of the '634 patent, on November 9, 2015, under 35 U.S.C. § 103(a), as to claims 4 and 28 as obvious over Ibaraki '882,[1] Yamaguchi,[2] and the general knowledge of a person with ordinary skill in the art; claims 13–15 as obvious over Ibaraki '882, Masding/Bumby 1988,[3] and Admitted Prior Art (APA); claim 25 as obvious over Ibaraki '882 and Kawakatsu;[4] claim 29 as

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[1] U.S. Patent No. 5,789,882, issued Aug. 4, 1998 (Ex. 1652) ("Ibaraki '882").

[2] U.S. Patent No. 5,865,263, issued Feb. 2, 1999 (Ex. 1653) ("Yamaguchi").

[3] P.W. Masding, J.R. Bumby, and N. Herron, *A Microprocessor Controlled Gearbox for Use in Electric and Hybrid-Electric Vehicles*, TRANSACTIONS OF THE INSTITUTE OF MEASUREMENT AND CONTROL (1988) (Ex. 1654) ("Masding/Bumby 1988").

[4] U.S. Patent No. 4,335,429, issued June 15, 1982 (Ex. 1655) ("Kawakatsu").

obvious over Ibaraki '882 and Vittone;[5] claim 32 as obvious over Ibaraki '882 and Ibaraki '626;[6] and claims 67 and 79 as obvious over Ibaraki '882 and Suga.[7] Paper 13 ("Dec.").

Patent Owner filed a Response (Paper 18, "PO Resp."), and Petitioner filed a Reply (Paper 24, "Pet. Reply").[8] Oral hearing was held on June 28, 2016, and the hearing transcript has been entered in the record. Paper 33 ("Tr.").

The Board has jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Pursuant to our jurisdiction under 35 U.S.C. § 6, we conclude, *first*, that Petitioner is estopped from maintaining its challenge in this proceeding against claim 14. For the reasons discussed below, we are persuaded that Petitioner has shown by a preponderance of the evidence that claims 4, 13, 15, 25, 28, 29, 32, 67, and 79 of the '634 patent are unpatentable.

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[5] Oreste Vittone, *Fiat Conceptual Approach to Hybrid Cars Design*, 12TH INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM (1994) (Ex. 1656) ("Vittone").

[6] U.S. Patent No. 6,003,626, issued Dec. 21, 1999 (Ex. 1657) ("Ibaraki '626").

[7] U.S. Patent No. 5,623,104, issued Apr. 22, 1997 (Ex. 1658) ("Suga").

[8] In addition, Patent Owner filed a Motion for Observation on Cross-Examination (Paper 26) and Petitioner filed a Response to Motion for Observation on Cross-Examination (Paper 29), both of which have been considered.

B. Related Proceedings

The '634 patent is involved in *Paice LLC v. Ford Motor Co.*, No. 1-14-cv-00492, filed on February 19, 2014, in the United States District Court for the District of Maryland. Pet. 2. Petitioner twice filed an earlier Petition for *inter partes* review of the '634 patent, and we instituted trial in both proceedings and subsequently entered final written decisions. *Ford Motor Co. v. Paice LLC & The Abell Foundation, Inc.*, Case IPR2014-00904 (Papers 13 and 41), and *Ford Motor Co. v. Paice LLC & The Abell Foundation*, Inc., Case IPR2014-01416 (Papers 9 and 26). The '634 patent also is involved in the following *inter partes* review proceedings: IPR2015-00606, IPR2015-00722, IPR2015-00758, IPR2015-00784, IPR2015-00785, IPR2015-00787, IPR2015-00791, IPR2015-00799, IPR2015-00800, and IPR2015-00801.

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. 1650, 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.

D. Illustrative Claim

Petitioner challenges claims 4, 13–15, 25, 28, 29, 32, 67, and 79 of the '634 patent. Pet. 3–59. Although not challenged, claim 1, from which all challenged claims depend, is illustrative of the claims at issue and is reproduced below:

> 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

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