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Paper 31
Entered: November 1, 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 IPR2015-00794
Patent 7,104,347 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 23–30, 32, and 39–41 of U.S. Patent No. 7,104,347 B2 (Ex. 1401, "the '347 patent"). Paper 1 ("Pet."). Paice LLC and The Abell Foundation, Inc. (collectively, "Patent Owner") filed a Preliminary Response in unredacted and redacted forms. Papers 9, 10 ("Prelim. Resp."). Patent Owner also filed a Motion to Seal. Paper 11 ("Motion to Seal").

Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review of the '347 patent, on November 2, 2015, under 35 U.S.C. § 103(a), as to claims 23, 28, 30, and 32 as obvious over Ibaraki '882;[1] claim 29 as obvious over Ibaraki '882 and Admitted Prior Art ("APA");[2] claim 39 as obvious over Ibaraki '882 and Vittone;[3] claim 40 as obvious over Ibaraki '882 and Yamaguchi;[4] claim 41 as obvious over Ibaraki '882 and Ibaraki '626;[5] claim

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[1] U.S. Patent No. 5,789,882, issued Aug. 4, 1998 (Ex. 1403) ("Ibaraki '882").

[2] Petitioner relies on Figures 1 and 2 of the '347 patent, reproduced from the '970 patent, and the Masding/Bumby disclosures from the '634 patent (Ex. 1433).

[3] Oreste Vittone, *Fiat Conceptual Approach to Hybrid Cars Design*, 12TH INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM (1994) (Ex. 1420) ("Vittone").

[4] U.S. Patent No. 5,865,263, issued Feb. 2, 1999 (Ex. 1421) ("Yamaguchi").

[5] U.S. Patent No. 6,003,626, issued Dec. 21, 1999 (Ex. 1422) ("Ibaraki '626").

27 as obvious over Ibaraki '882 and Lateur;[6] and claims 25 and 26 as obvious over Ibaraki '882 and Frank.[7] Paper 12 ("Dec."). We did not institute *inter partes* review of claim 24 as obvious over Ibaraki '882. Dec. 20–21.

Patent Owner filed a Response (Paper 16, "PO Resp."), and Petitioner filed a Reply (Paper 22, "Pet. Reply").[8] Oral hearing was held on June 28, 2016, and the hearing transcript has been entered in the record. Paper 30 ("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 23. For the reasons discussed below, we are persuaded that Petitioner has shown by a preponderance of the evidence that claims 25–30, 32, and 39–41 of the '347 patent are unpatentable.

B. Related Proceedings

Petitioner indicates that the '347 patent is the subject of *Paice, LLC and The Abell Foundation, Inc. v. Ford Motor Company*, Case No. 1-14-cv-00492 and *Paice LLC and The Abell Foundation, Inc. v. Hyundai Motor America et. al.*, Case No. 1:2012-cv-00499. Pet. 1; Paper 5, 2. Petitioner

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[6] U.S. Patent No. 5,823,280, issued Oct. 20, 1998 (Ex. 1407) ("Lateur").

[7] U.S. Patent No. 6,116,363, issued Sept. 12, 2000 (Ex. 1418) ("Frank").

[8] In addition, Patent Owner filed a Motion for Observation on Cross-Examination (Paper 23) and Petitioner filed a Response to Motion for Observation on Cross-Examination (Paper 26), both of which have been considered.

also indicates that the '347 patent was the subject of IPR2014-00571, IPR2014-00579, and IPR2014-00884, in which final decisions have been issued. *Id.*; Paper 5, 3. Petitioner further indicates that patents related to the '347 patent are the subject matter of IPR2014-00570, IPR2014-01415, IPR2014-00568, IPR2014-00852, IPR2014-00875, IPR2014-00904, IPR2014-01416, IPR2015-00606, IPR2015-00767, IPR2015-00722, IPR2015-00758, IPR2015-00784, IPR2015-00785, IPR2015-00791, IPR2015-00787, IPR2015-00790, IPR2015-00795, and IPR2015-00792. *Id.* at 1–2; Paper 5, 3.

C. The '347 Patent

The '347 patent describes a hybrid vehicle with an internal combustion engine, two electric motors (a starter motor and a traction motor), and a battery bank, all controlled by a microprocessor that directs the transfer of torque from the engine and traction motor to the drive wheels of the vehicle. Ex. 1401, 17:5–45, Fig. 4. The microprocessor features a control strategy that runs the engine only under conditions of high efficiency, typically when the vehicle's instantaneous torque requirements (i.e., the amount of torque required to propel the vehicle, or "road load") are at least equal to 30% of the engine's maximum torque output ("MTO") capability. *Id.* at 20:52–60, 35:5–14; *see also id.* at 13:47–61 ("the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently").

Running the engine only when it is efficient to do so leads to improved fuel economy and reduced emissions. *Id.* at 13:47–52. To achieve such efficiency, the hybrid vehicle includes various operating modes that depend on the vehicle's torque requirements, the battery's state of charge,

and other operating parameters. *Id*. at 19:53–55. For example, the hybrid vehicle may operate in: (1) an all-electric mode, where only the traction motor provides the torque to propel the vehicle and operation of the engine would be inefficient (i.e., stop-and-go city driving); (2) an engine-only mode, where only the engine provides the torque to propel the vehicle and the engine would run at an efficient level (i.e., highway cruising); (3) a dual-operation mode, where the traction motor provides additional torque to propel the vehicle beyond that already provided by the engine and the torque required to propel the vehicle exceeds the maximum torque output of the engine (i.e., while accelerating, passing, and climbing hills); and (4) a battery recharge mode where the engine operates a generator to recharge the battery while the traction motor drives the vehicle. *Id*. at 35:66–36:58, 37:26–38:55.

D. Illustrative Claim

Petitioner challenges claims 23, 25–30, 32, and 39–41 of the '347 patent. Pet. 4–60. Claim 23 is illustrative of the claims at issue and is reproduced below:

> 23. A method of control of a hybrid vehicle, said vehicle comprising an internal combustion engine capable of efficiently producing torque at loads between a lower level SP and a maximum torque output MTO, a battery, and one or more electric motors being capable of providing output torque responsive to supplied current, and of generating electrical current responsive to applied torque, said engine being controllably connected to wheels of said vehicle for applying propulsive torque thereto and to said at least one motor for applying torque thereto, said method comprising the steps of:
>
> determining the instantaneous torque RL required to propel said vehicle responsive to an operator command;
>
> monitoring the state of charge of said battery;

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