

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 IPR2015-00758
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 & 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 for *inter partes* review of the ’634 patent, challenging the patentability of claims 80–90, 114–124, 161–171, 215–225, and 294 under 35 U.S.C. § 103. Paper 1 (“Pet.”). In a preliminary proceeding, we instituted an *inter partes* review because Ford made a threshold showing of a “reasonable likelihood” that the challenged claims are unpatentable under 35 U.S.C. § 314. Paper 12 (“Dec.”).

Subsequent to institution, Paice filed a Patent Owner Response (Paper 16, “PO Resp.”), and Ford followed with a Reply (Paper 18, “Reply”). An oral hearing was held on June 28, 2016, and a transcript of the hearing is included in the record. Paper 27 (“Tr.”). After reviewing the evidence and arguments of the parties, and pursuant to our jurisdiction under 35 U.S.C. § 6, we conclude, *first*, that Ford is estopped from maintaining its challenge in this proceeding against claims 80, 114, 161, and 215, and, *second*, that Ford has proven, by a preponderance of the evidence, that remaining claims 81–90, 115–124, 162–171, 216–225, and 294 are unpatentable.

II. BACKGROUND

A. *Related Cases*

The ’634 patent, which includes over 300 claims, has previously been before us, having been the subject of multiple petitions filed by Ford for *inter partes* review (“IPR”). Aside from this case, the IPRs on which we have instituted trial include IPRs 2014-00904, 2014-1416, 2015-00606, 2015-00722, 2015-00784, 2015-00785, 2015-00787, 2015-00790, 2015-00791, 2015-00799, 2015-00800, and 2015-00801. And, with our decision

today, we have rendered final decisions in all of these IPRs, many of which include some overlap in terms of claims challenged or prior art asserted or both. Indeed, four of the five independent claims challenged here—claims 80, 114, 161, and 215—were adjudicated previously in IPR2014-01416 (Paper 29) on grounds identical to those asserted here. *See Ford Motor Co. v. Paice LLC*, 2016 WL 932948 (PTAB Mar. 10, 2016).¹

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. 2.

B. 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 the transfer of torque between the engine, the motor, and the drive wheels of the vehicle. Ex. 1201, 17:17–56, Fig. 4. The microprocessor determines whether to operate the engine, the motor, or both, in response to “road load,” that is, the instantaneous torque required to drive the vehicle. *Id.* at 12:42–46. The microprocessor “can effectively determine the road load by monitoring the response of the vehicle to the operator’s command for more power.”² *Id.* at 37:42–49. The operator commands include “the rate at which the operator depresses [accelerator and

¹ The Final Decision in the -1416 IPR is currently on appeal at the U.S. Court of Appeals for the Federal Circuit.

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. 1201, 13:39–42.

brake] pedals 69 and 70 as well as the degree to which [they] are depressed.” *Id.* at 27:26–38, Figs. 3, 4. The microprocessor uses information from the operator commands “as an indication that an amount of torque . . . will shortly be required.” *Id.* at 27:41–57.

The microprocessor then compares the vehicle’s torque requirements against a predefined “setpoint,” or “SP,” and uses the results of the comparison to determine 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”). In other words, when the road load is above 30% of the engine’s maximum torque output, the vehicle operates in an engine-alone mode. *Id.* at 37:42–44. When the road load is below 30% of the engine’s maximum torque, the vehicle operates in a straight-electric mode. *Id.* at 37:24–28. Operating the engine in a range above the setpoint but below the engine’s maximum torque output maximizes fuel efficiency and reduces pollutant emissions of the vehicle. *Id.* at 15:55–58.

C. The Challenged Claims

Of the challenged claims, five are independent—claims 80, 114, 161, 215, and 294. Common to the independent claims, except for claim 294, is a hybrid control strategy that compares “road load” of the vehicle to a

“setpoint” in order to determine when to operate the engine and motor.³ The challenged claims depending from these base claims combine that hybrid control strategy with additional limitations requiring that energy supplied from the battery to the motor be at a specific “maximum DC voltage” and a specific “maximum current.” For instance, a first set of dependent claims relates to maximum voltage supplied from the battery: “the maximum DC voltage is at least approximately 500 volts” (the “maximum voltage” limitations). A second set of claims relates to maximum current, requiring that it be “less than approximately 150 amperes” (the “maximum current” limitations). And a third set of claims requires that “a ratio of maximum DC voltage to maximum current supplied is at least 2.5” (the “ratio” claims). Claim 294, the other independent claim under challenge, requires that the maximum current be “no more than about 75 amperes.”

Independent claim 80 and dependent claims 81 through 83 are illustrative of the claims being challenged:

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

³ Claim 294 does not recite a “setpoint,” but does utilize a hybrid control strategy that is responsive to “road load” for determining when to operate the engine and motor.

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