

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 IPR2014-00875
Patent 7,559,388 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 1–4, 6, 12, and 19 of U.S. Patent No. 7,559,388 B2 (Ex. 1001; “the ’388 patent”). Paper 2 (“Pet.”). Paice LLC & The Abell Foundation, Inc. (collectively, “Patent Owner”) filed a Preliminary Response. Paper 8 (“Prelim. Resp.”).¹ Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review of the ’388 patent, on December 11, 2014, under 35 U.S.C. § 103(a), as to claims 1, 3, and 19 as obvious over Ehsani² and Vittone,³ claim 2 as obvious over Ehsani, Vittone, and Caraceni,⁴ claim 6 as obvious over Ehsani, Vittone, and Fjällström,⁵ claim 12 as obvious over Ehsani, Vittone, and Yamaguchi,⁶ and claims 1, 3, 4, and 19 as obvious over Kawakatsu⁷ and Vittone. Paper 11 (“Dec.”).

Patent Owner filed a Response (Paper 19, “PO Resp.”), and Petitioner filed a Reply (Paper 22, “Pet. Reply”). Patent Owner filed a Motion to Seal

¹ Patent Owner filed both redacted and unredacted versions of its Preliminary Response. Papers 7, 8. Our Decision cites to the redacted version, i.e., Paper 8, which is marked “Public.”

² U.S. Patent No. 5,586,613, issued Dec. 24, 1996 (Ex. 1003) (“Ehsani”).

³ Oreste Vittone, *Fiat’s Conceptual Approach to Hybrid Car Design*, 12TH INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM (1994) (Ex. 1005) (“Vittone”).

⁴ A. Caraceni et al., *Hybrid Power Unit Development for Fiat Multipla Vehicle*, SAE 981124 (1998) (Ex. 1006) (“Caraceni”).

⁵ U.S. Patent No. 5,120,282, issued June 9, 1992 (Ex. 1007) (“Fjällström”).

⁶ U.S. Patent No. 5,865,263, issued Feb. 2, 1999 (Ex. 1008) (“Yamaguchi”).

⁷ U.S. Patent No. 4,335,429, issued June 15, 1982 (Ex. 1004) (“Kawakatsu”).

(Paper 9, “Mot.”). Oral hearing was held on July 1, 2015, and the hearing transcript has been entered in the record. Paper 35 (“Tr.”).

The Board has jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, we are persuaded that Petitioner has shown by a preponderance of the evidence that claims 1–4, 6, 12, and 19 of the ’388 patent are unpatentable.

B. Related Proceedings

Petitioner indicates that the ’388 patent is the subject of the proceedings in *Paice, LLC v. Ford Motor Co.*, No. 1:14-cv-00492 (D. Md.) and *Paice LLC v. Hyundai Motor America*, No. 1:2012-cv-00499 (D. Md.). Pet. 1–2.

Additionally, Petitioner indicates that this Petition is related to IPR2014-00568, IPR2014-00570, IPR2014-00571, IPR2014-00579, IPR2014-00852, IPR2014-00884, IPR2014-00904, IPR2014-01415, and IPR2014-01416. Pet. 2; Paper 10, 1.

C. The ’388 Patent

The ’388 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 torque transfer between the engine, the motors, and the drive wheels of the vehicle. Ex. 1001, 17:7–47, Fig. 4. The hybrid vehicle features a hybrid control strategy that runs the engine only under conditions of high efficiency, typically when the vehicle’s instantaneous torque demand (i.e., the amount of torque required to propel the vehicle at a desired speed) is at least equal to 30% of the engine’s maximum torque output (“MTO”). *Id.* at

20:28–35, 35:5–14; *see also id.* at 13:44–46 (“the engine is never operated at less than 30% of MTO, and is thus never operated inefficiently”).

Running the engine only under efficient operating conditions leads to improved fuel economy and reduced emissions. *Id.* at 13:35–37. To achieve such efficiency, the hybrid vehicle includes different operating modes that depend on the vehicle’s instantaneous torque demand, the battery’s state of charge, and other operating parameters. *Id.* at 19:31–33. For example, the hybrid vehicle operates in: (1) an all-electric mode, where only the traction motor provides the torque to propel the vehicle, whenever 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, whenever the engine can run at an efficient level (i.e., highway cruising); (3) a hybrid mode, where the traction motor provides additional torque to propel the vehicle beyond that already provided by the engine, whenever the instantaneous torque demand 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 35:6–64.

D. Illustrative Claim

Petitioner challenges claims 1–4, 6, 12, and 19 of the ’388 patent. Pet. 15–60. Claim 1 is illustrative of the claims at issue and is reproduced below:

1. A hybrid vehicle, comprising:
 - at least two wheels, operable to receive power to propel said hybrid vehicle;
 - a first alternating current (AC) electric motor, operable to provide power to said at least two wheels to propel said hybrid vehicle;
 - a second AC electric motor;

an engine coupled to said second electric motor, operable to provide power to said at least two wheels to propel the hybrid vehicle, and/or to said second electric motor to drive the second electric motor to generate electric power;

a first alternating current-direct current (AC-DC) converter having an AC side coupled to said first electric motor, operable to accept AC or DC current and convert the current to DC or AC current respectively;

a second AC-DC converter coupled to said second electric motor, at least operable to accept AC current and convert the current to DC;

an electrical storage device operable to store energy converted to DC by said AC-DC converters and to provide energy to be converted to AC by at least said first AC-DC converter to power at least said first electric motor; and

a controller;

wherein a rate of change of torque output of said engine is limited to a threshold value, wherein when a rate of change of road load exceeds said threshold value of the rate of change of torque output of the engine, said controller is operable to operate said first motor and/or said second motor to supply additional power to at least said two wheels to supply remaining required torque.

Ex. 1001, 56:42–57:5.

E. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278–80 (Fed. Cir. 2015) (“Congress implicitly approved the broadest reasonable interpretation standard in enacting the AIA,” and “the standard was properly adopted by PTO regulation.”). Under the broadest reasonable interpretation standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary

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