

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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FORD MOTOR CO.,  
Petitioner,

v.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,  
Patent Owner.

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IPR2019-01402  
Patent 10,138,826 B2

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Before KEN B. BARRETT, LYNNE H. BROWNE, and  
JAMES J. MAYBERRY, *Administrative Patent Judges*.

MAYBERRY, *Administrative Patent Judge*.

JUDGMENT  
Final Written Decision  
Determining All Challenged Claims Unpatentable  
*35 U.S.C. § 318(a)*  
ORDER  
Dismissing Patent Owner's Motion to Exclude  
*37 C.F.R. § 42.64*

## I. INTRODUCTION

### A. *Background and Summary*

Petitioner, Ford Motor Company, filed a Petition (“Pet.”) requesting *inter partes* review of claims 1–8, 10–24, 26, 27, and 31–33 (the “Challenged Claims”) of U.S. Patent No. 10,138,826 B2 (Ex. 1001, the “’826 patent”). Paper 2. We instituted trial on all Challenged Claims and grounds. Paper 10.

Patent Owner filed a Patent Owner Response. Paper 18 (“PO Resp.”). Petitioner filed a Reply to the Patent Owner Response. Paper 22 (“Reply”). Patent Owner filed a Sur-reply to the Reply. Paper 28 (Sur-reply”).

We conducted a consolidated oral hearing on November 19, 2020, for this proceeding, IPR2019-01399, and IPR2019-01401 and the record includes a copy of the transcript of that hearing. Paper 36 (“Tr.”).

Patent Owner moves to exclude certain evidence. Paper 29. Petitioner opposes that motion (Paper 30) and Patent Owner replies to the opposition (Paper 33).

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. For the reasons that follow, we conclude that Petitioner demonstrates, by a preponderance of the evidence, that the Challenged Claims are unpatentable.

### B. *Real Parties in Interest*

Petitioner identifies itself as the sole real party-in-interest. Pet. 78. Patent Owner identifies itself and Ethanol Boosting Systems, LLC, the exclusive licensee of the ’826 patent, as real parties-in-interest. Paper 6, 2.

### C. *Related Matters*

Petitioner and Patent Owner indicate that the ’826 patent is the subject of litigation in the U.S. District Court for the District of Delaware in a case

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styled *Ethanol Boosting Systems, LLC v. Ford Motor Company, LLC*, No. 1:19-cv-00196-CFC (D. Del.). Pet. 78; Paper 6, 2. Patent Owner appealed the claim constructions in this litigation to the Federal Circuit. PO Resp. 30; *see also* Ex. 1041 (providing the District Court’s claim construction order). The Federal Circuit affirmed the constructions. Ex. 1052 (providing the Federal Circuit’s Rule 36 affirmance).

Patent Owner indicates that litigation in the U.S. District Court for the District of Delaware in a case styled *Ethanol Boosting Systems, LLC v. Ford Motor Company, LLC*, No. 1:20-cv-00706-CFC (D. Del.) relates to the ’826 patent. Paper 24, 2.

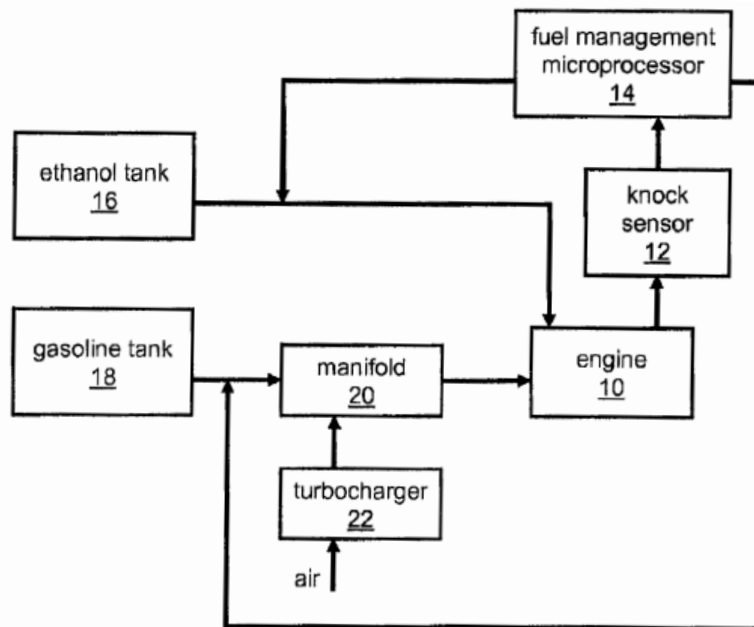
Petitioner also filed, concurrent with the filing of the Petition, petitions for *inter partes* review of three related patents, in cases numbered IPR2019-01399 (challenging US 9,810,166), IPR2019-01400 (challenging US 8,069,839), and IPR2019-01401 (challenging US 9,255,519). Pet. 78; Paper 6, 2. Patent Owner also identifies IPR2020-00012, which also challenges the ’826 patent. Paper 6, 2.

The parties indicate that the ’826 patent is related to the following additional patents and pending patent applications: US 10,344,689; US 10,221,783; US 9,708,965; US 9,695,784; US 9,255,519; US 8,857,410; US 8,733,321; US 8,707,913; US 8,522,746; US 8,468,983; US 8,353,269; US 8,302,580; US 8,276,565; US 8,171,915; US 8,146,568; US 7,971,572; US 7,841,325; US 7,762,233; US 7,740,004; US 7,640,915; US 7,444,987; US 7,314,033; US 7,225,787; US App. 16/251,658; US App. 16/424,471. Pet. 70–71; Paper 5, 2–5.

#### *D. The ’862 Patent*

The ’826 patent, titled “Fuel Management System for Variable Ethanol Octane Enhancement of Gasoline Engines,” issued November 27,

2018, from an application filed September 27, 2017, and ultimately claims priority to an application filed November 18, 2004. Ex. 1001, codes (54), (45), (22), (63). The '826 patent is directed “to spark ignition gasoline engines utilizing an antiknock agent which is a liquid fuel with a higher octane number than gasoline such as ethanol to improve engine efficiency.” *Id.* at 1:38–41. We reproduce Figure 1 from the '826 patent below.



**FIG. 1**

Figure 1 depicts “a block diagram of one embodiment of the invention disclosed” in the '826 patent. Ex. 1001, 3:7–8. Spark ignition gasoline engine 10 includes knock sensor 12, fuel management microprocessor system 14, engine manifold 20, and turbocharger 22. *Id.* at 3:24–32. Ethanol tank 16 contains an anti-knock agent, such as ethanol, and gasoline tank 18 contains the primary fuel, such as gasoline. *Id.* at 3:26–31. Fuel management microprocessor system 14 controls the direct injection of the anti-knock agent into engine 10 and the injection of gasoline into engine manifold 20. *Id.* “The amount of ethanol injection is dictated either by a

predetermined correlation between octane number enhancement and fraction of fuel that is provided by ethanol in an open loop system or by a closed loop control system that uses a signal from the knock sensor 12 as an input to the fuel management microprocessor 14.” *Id.* at 3:32–38. The fuel management system minimizes the amount of ethanol directly injected into the cylinder while still preventing engine knock. *Id.* at 3:38–40.

“Direct injection [into the cylinder] substantially increases the benefits of ethanol addition and decreases the required amount of ethanol. . . . Because ethanol has a high heat of vaporization there will be substantial cooling when it is directly injected into the engine 10,” which “further increases knock resistance.” Ex. 1001, 3:44–52. The amount of octane enhancement needed from the ethanol to prevent knocking is a function of the torque level. *Id.* at 6:6–10. “[P]ort fuel injection of the gasoline in which the gasoline is injected into the manifold rather than directly injected into the cylinder is preferred because it is advantageous in obtaining good air/fuel mixing and combustion stability that are difficult to obtain with direct injection.” *Id.* at 3:53–57.

#### *E. Illustrative Claims*

Of the Challenged Claims, claims 1, 12, 21, and 31 are independent claims. Claim 1, reproduced below, is representative.

1. A fuel management system for a spark ignition engine that has
  - a first fueling system that uses direct injection and also has a second fueling system that uses port fuel injection; and
  - where the fueling is such that there is a first torque range where both the first and second fueling system are used throughout the range; and
  - where the fraction of fueling provided by the first fueling system is higher at the highest value of torque in the first torque

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