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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* HIROYUKI INUZUKA and MAKOTO MIWA

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Appeal 2014-009313  
Application 13/454,344  
Technology Center 3700

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Before JENNIFER D. BAHR, EDWARD A. BROWN, and  
SEAN P. O'HANLON, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Hiroyuki Inuzuka and Makoto Miwa (Appellants) appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 3–22. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART, and designate the affirmance as NEW GROUNDS OF REJECTION pursuant to 37 C.F.R. § 41.50(b).

### THE CLAIMED SUBJECT MATTER

Claim 3, reproduced below, is illustrative of the claimed subject matter.

3. A fuel-property reforming apparatus for an internal combustion engine, comprising:
  - a reforming-fuel injector injecting a reforming-fuel into a medium fluid which will be supplied to an intake pipe of the internal combustion engine;
  - a fuel reforming portion reforming the fuel in the medium fluid; and
  - a reforming controller establishing an injection quantity of the reforming-fuel according to a driving condition of the internal combustion engine, wherein:
    - the reforming controller varies an injection cycle of the reforming-fuel according to a subject quantity which represents at least one of an injection quantity of the reforming-fuel and a flow rate of the medium fluid.

### REJECTIONS

- I. Claims 3–7, 11–17, 21, and 22 stand rejected under 35 U.S.C. § 102(b) as anticipated by Sakurai (JP 2007-113420 A, pub. May 10, 2007).<sup>1</sup>
- II. Claims 8–10 and 18–20 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Sakurai and Kerns (US 2011/0132306 A1, pub. June 9, 2011).

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<sup>1</sup> An English-language translation of Sakurai was entered into the electronic record of the present application on May 8, 2013. Any references to paragraphs of Sakurai in this opinion are to this English-language translation.

## DISCUSSION

### *Rejection I*

#### *Claims 3 and 13:*

Independent claim 3 recites an apparatus comprising, in pertinent part, a reforming controller that establishes “an injection quantity of the reforming-fuel according to a driving condition of the internal combustion engine” and “*varies an injection cycle* of the reforming-fuel according to a subject quantity which represents at least one of an injection quantity of the reforming-fuel and a flow rate of the medium fluid.” Appeal Br. 16 (Claims App.) (emphasis added). Independent claim 13 recites an electronic control unit comprising a substantially similar limitation, namely, “a computer processor system configured to[] establish an injection quantity of the reforming-fuel . . . and *vary an injection cycle* of the reforming-fuel according to a subject quantity which represents an injection quantity of the reforming-fuel and/or a flow rate of the medium fluid.” *Id.* at 18 (Claims App.) (emphasis added). Appellants argue that Sakurai fails to disclose the reforming controller varying an injection cycle of the reforming-fuel as called for in claims 3 and 13. Appeal Br. 10, 11.

The Examiner finds that Sakurai discloses “a reforming controller (50) that facilitates establishing an injection quantity of the reforming-fuel according to a driving condition of the internal combustion engine.” Ans. 2 (citing Sakurai ¶¶ 31, 32). The Examiner finds further that “Sakurai discloses that the reforming controller varies the injection quantity of the reforming-fuel according to a subject quantity which represents at least one of an injection quantity of the fuel reforming portion and a flow rate of the medium fluid.” *Id.* (citing Sakurai ¶ 32). More specifically, the Examiner

finds that “Sakurai discloses that the controller (ECU (50)) switches (varies) the injection quantity of the reforming-fuel according to a subject quantity which represents at least one of an injection quantity of the fuel reforming portion.” *Id.* at 6 (citing Sakurai ¶¶ 32, 34); *see also id.* at 3. According to the Examiner, “‘switching’ in Sakurai represents a variation of the injection cycle as provided in claim 3.” *Id.* at 6. The Examiner explains that Sakurai’s “ECU (50) disables and enables injection of reformed gas” and that “[u]pon this enablement of the reformed gas injection cycle, injection increases from zero-flow (off) to some final injection flow rate (on).” *Id.* (citing Sakurai ¶ 32, ll. 1–3; ¶ 34, ll. 1–3). The Examiner interprets “[t]his increase to the final injection flow rate” as “the reforming controller (34) var[ying] an injection cycle,” as called for in claims 3 and 13. *Id.*

In interpreting claim language, we apply the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description. *See In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). *See also In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004).

[U]nder the broadest reasonable interpretation, the Board’s construction “cannot be divorced from the specification and the record evidence,” *In re NTP, Inc.*, 654 F.3d 1279, 1288 (Fed. Cir. 2011), and “must be consistent with the one that those skilled in the art would reach,” *In re Cortright*, 165 F.3d 1353, 1358 (Fed. Cir. 1999). A construction that is “unreasonably broad” and which does not “reasonably reflect the plain language and disclosure” will not pass muster.

*Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (quoting *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010)).

Appellants' Specification expressly defines "injection cycle" as "a time period from when the reforming-fuel injector 26 injects the reforming-fuel until when the reforming-fuel injector 26 injects the reforming fuel successively again." Spec. 6, ll. 31–33; *see also* Reply Br. 3 (emphasizing same). Appellants' definition of "injection cycle" indicates that Appellants use the term "cycle" in accordance with its ordinary and customary meaning of "a recurring period of time in which certain events or phenomena occur and reach completion or repeat themselves in a regular sequence."<sup>2</sup>

Appellants contend, and we agree, that "[m]erely disabling and enabling injection of reformed gas to thereby turn off (zero flow) or turn on (non-zero flow) the injection of reformed gas *does not disclose varying a time period* from when the reforming-fuel injector injects the reforming-fuel until when the reforming-fuel injector injects the reforming fuel successively again." Reply Br. 3. Construing "injection cycle" consistent with the definition in Appellants' Specification and the aforementioned ordinary and customary definition of "cycle," there is no "injection cycle" during the period in which fuel injection by Sakurai's reforming-fuel injector (second injector 40) is disabled or suspended.<sup>3</sup> Consequently, switching from

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<sup>2</sup> Cycle. (2014). In *Collins English Dictionary*. Retrieved from <http://search.credoreference.com/content/entry/hcengdict/cycle/0> (last referenced December 5, 2016).

<sup>3</sup> When abnormalities are detected in Sakurai's fuel reforming means based on outputs from temperature sensor 54, a carbon monoxide sensor, or a hydrogen sensor, fuel injection by the reforming-fuel injector (second injector 40) is suspended, and any unmodified fuel and any mixed gas

disabling fuel injection by second injector 40 to enabling fuel injection by second injector 40, as described in paragraphs 34 and 39 of Sakurai, does not constitute the reforming controller or computer processor system “var[ying] an injection cycle,” as called for in claims 3 and 13. Thus, the Examiner fails to establish, by a preponderance of the evidence, that Sakurai discloses this feature of claims 3 and 13.

Nevertheless, we find that Sakurai discloses the subject matter of claims 3 and 13. Sakurai discloses a fuel-reforming portion (fuel reformer 34) and a reforming-fuel injector (second injector 40), which injects a reforming-fuel into a medium fluid (exhaust gas from exhaust pipe 32), which is supplied after reforming with reforming-fuel in fuel reformer 34 to the intake of internal combustion engine 11. Sakurai, Fig. 1; ¶¶ 21–23. Sakurai also discloses a reforming controller (electronic control unit (ECU 50)), which determines (i.e., establishes) a reforming-fuel quantity (“2nd fuel oil consumption”) based on a predetermined air-fuel ratio for fuel reformer 34 and the value of refining air content supplied to fuel reformer 34, which is determined according to the target torque of the engine based on an accelerator opening detected by accelerator opening sensors 53. *Id.* ¶¶ 31, 28 (disclosing that “accelerator opening sensors 53 which detect the amount of treading in of an accelerator pedal as an accelerator opening are provided, and the present accelerator opening is outputted to ECU50”). Appellants state that “Sakurai is totally silent about the injection cycle of the reforming-fuel” (Appeal Br. 11), but admit that “[i]n Sakurai, the reforming-fuel is injected at a *regular interval corresponding to the determined fuel*

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remaining in the fuel reforming means is purged. Sakurai ¶¶ 9, 12, 13, 30, 34.

*injection quantity*” (*id.* at 10) (emphasis added). As such, Sakurai’s ECU 50 sets the injection cycle (i.e., the regular interval) according to a subject quantity which represents at least one of an injection quantity (i.e., the detected accelerator opening or the value of the determined reforming-fuel quantity) and a flow rate of the medium fluid (i.e., the value of refining air content supplied to fuel reformer 34, which is determined according to the target torque of the engine based on an accelerator opening detected by accelerator opening sensors 53). In other words, according to Appellants’ admission, the injection cycle of Sakurai’s reforming-fuel is not a fixed value, but, rather, is determined based on detected quantities that represent injection quantity of the reforming-fuel and a flow rate of the medium fluid. Thus, Sakurai’s ECU 50 is configured to *vary* “the injection cycle of the reforming-fuel according to a subject quantity which represents at least one of an injection quantity of the reforming-fuel and a flow rate of the medium fluid,” as called for in claims 3 and 13.

Accordingly, we sustain the rejection of claims 3 and 13 under 35 U.S.C. § 102(b) as anticipated by Sakurai. However, because our affirmance of this rejection is predicated on findings not relied on, or at least not articulated with sufficient clarity, by the Examiner, we designate our affirmance as a new ground of rejection pursuant to 37 C.F.R. § 41.50(b) in order to provide Appellants with an opportunity to respond thereto.

*Claims 4–7 and 14–17:*

In addressing these claims, the Examiner makes no specific findings directed to the particular limitations in these claims. *See* Ans. 3. Rather, the Examiner merely points out that intended use “does not differentiate the

claimed apparatus from a prior art apparatus satisfying the claimed structural limitations” and states that

any statement of intended use and all other functional implications have been carefully considered but are deemed not to impose any patentably distinguishing structure over that disclosed by Sakurai which is capable of being used in the intended manner, i.e., operating the controller to vary the injection cycle based upon engine operating conditions.

*Id.* For the reasons set forth by Appellants on page 13–14 of their Appeal Brief, the Examiner’s statements are inadequate to establish by a preponderance of the evidence that Sakurai anticipates the subject matter of these claims. Accordingly, we do not sustain the rejections of claims 4–7 and 14–17 under 35 U.S.C. § 102(b) as anticipated by Sakurai.

*Claims 11, 12, 21, and 22:*

Claims 11 and 21 require the reforming controller to be configured to vary the injection quantity of the reforming-fuel according to a subject temperature representing at least one of a temperature of the fuel reforming portion and a temperature of the medium fluid. Appeal Br. 17, 19 (Claims App.). Claims 12 and 22 require the reforming controller to be configured to decrease the injection quantity of the reforming-fuel as the subject temperature decreases and to increase the injection quantity of the reforming-fuel as the subject temperature increases. *Id.* at 17–18 (Claims App.); Amendment filed July 30, 2013.<sup>4</sup>

In addressing these limitations, the Examiner finds that Sakurai “discloses that the reforming controller varies the injection quantity of the reforming-fuel according to a subject temperature which represents at least

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<sup>4</sup> The Claims Appendix in the Appeal Brief omits claim 22.

one of a temperature of the fuel reforming portion and a temperature of the medium fluid.” Ans. 4 (citing Sakurai ¶¶ 35, 40, 41).

As Appellants point out, these paragraphs “disclose detecting a reforming catalyst temperature  $T_c$  and determining whether this temperature  $T_c$  is between upper and lower temperature limits  $T_1$ ,  $T_2$ .” Appeal Br. 14. Sakurai discloses that ECU 50 uses this determination to determine whether reforming-fuel injection by second injector 40 should be suspended. Sakurai ¶¶ 40, 41. By suspending reforming-fuel injection by second injector 40, Sakurai’s controller ECU 50 varies the injection quantity of the reforming-fuel from the injection quantity effected by second fuel injection at Step S16 to zero. Sakurai ¶ 39; *see also id.* ¶ 31 (disclosing establishing the injection quantity of the reforming-fuel (i.e., “the 2nd fuel oil consumption”). Thus, Sakurai supports the Examiner’s finding that Sakurai’s ECU 50 varies the injection quantity of the reforming-fuel according to a subject temperature which represents at least a temperature of the fuel reforming portion. Accordingly, we sustain the rejection of claims 11 and 21. Because our affirmance of the rejection of these claims is predicated in part on the findings discussed above with respect to claims 3 and 13, we designate it as a new ground of rejection pursuant to 37 C.F.R. § 41.50(b) to provide Appellants with an opportunity to respond thereto.

However, we do not sustain the rejection of claims 12 and 22 because, as Appellants point out, “there is no specific teaching or disclosure in these cited paragraphs of [varying the injection quantity of reforming-fuel] so that the injection quantity of the reforming-fuel is decreased as the subject temperature becomes lower and increased as the subject temperature becomes higher,” as called for in these claims. Appeal Br. 14.

*Rejection II*

In contesting the rejection of claims 8–10 and 18–20, Appellants argue only that “Kerns fails to resolve” the asserted “deficiencies of Sakurai with respect to claims 3 and 13.” Appeal Br. 14. As discussed above, Appellants fail to apprise us of deficiencies in Sakurai with respect to claims 3 and 13, and, for the same reasons, fail to apprise us of error in the rejection of claims 8–10 and 18–20. Accordingly, we sustain the rejection of claims 8–10 and 18–20 under 35 U.S.C. § 103(a) as unpatentable over Sakurai and Kerns. Because our affirmance of the rejection of these claims is predicated in part on the findings discussed above with respect to claims 3 and 13, we designate it as a new ground of rejection pursuant to 37 C.F.R. § 41.50(b) to provide Appellants with an opportunity to respond thereto.

DECISION

The Examiner’s decision rejecting claims 3, 8–11, 13, and 18–21 is AFFIRMED.

The Examiner’s decision rejecting claims 4–7, 12, 14–17, and 22 is REVERSED.

FINALITY OF DECISION

This decision contains new grounds of rejection pursuant to 37 C.F.R. § 41.50(b). 37 C.F.R. § 41.50(b) provides “[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review.” 37 C.F.R. § 41.50(b) also provides:

When the Board enters such a non-final decision, the appellant, within two months from the date of the decision, must exercise one of the following two options with respect to the new ground

of rejection to avoid termination of the appeal as to the rejected claims:

(1) *Reopen prosecution.* Submit an appropriate amendment of the claims so rejected or new Evidence relating to the claims so rejected, or both, and have the matter reconsidered by the Examiner, in which event the prosecution will be remanded to the Examiner. The new ground of rejection is binding upon the examiner unless an amendment or new Evidence not previously of Record is made which, in the opinion of the examiner, overcomes the new ground of rejection designated in the decision. Should the examiner reject the claims, appellant may again appeal to the Board pursuant to this subpart.

(2) *Request rehearing.* Request that the proceeding be reheard under § 41.52 by the Board upon the same Record. The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought.

Further guidance on responding to a new ground of rejection can be found in the Manual of Patent Examining Procedure § 1214.01.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART; 37 C.F.R. § 41.50(b)