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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MATTHEW J. BRUSSLAR, CHARLES L. GRAY, JR.,
and DAVID JAMES HAUGEN

Appeal 2014-006515
Application 12/077,378
Technology Center 3700

Before LINDA E. HORNER, BARRY L. GROSSMAN, and
AMANDA F. WIEKER, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Matthew J. Brusslar et al. (Appellants)¹ seek our review under 35 U.S.C. § 134 of the Examiner’s decision, as set forth in the Final Office Action, dated November 7, 2013, (“Final Act.”) and further explained in the Advisory Action, dated January 13, 2014, (“Adv. Act.”), rejecting claims 1–26. Claims 27 and 28 have been withdrawn. We have jurisdiction under 35 U.S.C. § 6(b).

¹ Appellants identify the real party in interest as the United States of America, as represented by the Administrator of the U.S. Environmental Protection Agency. Appeal Br. 2.

We REVERSE.

CLAIMED SUBJECT MATTER

Appellants' claimed subject matter relates to "internal combustion engines, particularly those designed for use with high octane alcohol or alcohol blend fuels, including ethanol and methanol." Spec. 1, ll. 10–11. Claim 1 is the sole independent claim on appeal and is reproduced below.

1. An internal combustion engine system, comprising:
 - an engine block with a plurality of combustion cylinders formed therein, each combustion cylinder being closed at one end by a cylinder head and having a cylinder bore diameter (B);
 - an intake manifold for receiving charge-air from an intake line and distributing said charge-air to the combustion cylinders;
 - fuel injectors for providing quantities of an alcohol fuel to mix with the charge-air for combustion;
 - a controller, for controlling the quantities of alcohol fuel to provide for stoichiometric combustion of the fuel and charge-air mixture;
 - a piston mounted within each combustion cylinder for reciprocating motion within the combustion cylinder, said piston cycling toward and away from the cylinder head, with a compression ratio of 15:1 or greater, from a bottom dead center position to a top dead center position within the combustion cylinder;
 - a combustion bowl formed in a head of the piston, said combustion bowl defining walls, along with the cylinder head, of a compact combustion chamber for combustion of the mixture of fuel and charge-air within the combustion cylinder;
 - a spark plug positioned within a recess in the cylinder head, with a tip extending toward the combustion chamber and in operative communication with the combustion chamber, for

triggering combustion of the alcohol fuel and charge-air mixture in the combustion cylinder, wherein the distance (L) between the tip of the spark plug and the farthest point of the compact combustion chamber from that spark plug, when the piston is at the top dead center position, is less than one-half the cylinder bore diameter (B);

an exhaust manifold for receiving and routing exhaust gases from the combustion cylinders to an exhaust line for discharge of the exhaust gas; and

a three-way catalyst aftertreatment device operatively connected to the exhaust line, for reduction of harmful emissions in the exhaust gas.

EVIDENCE

The Examiner relied upon the following evidence in the Final Action:

Tsutsumi	US 4,442,808	Apr. 17, 1984
Suzuki	US 5,353,752	Oct. 11, 1994
Kruse	US 2001/0050068 A1	Dec. 13, 2001
Buckland	US 6,513,484 B1	Feb. 4, 2003

Appellants relied upon the following evidence² in the briefs on appeal:

Declaration of Inventor Pursuant to 37 CFR 1.132, dated January 3, 2014 (“Inventor Dec.”)

² Appellants also cited to new evidence for the first time in the Appeal Brief. Appeal Br. 16 (citing Coordinating Research Council, Inc., “Review to Determine the Benefits of Increasing Octane Number on Gasoline Engine Efficiency: Analysis and Recommendations,” at 60 (September 2012)). As noted by the Examiner in the Answer (Ans. 16), this evidence is untimely and will not be considered in by the Board in this appeal. *See* 37 C.F.R. § 41.37(c)(2) (“A brief shall not include . . . any new or non-admitted affidavit or other Evidence”).

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John B. Heywood, “Internal Combustion Engine Fundamentals,”
McGraw-Hill, Inc. (1988), pp. 655–657 (“Heywood”).

REJECTIONS

The Final Action included the following grounds of rejection:

1. Claims 1, 6–17, and 19–21 under 35 U.S.C. § 103(a) as unpatentable over Tsutsumi and Kruse.
2. Claims 2–5 under 35 U.S.C. § 103(a) as unpatentable over Tsutsumi, Kruse, and Buckland.
3. Claim 18 under 35 U.S.C. § 103(a) as unpatentable over Tsutsumi, Kruse, and Suzuki.
4. Claims 22–26 under 35 U.S.C. § 103(a) as unpatentable over Tsutsumi, Kruse, and Appellants’ Admitted Prior Art (“AAPA”).³

PROCEDURAL HISTORY

The application before us on appeal has been the subject of a prior appeal to this Board. In the prior appeal, the Board reversed the Examiner’s decision rejecting claims 1, 6–17, and 19–21 as being unpatentable over Gruden (US 4,811,708, issued March 14, 1989) and Kruse, claims 2–5 as being unpatentable over Gruden, Kruse, and Buckland, claim 18 as being unpatentable over Gruden, Kruse, and Suzuki, and claims 22–26 as being unpatentable over Gruden, Kruse, and AAPA. Decision in Appeal 2011-004579, dated May 10, 2013 (“Prior Dec.”). After issuance of the

³ The Examiner states that “the AAPA discloses a flex fuel system for determining the content of ethanol in an ethanol/gasoline fuel.” Final Act. 7 (citing Spec. 17).

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Prior Decision, the Examiner, under authorization of a Technology Center Director, reopened prosecution, which led to the Final Action that is now before us on appeal. Appellants assert that the Examiner's decision to conduct another search subsequent to the Board's reversal was improper. Appeal Br. 11. The Technology Center Director's decision to reopen prosecution after the Prior Decision is reviewable by petition under 37 C.F.R. § 1.181, and is not within the jurisdiction of the Board. Manual of Patent Examining Procedure ("MPEP") § 1002.02(b), 9th ed., rev. July 2015, (item 17); *see also Ex parte Frye*, 94 USPQ2d 1072, 1077–78 (precedential) (discussing distinction between matters reviewed by petition to the Director and matters reviewed on appeal to the Board). "The Board will not ordinarily hear a question that should be decided by the Director on petition." MPEP § 1201, 9th ed., rev. July 2015. As such, we review the adverse decision of the Examiner as set forth in the Final Action.

ANALYSIS

Waiver

The Examiner requests, as an initial matter, that the Board "consider and advise . . . as to appropriateness of *waiver* with respect to the Kruse reference in the instant application on appeal." Ans. 10; *id.* at 9 (noting that Appellants' arguments in the prior appeal were directed solely towards the applied Gruden reference and did not assert any deficiencies in Kruse). Because the present appeal is a separate appeal addressing different grounds of rejection than presented in the prior appeal, we do not deem Appellants to have waived any arguments as to Kruse by virtue of not having presented

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arguments as to Kruse in the prior appeal. We agree with Appellants that the authorities cited in the Examiner's Answer in support of a theory of waiver are inapposite because those decisions addressed situations in which appellants attempted to present new arguments in an appeal that were not argued previously to the Board in the same matter. Reply Br. 2–3. In this case, the new grounds of rejection entered by the Examiner subsequent to the prior appeal necessitated the new arguments presented by Appellants. For these reasons, we do not deem Appellants to have waived any arguments regarding the Kruse reference. We now examine the grounds of rejection in this appeal.

First Ground of Rejection

In the rejection of independent claim 1, the Examiner determined that it would have been obvious “to utilize the engine of Tsutsumi as a flexible fuel engine with a high compression ratio as taught by Kruse . . . because it is known and understood that efficiency improves with an increase of compression ratio, and improved efficiency is generally considered desirable in today's society.” Final Act. 4. The Examiner further found that a controller to provide for stoichiometric combustion and a three-way catalyst aftertreatment device are “well understood” and “are considered within the level of skill of one having ordinary skill in the art.” *Id.*

For the reasons set forth by Appellants in the Appeal Brief, we find that the Examiner has not articulated adequate reasoning based on rational underpinnings for the proposed modification of Tsutsumi with the teachings of Kruse, or for the further proposed modification Tsutsumi to use a

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controller to provide for stoichiometric combustion and a three-way catalyst aftertreatment device. Appeal Br. 11–15. In particular, Appellants argue that the teachings of Kruse and Tsutsumi are inherently incompatible and not properly combined. Appeal Br. 11–12 (arguing that Kruse deliberately lengthens the combustion process, while Tsutsumi is directed toward trying to shorten a single-phase combustion process). Appellants also argue that it would not have been obvious to operate the engine of Tsutsumi, as modified by Kruse, at near stoichiometric to be compatible with use of a three-way catalyst. Appeal Br. 13–15 (arguing that in Kruse, lean combustion is a key principle for the success of Kruse’s invention) (citing Inventor Dec.). Appellants further allege that Tsutsumi is also directed to improving combustion of lean mixtures, and thus “any proposed combination of Kruse and Tsutsumi would also be expected to utilize the lean combustion advocated in both references.” Appeal Br. 15.

As to the proposed modification of Tsutsumi with the teachings of Kruse, the Examiner’s rationale that one would have been motivated to modify Tsutsumi to operate at a higher compression ratio, as taught by Kruse, to achieve desirable improved efficiency, is insufficient. As noted by Appellants (Appeal Br. 12), Tsutsumi is directed to using a particular combustion chamber to achieve better conditions for efficient combustion and short combustion duration (Tsutsumi, Abst., col. 1, ll. 55–68). Kruse, by contrast, is directed to achieving a high compression ratio by using a lengthened two-phase combustion process. Kruse, paras. 14, 15 (teaching a method of controlling the fuel quantity and injection timing of a direct

injection system in an internal combustion engine, so as to produce a combustion process consisting of a constant volume (isochoric) phase and a constant temperature (isothermal) phase); *see also id.* at Fig. 3 (depicting two-phase fuel injection). The Examiner has not explained adequately why one having ordinary skill in the art would have been led to lengthen the duration of the combustion cycle of Tsutsumi by injecting the fuel in two phases, and has not explained why this proposed modification would not be inconsistent with the principle of operation of Tsutsumi.

The Examiner responded to Appellants' arguments by stating that "nothing in Kruse disparages or discredits the use of a shorter combustion duration" and that "Kruse discloses the invention can be practiced with existing Otto, Diesel, lean-burn or stratified charge engine processes." Ans. 13 (citing Kruse, para. 98). Kruse provides that "[t]he invention can also be put into practice *in combination with* existing Otto, Diesel, lean-burn or stratified charge engine processes in the same engine at different loads or different operating conditions." Kruse, para. 98 (emphasis added). Kruse does not explain in any further detail how a higher compression ratio would be achieved "in combination with" an existing Otto engine process. A preponderance of the evidence does not support the Examiner's finding that "Kruse is quite adaptable and not limited to only the alleged lengthened combustion duration described." Ans. 13. For these reasons, the Examiner fails to explain adequately how one having ordinary skill in the art would have been led to adapt the teachings of Kruse to achieve the high

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compression ratio in a modified system of Tsutsumi without lengthening the combustion cycle.

With respect to the further modification of Tsutsumi to use a controller to provide for stoichiometric combustion and to use a three-way catalyst aftertreatment device, the Examiner provides no reasoning in the Final Action to explain what would have prompted one having ordinary skill in the art to make these further modifications. In particular, the Examiner explained only that “stoichiometric mixtures of air and fuel are well understood, as are the use of three[-]way catalysts for emissions reduction, and are considered within the level of skill of one having ordinary skill in the art.” Final Act. 4. Appellants do not contest these findings; rather, they assert that one having ordinary skill in the art would not have had an apparent reason to combine the known elements in the fashion claimed. Appeal Br. 11. We are persuaded by Appellants’ arguments and evidence. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418–419 (2007) (“it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does . . . because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.”)

In this case, Appellants demonstrate that both Tsutsumi and Kruse use a lean combustion process, and thus any proposed combination would also be expected to utilize lean, not stoichiometric, combustion. Appeal Br. 15.

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The Examiner has not explained what would have led one having ordinary skill in the art to operate the modified Tsutsumi system at stoichiometric. Further, Appellants provide evidence showing that the use of a three-way catalyst is ineffective except in a narrow range of air/fuel ratios near stoichiometric. Appeal Br. 13–14; Inventor Dec., para. 2; Heywood, p. 656, Fig. 11-57. As such, the Examiner failed to articulate adequately why one having ordinary skill in the art would have been led to employ a three-way catalyst aftertreatment device in the modified Tsutsumi system operating with a lean air/fuel ratio. For these reasons, we do not sustain the rejection of independent claim 1 and its dependent claims 6–17 and 19–21 under 35 U.S.C. § 103(a) as unpatentable over Tsutsumi and Kruse.

Remaining Grounds of Rejection

The remaining grounds of rejection are based on the same proposed modification of Tsutsumi with Kruse that we found deficient in the first ground of rejection. Accordingly, we do not sustain the rejections under 35 U.S.C. § 103(a) of claim 2–5 as unpatentable over Tsutsumi, Kruse, and Buckland, of claim 18 as unpatentable over Tsutsumi, Kruse, and Suzuki, and of claims 22–26 as unpatentable over Tsutsumi, Kruse, and AAPA.

DECISION

The decision of the Examiner to reject claims 1–26 is REVERSED.

REVERSED