



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
**United States Patent and Trademark Office**  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/248,585	04/09/2014	James D. Tate	64118A-US-CIP	3022
109	7590	08/25/2020	EXAMINER	
The Dow Chemical Company			LAU, JASON	
P.O. BOX 1967			ART UNIT	
2211 H.H. Dow Way			PAPER NUMBER	
Midland, MI 48674			3762	
			NOTIFICATION DATE	
			DELIVERY MODE	
			08/25/2020	
			ELECTRONIC	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

FFUIMPC@dow.com

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

*Ex parte* JAMES D. TATE, GERALD D. FREDERICK,  
SYLVESTER IRVING, CHARLES W. LIPP,  
ANDY E. WEBER, and CHRIS REED

---

Appeal 2019-004195  
Application 14/248,585  
Technology Center 3700

---

Before STEFAN STAICOVICI, ANNETTE R. REIMERS, and  
JEREMY M. PLENZLER, *Administrative Patent Judges*.

STAICOVICI, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant<sup>1</sup> appeals under 35 U.S.C. § 134(a) from the Examiner’s decision in the Final Office Action (dated Sept. 27, 2017, hereinafter “Final Act.”) rejecting claims 1–6. Appellant’s representative presented oral argument on July 29, 2020. We have jurisdiction over this appeal under 35 U.S.C. § 6(b).

---

<sup>1</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Dow Global Technologies LLC is identified as the real party in interest in Appellant’s Appeal Brief (filed Apr. 3, 2018, hereinafter “Appeal Br.”). Appeal Br. 2.

## SUMMARY OF DECISION

We AFFIRM.

### INVENTION

Appellant's invention relates to "methods for the control of excess air in cracker furnace burners" for producing olefins. Spec. 1, ll. 4–5.

Claims 1 and 6 are independent. Claim 1, with formatting added, is illustrative of the claimed invention and reads as follows:

1. A method for control of the air/fuel ratio of burner(s) of a thermal cracker for producing olefins which comprises a firebox portion, a bridge wall portion and a convection portion, comprising the steps of:

(a) directing a wavelength modulated beam of near infrared light from two tunable diode lasers that are positioned with a line of sight through combustion gas from burners located in the firebox portion at a location in the bridge wall portion where mixing of the combustion gas is uniform, one of the tunable diode lasers being tuned to a frequency characteristic of oxygen to establish a signal for oxygen content of the combustion gas and one being tuned to a frequency characteristic of carbon monoxide to establish a signal for carbon monoxide content of the combustion gas, to a pair of near infrared light detectors to generate two detector signals, one for each of oxygen and carbon monoxide;

(b) analyzing the detector signals for spectroscopic absorption at wavelengths characteristic for oxygen and carbon monoxide to determine their respective concentration in the combustion gas; and

(c) adjusting the air/fuel ratio of the burners (excess air) in response to the concentrations of oxygen and carbon monoxide of step (b), wherein the combustion gas flows vertically from the firebox portion, through the bridge wall portion, and through the convection portion, and wherein each tunable diode laser is positioned in a first wall of the bridge wall portion and each corresponding near infrared light

detector is positioned in a second wall of the bridge wall portion opposite the first wall.

## REJECTIONS

- I. The Examiner rejects claims 1, 2, and 5 under 35 U.S.C. § 103 as being unpatentable over Reed<sup>2</sup> and Sappey.<sup>3</sup>
- II. The Examiner rejects claim 3 under 35 U.S.C. § 103 as being unpatentable over Reed, Sappey, and Lehmann.<sup>4</sup>
- III. The Examiner rejects claim 4 under 35 U.S.C. § 103 as being unpatentable over Reed, Sappey, and Von Drasek.<sup>5</sup>
- IV. The Examiner rejects claim 6 under 35 U.S.C. § 103 as being unpatentable over Reed, Sappey, Lehmann, and Von Drasek.

## ANALYSIS

### *Rejection I*

Appellant does not present arguments for the patentability of claims 2 and 5 apart from claim 1. *See* Appeal Br. 9. Therefore, in accordance with 37 C.F.R. § 41.37(c)(1)(iv), we select claim 1 as the representative claim to decide the appeal of the rejection of these claims, with claims 2 and 5 standing or falling with claim 1.

The Examiner finds Reed discloses a thermal cracker for producing olefins including, *inter alia*, firebox portion 16, bridge wall portion 12, and convection portion 14. Final Act. 2; *see also* Reed, Fig. 1. The Examiner

---

<sup>2</sup> Reed et al., US 5,656,150, issued Aug. 12, 1997.

<sup>3</sup> Sappey et al., US 7,248,755 B2, issued July 24, 2007.

<sup>4</sup> Lehmann et al., US 2003/0109055 A1, published June 12, 2003.

<sup>5</sup> Von Drasek et al., US 2002/0031737 A1, published Mar. 14, 2002.

further finds that Reed fails to disclose performing steps (a) through (c), as recited in claim 1. *Id.* Nonetheless, the Examiner finds Sappey discloses a process for controlling air/fuel ratio of burners including, *inter alia*, steps (a) through (c), as recited in claim 1, and concludes that it would have been obvious for a person of ordinary skill in the art to modify the process of Reed, according to the process steps of Sappey, in order “to optimally regulate the temperature inside the furnace (by adjusting the air/fuel ratio of the burners) to produce the necessary cracking and . . . desired end-products,” and, also because “emissions can be reduced by optimizing the air/fuel ratio.” *Id.* at 2–4 (citing Sappey, col. 1, l. 56–col. 2, l. 15, col. 3, ll. 42–47, col. 8, ll. 52–65, col. 12, ll. 5–31, col. 13, ll. 16–29, Table 1, Figs. 1, 3, 5).

The Examiner further finds that Sappey does not disclose placing diode-detector pairs “at a location in the bridge wall portion where the combustion gas is uniform,” but rather “anywhere in the combustion chamber.” *Id.* at 3 (citing Sappey, col. 10, ll. 30–33). Thus, the Examiner contends that Sappey’s “teaching of placing the diode-detector pairs anywhere in the combustion chamber suggests that the particular location is not important,” and, thus, a skilled artisan would “want to position the diode-detector pairs at a location in the bridge wall portion since that is a location downstream the burners where the combustion gases would gather.” *Id.* at 3–4. The Examiner explains that “[i]f the location is more upstream[,] then the combustion gases may not have time to fully develop.” *Id.* at 4.

Appellant argues that the Examiner’s rejection is based upon impermissible hindsight because (1) the Examiner has not set forth a proper motivation to combine the teachings of Reed and Sappey as “Reed is

focused on typical operating temperatures of cracking furnaces and not . . . optimizing the air/fuel ratio within the furnace” (*see* Appeal Br. 6, 8); (2) Sappey’s combustion in coal-fired boilers . . . is substantially different from [combustion in Reed’s] olefin furnace or cracker” (*see id.* at 7, 8); and (3) neither Reed nor Sappey discloses positioning the diode laser and detector pairs in the specific location required by claim 1, namely, the bridge wall portion (*see id.* at 7–8).

In regards to Appellant’s first argument, even though Reed is concerned with the operating temperature within a combustion furnace, and not with optimizing the air/fuel ratio within the furnace, nonetheless, we agree with the Examiner that “[a] person having ordinary skill in the art of combustion would understand that flame/combustion temperatures can be adjusted by regulating the air and fuel concentrations.” Final Act. 8. Hence, as an artisan must be presumed to know something about the art apart from what the references disclose, a skilled artisan in the art of combustion would understand “to regulate the air/fuel ratio [in Reed, according to the process of Sappey, in order] to control the temperature inside the combustion space.” Examiner’s Answer (dated June 6, 2018, hereinafter “Ans.”) 2; *see also In re Jacoby*, 309 F.2d 513, 516 (CCPA 1962).

Accordingly, the Examiner is correct that “based on the teachings of Reed, Sappey, and the knowledge generally available to a person skilled in the art, it would have been obvious to apply the technique of Sappey to the cracking furnace of Reed to regulate the air and fuel flow rates based on the current conditions in the furnace so that an optimal and desired air/fuel ratio is achieved” in order to control “the furnace temperature . . . in the optimal range, thereby reducing nitrogen oxide emissions and providing the

necessary cracking conditions.” *Id.* at 3.<sup>6</sup> Therefore, the Examiner has articulated adequate reasoning based on a rational underpinning to explain why a person of ordinary skill in the art would combine the teachings of Reed and Sappey. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (stating that “rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness” (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006))).

Moreover, we note that the references relied upon to reject claims under 35 U.S.C. § 103(a) are not required to have the same objectives as the claimed invention. *See e.g.*, Transcript of July 29, 2020 Oral Hearing (hereinafter “Tr.”) 8. Rather, it is not necessary for the prior art to serve the same purpose as that disclosed in Appellant’s Specification in order to support the conclusion that the claimed subject matter would have been obvious. *See KSR*, 550 U.S. at 419 (“In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the [Appellant] controls.”); *see also In re Linter*, 458 F.2d 1013, 1016 (CCPA 1972).

With respect to Appellant’s second argument, we appreciate that Reed’s combustion process employs radiant heat, whereas Sappey’s combustion process uses convective heat and generates particulates and a heterogeneous combustion gas. Appeal Br. 7; *see also* Reply Brief (filed

---

<sup>6</sup> The Examiner explains that a “lean combustion, i.e., more air and less fuel, results in higher temperatures . . . [that] produce higher concentrations of nitrogen oxides. Conversely . . . [a] rich combustion, i.e., more fuel than air, results in lower temperatures, produces lower nitrogen oxides, but is also less efficient.” *Id.*

Oct. 4, 2018, hereinafter “Reply Br.”) 2. However, although there are some differences between the combustion processes of Reed and Sappey, “[w]hen a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Here, Appellant does not sufficiently explain why such differences in the combustion processes of Reed and Sappey would have dissuaded a person of ordinary skill in the art from employing Sappey’s diode-detector pairs and technique to optimize the air/fuel ratio of Reed’s burners, and, thus, control the operating temperature inside Reed’s olefin furnace, as reasoned by the Examiner. *See* Ans. 3 (“Appellant fails to discuss how these differences render the method of Sappey unsuitable for the olefin furnace of Reed.”).

In other words, as Sappey’s diode-detector pairs are employed to *analyze* a combustion gas content, Appellant fails to adequately explain why a skilled artisan would not consider using Sappey’s diode-detector pairs to analyze Reed’s combustion gas content. Appellant fails to provide a “nexus” between Sappey’s diode-detector pairs and the differences of the combustion processes of Reed and Sappey in order to properly explain “how these differences render the . . . [sensor] system of Sappey unsuitable for a cracking furnace.” Final Act. 8. Moreover, we note that absolute predictability that the Examiner’s modification will be successful is not required, all that is required is a reasonable expectation of success. *See In re O’Farrell*, 853 F.2d 894, 903–904 (Fed. Cir. 1988); *see also* Tr. 11–12.



Finally, we are not persuaded by Appellant’s third argument because the Examiner is not relying on the locations illustrated in Sappey’s Figure 3 (*see* Appeal Br. 8, Reply Br. 2–3), but rather is modifying the process of Reed and Sappey to position Sappey’s diode-detector pairs in Reed’s bridge wall portion 12. *See* Final Act. 4. According to the Examiner, “it would make logical sense to place the lasers at a point downstream of the combustion process,” namely, “in bridge 12 *or* duct 14.” *Id.* at 8 (emphasis added).

Selecting one of a plurality of a finite number of identified predictable solutions might not be the product of innovation but something that occurs in the ordinary course of using a known device. *See, e.g., In re Kubin*, 561 F.3d 1351, 1358–61 (Fed. Cir. 2009); *see also* Tr. 12–14. The Examiner explains that Sappey discloses placing diode-detector pairs in a downstream location from the combustion chamber because oxygen and carbon monoxide gases tend to accumulate in such a location, and, thus, “[a]n accurate measurement of the accumulated concentration of oxygen and combustion gases can only be performed at the bridge portion 12 *or* convection zone 14 of Reed.” Ans. 4 (citing Sappey, col. 10, ll. 30–33) (emphasis added). Accordingly, because positioning Sappey’s diode-detector pairs in Reed’s bridge wall portion 12 is one of a finite number (i.e., two) of predictable solutions, a skilled artisan would have had good reason to pursue the known options within his or her technical grasp, and thus, the claimed subject matter is “the product not of innovation but of ordinary skill and common sense.” *KSR*, 550 U.S. 398 at 421. Therefore, positioning Sappey’s diode-detector pairs in Reed’s bridge wall portion 12 would have been obvious to try in light of Sappey’s disclosure of diode-detector pairs

located downstream of the combustion chamber. Appellant does not adequately explain why the Examiner's findings and reasoning are in error.

In conclusion, for the foregoing reasons, we sustain the rejection under 35 U.S.C. § 103 of independent claim 1 as unpatentable over Reed and Sappey. Claims 2 and 5 fall with claim 1.

*Rejections II–IV*

Appellant relies on the same arguments discussed *supra* for the remaining rejections. *See* Appeal Br. 8–9. Therefore, for the same reasons discussed above, we also sustain the rejections under 35 U.S.C. § 103 of claim 3 as unpatentable over Reed, Sappey, and Lehmann; of claim 4 as unpatentable over Reed, Sappey, and Von Drasek; and of claim 6 as unpatentable over Reed, Sappey, Lehmann, and Von Drasek.

CONCLUSION

<b>Claim(s) Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/ Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1, 2, 5	103	Reed, Sappey	1, 2, 5	
3	103	Reed, Sappey, Lehmann	3	
4	103	Reed, Sappey, Von Drasek	4	
6	103	Reed, Sappey, Lehmann, Von Drasek	6	
<b>Overall Outcome</b>			<b>1–6</b>	

Appeal 2019-004195  
Application 14/248,585

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