

The opinion in support of the decision being entered today is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte STEFAN BRAUCHLE
And MATTHIAS WOLFSTEINER

Appeal 2007-4230
Application 09/984,339
Technology Center 1700

Decided: September 25, 2007

Before CHARLES F. WARREN, PETER F. KRATZ, and
JEFFREY T. SMITH, *Administrative Patent Judges*.

KRATZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal from the Examiner's final rejection of claims 1 and 3, the only claims that remain pending in this application. We have jurisdiction pursuant to 35 U.S.C. § 6 and 134.

Appellants' invention is directed to a method of operating a steam reforming plant including a mixture preparation stage, a reactor having a reformer and a carbon monoxide oxidation stage, a control circuit having a control unit, and a temperature sensor. A steam/hydrocarbon¹ mixture is prepared in the mixture preparation stage using a temperature of a product gas leaving the carbon monoxide stage for setting the steam/ hydrocarbon mixing ratio of the mixture generated in the mixture preparation stage to counteract an aging-related shift in a temperature profile within the reforming reactor. The plant can be a mobile plant used in combination with fuel cell vehicles for the purposes of supplying hydrogen to the fuel cells (Specification ¶ 0003). Claim 1 is illustrative and reproduced below:

1. A method for operating a plant for the steam reforming of hydrocarbons, comprising:

providing a control circuit including a control unit, a mixture preparation stage, a reactor having a reformer and a CO oxidation stage, and a temperature sensor,

in the mixture-preparation stage, generating a steam/hydrocarbon mixture from water and at least one hydrocarbon;

introducing the prepared steam/hydrocarbon mixture into the reformer of the reforming reactor; and

counteracting an aging-related shift in a temperature profile within the reforming reactor by setting a steam/hydrocarbon mixing ratio of the steam/hydrocarbon mixture generated in the mixture-preparation stage as a function of a temperature of a reformate gas stream emerging from the CO oxidation stage of the reforming reactor.

¹ The term "hydrocarbon" is used by Appellants in a manner that includes methanol within the scope thereof (Specification ¶ 0002).

The Examiner relies on the following prior art references as evidence in rejecting the appealed claims:

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|---------|--------------|---------------|
| Heil | US 5,874,051 | Feb. 23, 1999 |
| Wiesheu | US 5,984,986 | Nov. 16, 1999 |

Claims 1 and 3 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wiesheu in view of Heil.

Wiesheu discloses a steam reforming process wherein a water vapor/methanol mixture is prepared in a mixture preparation step and the mixture is supplied to a reforming reactor (Wiesheu, Abstract, col. 2, l. 38- col. 4, l. 7). The water vapor/methanol mixing ratio is adjusted as a function of the reforming system load condition and/or load condition changes thereof (*id.*). For example, a carbon monoxide sensor (9, Fig. 1) is provided to detect the carbon monoxide concentration in the reformatte leaving the reforming reactor. A regulation unit (7, Fig. 1) is provided for determining the deviation from a desired carbon monoxide concentration value and operates to feed a signal to the mixture preparation unit for adjusting the water vapor/methanol mixture. A carbon monoxide conversion step (not shown in Fig. 1) is performed to remove carbon monoxide from the reformer effluent and is located downstream of the reformer and upstream of a fuel cell arrangement that would be poisoned thereby (Wiesheu, col. 2, ll. 29-37).

The Examiner acknowledges that Wiesheu does not “specifically disclose the measure of temperature of a reformatte gas stream emerging from a reforming reactor that comprises more than one stage (i.e., additional oxidation stage), and thus counteracting an aging-related shift in a

temperature profile in view of a function of a temperature of a reformate gas stream emerging from the CO oxidation stage of the reforming reactor” (Answer 4).

Indeed, the Examiner has not shown nor do we find where Wiesheu discloses the measurement and/or a determination of the temperature of any gas stream emerging from a reforming reactor whether or not a CO oxidation stage is included. It follows that Wiesheu does not disclose setting a steam (water vapor)/ methanol mixing ratio in the mixture preparation step as a function of the temperature of the CO oxidation stage effluent.

According to the Examiner, Heil discloses a three-stage carbon monoxide oxidation reaction system and method in which a temperature is measured via a sensor and adjusted in the reactor to any desired temperature profile along the reaction gas mixture flow path (Answer 5). This procedure is said to counteract an aging-related shift in the temperature profile within a reforming reactor (Answer 5; Heil, Abstract, col. 1, ll. 7-11, col. 2, ll. 5-58, col. 3, l. 17, col. 7, l. 40, Figs 1 and 2).

Based on these assertions, the Examiner takes the position that:

It would have been obvious to one of ordinary skill in the art at the time the applicants' invention was made to modify the process for operating a steam reforming system, as disclosed by Wiesheu et al., by using the method and apparatus for selective catalytic oxidation of carbon monoxide, as taught by Heil et al., in order to achieve practically any desired temperature profile along the flow path of the reaction gas mixture (Heil et al.: abstract; column 2, lines 17-48; column 6, lines 51-62; and column 7, lines 4-23).

Answer 5.

Appellants, on the other hand, contend that Heil does not teach or suggest “setting a steam/hydrocarbon mixing ratio of a mixture generated in a mixture-preparation stage as a function of a temperature of a reformate gas stream emerging from a CO oxidation stage of a reforming reactor as claim 1 specifies”; hence, the combination of Wiesheu and Heil do not suggest the subject matter required by rejected claims 1 and 3 (Br. 5).

The issue before us is: Have Appellants identified reversible error in the Examiner’s obviousness rejection by their assertions in the Brief? We answer that question in the affirmative and we reverse the Examiner’s obviousness rejection.

The Examiner bears the initial burden, on review of prior art or on any other ground, of presenting a *prima facie* case of unpatentability. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

Here, the Examiner has not established that the combination of the carbon monoxide oxidation method of Heil with the reforming method of Wiesheu would have resulted in a process as claimed wherein a steam/hydrocarbon mixing ratio of the steam/hydrocarbon mixture generated in a mixture preparation stage, which mixture is introduced into the reformer of a reforming reactor, is set as a function of a temperature of a reformate gas stream emerging from a CO oxidation stage of a reforming reactor for the reasons stated by Appellants in the Brief. While Heil discloses adjusting the temperature in the CO oxidation multi-stage reactor via metering of oxygen gas and passive cooling using static mixing structures in addition to the use of cooling circuits (col. 4, ll. 28-49), the Examiner has not reasonably established that combining the multi- stage CO reactor of Heil with the reformer of Wiesheu would have resulted in Appellants’ claimed

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process including the aforementioned step of setting the steam/hydrocarbon mixing ratio as a function of a temperature of a reformate gas stream emerging from a CO oxidation stage of the reforming reactor.

In making the assertions set forth in the Answer, the Examiner has seemingly taken at least some of the applied references' disclosures out of context without providing persuasive reasoning to support the contention that the combination of the CO reaction method of Heil with the reforming method of Wiesheu would have led one of ordinary skill in the art to the here claimed subject matter.

In other words, the Examiner's rationale for the rejection falls short of identifying "a reason that would have prompted a person of ordinary skill in the art to combine the elements" in the manner claimed. *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1731, 82 USPQ2d 1385, 1389 (2007).

CONCLUSION

The decision of the Examiner to reject claims 1 and 3 under 35 U.S.C. § 103(a) as being unpatentable over Wiesheu in view of Heil is reversed.

REVERSED

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