

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* STEVEN G. GOEBEL

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Appeal 2007-3670  
Application 10/404,701  
Technology Center 1700

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Decided: September 25, 2007

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Before BRADLEY R. GARRIS, CHARLES F. WARREN, and PETER F. KRATZ, *Administrative Patent Judges*.

GARRIS, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134 the final rejection of claims 1-6. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

## INTRODUCTION

Appellant claims an apparatus for mixing gaseous fuel and an oxidant for supply to an autothermal reformer reactor which comprises, in relevant part, “the first inlet comprising a plurality of tubes each having a discharge end through which the fuel or oxidant flows and extending into the mixing vessel and toward said exit such that the discharge ends of the tubes are downstream of the discharge end of said second inlet” (claim 1). Appellant discloses that the claimed invention improves the mixing of the fuel and oxidant to eliminate premature burning or flashing of the mixture before it enters a POX reactor (Specification 3).

Claims 1, 3, and 5 are illustrative:

1. Apparatus for mixing gaseous fuel and an oxidant for supply to an autothermal reformer comprising:

a mixing vessel for mixing said fuel and gaseous oxidant;

first and second inlets to said vessel for moving said fuel and oxidant therethrough,

said first and second inlets having discharge ends spaced apart from each other in the direction of flow through the vessel; and

an exit from said vessel spaced from said inlets and adjacent a partial oxidation reactor that burns a mixture of fuel and oxidant exiting the mixing vessel; the first inlet comprising a plurality of tubes each having a discharge end through which the fuel or oxidant flows and extending into the mixing vessel and toward said exit such that the discharge ends of the tubes are downstream of the discharge end of said second inlet for mixing said fuel and oxidant close to said partial oxidation reactor as to preclude premature combustion of the fuel-oxidant mixture in said vessel.

3. The apparatus of claim 1 wherein the second inlet comprises a plate having a plurality of apertures through which said tubes extend.

5. The apparatus of claim 1 wherein the second inlet is divided into first and second chambers by a porous septum.

The Examiner relies on the following prior art references as evidence of unpatentability:

Hershkowitz	WO 98/49096	Nov. 5, 1998
Woods	US 6,033,793	Mar. 7, 2000

The rejections as presented by the Examiner are as follows:

1. Claims 1-4 and 6 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Hershkowitz.
2. Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Hershkowitz in view of Woods.

Appellant separately argues claims 1, 3, and 5. Accordingly, non-argued dependent claims 2 and 6, which directly depend on claim 1, stand or fall with claim 1. Non-argued claim 4, which directly depends on claim 3, stands or falls with claim 3.

## OPINION

### CLAIM 1

Appellant argues that Hershkowitz does not disclose a “plurality of tubes 'extending into the vessel and towards the exit such that the discharge end[s] of the tubes are downstream of the discharge end of the second inlet'” (Br. 6). Appellant argues that Hershkowitz does not disclose “the 'first inlet comprising a plurality of tubes each having a discharge end'”, the first inlet's

plurality of tubes extending into the mixing vessel, or "[t]he first inlet's plurality of tubes extending into the mixing vessel and towards the exit such that the discharge ends of the tubes are downstream of the discharge ends of the second inlet" (Reply Br. 4). Appellant argues that Hershkowitz does not disclose "a mixing vessel (chamber) 32" or a "plurality of tubes extending into the mixing vessel (chamber)" (Br. 7). Relying on the definition of "tube" provided by the *McGraw-Hill Dictionary of Scientific and Technical Terms*, 6<sup>th</sup> Ed. (2003)<sup>1</sup>, Appellant argues that Hershkowitz's passages 23 are not tubes (Reply Br. 3). Appellant argues that Hershkowitz's disclosure that Figure 1 is a "diagrammatic illustration" indicates that Figure 1 is not a physical representation of the apparatus and, thus, cannot show "a plurality of tubes" (Reply Br. 4).

We have considered all of Appellant's arguments and are unpersuaded for the reasons below.

During examination, "claims ... are to be given their broadest reasonable interpretation consistent with the specification, and ... claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art." *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364, 70 USPQ2d 1827, 1830 (Fed. Cir. 2004).

Regarding Appellant's first argued claim feature, "the first inlet comprising a plurality of tubes" claim feature, the Examiner takes the position that Hershkowitz's passages 23 correspond to the "plurality of tubes" claim feature (Answer 9). We agree.

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<sup>1</sup> A copy of Appellant's definition from the *McGraw-Hill Dictionary of Scientific and Technical Terms* is attached to the Reply Brief.

Appellant has not defined the claim term “tubes” in the Specification. Instead, Appellant relies on the *McGraw-Hill Dictionary of Scientific and Technical Terms* as defining “tube” as “a long cylindrical body with a hollow center used especially to convey fluid.” However, as evinced by *Webster’s New International Dictionary of the English Language*, 2<sup>nd</sup> Ed. (1950), “tube” has a broader meaning than that provided by Appellant. Specifically, *Webster’s* defines “tube” as “any similar hollow conduit, often oval, square, or polygonal in section” (*Webster’s* 2729).

Accordingly, applying the broadest reasonable interpretation of the claim term “tubes,” it is reasonable to consider Hershkowitz’s passages 23 as corresponding to the claim feature “a plurality of tubes.” *Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d at 1364, 70 USPQ2d at 1830. Passages 23 are hollow conduits having a polygonal cross-section, thus satisfying *Webster’s* broader definition of the term “tube” (Hershkowitz Figure 2). Moreover, as shown in Hershkowitz’s Figures 1 and 2, there are a plurality of passages 23 (i.e., tubes) (Hershkowitz Figures 1 and 2). Accordingly, we determine the Examiner’s construction of the claim feature “a plurality of tubes” as including Hershkowitz’s passages 23 to be reasonable and consistent with Appellant’s Specification.

Regarding Appellant’s argued claim feature “each [tube] having a discharge end through which fuel or oxidant flows and extending into the mixing vessel and toward the exit,” the Examiner’s position is that Hershkowitz’s disclosure to place the gas jet injector means 11 or 20 (i.e., the injector means 20 composed of thin metal plates 21) into the autothermal reformer reactor 10 (i.e., mixing vessel) means the that the passages 23 (i.e.,

“tubes”) extend into the reactor 10 (i.e., mixing vessel) (Answer 9). We agree.

Contrary to Appellant’s argument, the Examiner properly construes the “autothermal reformer reactor 10” as corresponding to the claimed “mixing vessel.” Hershkowitz discloses that the goal of the autothermal reformer reactor is “that the streams [i.e., the fuel and oxidant streams] achieve a high degree of mixedness in a minimum amount of time and distance, before gas phase reactions begin to occur at any substantial level” (Hershkowitz 10). Therefore, as disclosed by Hershkowitz, within the autothermal reformer reactor 10 mixing is occurring such that it is reasonable to construe the claim feature, “mixing vessel,” as corresponding Hershkowitz’s autothermal reformer reactor 10.

Once the injector means 20 (or 11) is inserted into the top of the autothermal reformer reactor 10 (i.e., mixing vessel), the passages 23 (i.e., inlet tubes) would be “extending into the mixing vessel and toward said exit [of the mixing vessel]” as required by Appellant’s claim 1. The “exit” of the mixing vessel corresponds to the bottom part of the autothermal reformer reactor 10 which leads to the fixed catalyst bed 16 (Hershkowitz, Figure 1) and passages 23 (i.e., tubes) are directed downwardly toward the “exit.” In other words, because the passages 23 (i.e., tubes) in the injector means 20 are contained within the autothermal reformer reactor 10 (i.e., mixing vessel), the passages 23 (i.e., tubes) must be “extending into the mixing vessel” as required by claim 1.

Regarding Appellant’s argued claim feature that the “discharge ends of the [inlet] tubes are downstream of the discharge end of said second inlet,” the Examiner position is that Hershkowitz’s Figure 1 shows that the

discharge ends of the passages 23 (i.e., tubes) are downstream of the discharge ends of the passages 22 (i.e., second inlets) (Answer 10). We agree.

As clearly shown in Hershkowitz's Figure 1, the discharge ends of the passages 23 (i.e., tubes) are downstream of the discharge ends of the passages 22 (i.e., second inlets) in the jet nozzle 14. Appellant's argument that Figure 1 is a diagrammatic illustration, rather than the "physical representation of the apparatus" is not persuasive (Reply Br. 4). Even though Hershkowitz discloses that Figure 1 is a "diagrammatic illustration," Figure 1 still represents the relative relationship of one part of the apparatus to another part, specifically, the position of the discharge ends of the passages 23 (i.e., tubes) relative to the discharge ends of the passages 22 (i.e., second inlets).

Moreover, regardless if Figure 1 is diagrammatic illustration, Hershkowitz's Figure 2 shows that the discharge ends of the passages 23 (i.e., tubes) are positioned downstream of the discharge ends of the passages 22 (i.e., second inlets), albeit a small distance. Appellant's claims do not recite that a specific "downstream" distance is required between the discharge ends of the tubes and the discharge ends of the second inlets. Accordingly, Hershkowitz's placement of the discharge ends of passages 23 (i.e., tubes) any distance downstream of the discharge ends of the passages 22 (i.e., second inlets) satisfies Appellant's argued claim feature.

From the foregoing discussion, Hershkowitz discloses all of Appellant's argued claim features. Accordingly, we affirm the Examiner's § 102(b) rejection of argued claim 1 and non-argued claims 2 and 6.

### CLAIM 3

Claim 3 is rejected under § 102(b) over Hershkowitz. Appellant argues that Hershkowitz does not disclose “the second inlet comprising a plate having a plurality of apertures through which said tubes extend” as required by claim 3 (Br. 7).

We have considered Appellant’s argument and we cannot sustain the Examiner’s § 102(b) rejection of claim 3.

We construe claim 3 as requiring the second inlet comprise a plate with apertures, wherein the tubes extend through the apertures in the plate. Our construction of claim 3 is supported by Appellant’s Specification that indicates that the tubes 24 extend through apertures 52 formed in the second inlet’s distribution plate 50 (Specification 7, ll. 1-5).

The Examiner finds that Hershkowitz’s Figure 2 illustrates a plurality of metal plates 21 having segregated oxygen passages 22 (i.e., second inlets) and methane passages 23 (i.e., tubes) (Answer 5). However, it is not evident how Hershkowitz’s passages 23 (i.e., tubes) extend through the apertures used to form the passages 22 (i.e., second inlet) in the metal plates 21. Moreover, the Examiner has not explained how claim 3 is to be construed to include Hershkowitz’s injector means having passages 22 and 23 in metal plates 21.

Because we find that Hershkowitz fails to disclose the argued feature of claim 3, we reverse the Examiner’s § 102(b) rejection of argued claim 3 over Hershkowitz. Furthermore, because of its dependency on claim 3, we reverse the § 102(b) rejection of claim 4 over Hershkowitz.

## CLAIM 5

The Examiner rejects claim 5 under § 103(a) over Hershkowitz in view of Woods. The Examiner finds that Hershkowitz does not teach a porous septum (Answer 6). However, the Examiner finds that Woods discloses using diffusion membranes that are porous to hydrogen (Answer 6). The Examiner concludes that it would have been obvious to use the specific porous membrane (i.e., porous septum) of Woods in the partial oxidation apparatus of Hershkowitz because Woods discloses “such specific porous septum[s] are usable in hydrogen generation and purification systems for separating and purifying mixed gases” (Answer 6).

Appellant argues that the Examiner has not indicated how the porous septum would be incorporated into Hershkowitz’s diffusion bonded plate injector (i.e., injector means 20) (Br. 10). Appellant further argues that the proposed modification would render Hershkowitz’s autothermal reformer reactor unsatisfactory for its intended purpose because Woods’ porous membrane selectively removes all gases except hydrogen such that it would block the oxygen and hydrocarbons necessary to operate Hershkowitz’s autothermal reformer reactor (Br. 11).

We have considered all of Appellant’s arguments and we cannot sustain the Examiner’s § 103(a) rejection of claim 5.

If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

Woods discloses using a porous membrane (i.e., porous septum) to separate hydrogen gas from other gases (e.g., nitrogen, carbon dioxide, and

carbon monoxide) (Woods, col. 12, ll. 63-67; col. 13, ll. 4-8). Woods further discloses that porous membranes (i.e., porous septums) are used in the “device 118,” which is positioned after the reformer 116 (Woods, Figure 1A, col. 5, ll. 14-34).

Accordingly, from Woods’ disclosure, the combination of Woods’ porous membrane (i.e., porous septum) with Hershkowitz’s autothermal reformer reactor would have included placing the porous membrane after the autothermal reformer reactor to separate the desirable hydrogen gas produced in the autothermal reformer reactor from the undesirable gases.

However, Appellant’s claim 5 recites “the second inlet is divided into first and second chambers by a porous septum.” Plainly, the language of claim 5 indicates the porous septum must be positioned in the second inlet (i.e., before) the autothermal reformer reactor, not after the autothermal reformer reactor as disclosed by Woods. Therefore, the combination of Woods’ membrane with Hershkowitz’s autothermal reformer reactor would not have taught or suggested Appellant’s claim 5.

Furthermore, we agree with Appellant that placing Woods’ porous membrane (i.e., porous septum) in the passages 22 (i.e., second inlets) of Hershkowitz would remove the oxygen from the oxidant stream passing through the passages 22 (i.e., second inlets) so as to render Hershkowitz unsatisfactory of the its intended purpose (i.e., oxidizing hydrocarbons). *Gordon*, 733 F.2d at 902, 221 USPQ at 1127. Because the proposed combination would render Hershkowitz unsatisfactory for its intended purpose of oxidizing hydrocarbons, there would have been no motivation for the Examiner’s proposed combination of Woods’ porous membrane (i.e.,

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porous septum) with the passages 22 (i.e., second inlets) of Hershkowitz's authothermal reformer reactor. *Id.*

For the foregoing reasons, we reverse the Examiner's § 103(a) rejection of claim 5 over Hershkowitz in view of Woods.

## DECISION

We AFFIRM the Examiner's § 102(b) rejection of claims 1, 2, and 6 over Hershkowitz.

We REVERSE the Examiner's § 102(b) rejection of claims 3 and 4 over Hershkowitz.

We REVERSE the Examiner's § 103(a) rejection of claim 5 over Hershkowitz in view of Woods.

The Examiner's decision is affirmed-in-part.

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

AFFIRMED-IN-PART

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CARY W. BROOKS  
GENERAL MOTORS CORPORATION  
MAIL CODE 482-C23-B21  
P.O. BOX 300  
DETROIT, MI 48265-3000