UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte VIJAY A. DESHPANDE,
W. SPENCER WHEAT,
CURTIS L. KRAUSE and
RAPH S. WORSLEY

Appeal 2006-3385
Application 10/407,401
Technology Center 1700

Decided: April 20, 2007

Before CATHERINE Q. TIMM, JEFFREY T. SMITH, and LINDA M. GAUDETTE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the Examiner's final rejection of claims 36-52 the only claims pending in this application. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

Appellants' invention relates to a coolant system for an integrated fuel cell power plant. Fuel cells provide electricity from chemical oxidation-

reduction reactions and are said to possess significant advantages over other forms of power generation in terms of cleanliness and efficiency. Typically, fuel cells employ hydrogen as the fuel and oxygen as the oxidizing agent. Because hydrogen is difficult to store and transport, "fuel processors" or "reformers" are used to convert hydrocarbons to a hydrogen rich gas stream which can be used as a feed for fuel cells. Fuel processor reactions are carried out at elevated temperatures and heat management is critical for proper operation. According to Appellants, problems with conventional cooling subsystems include (1) dependence between the reactor cooling and the temperatures of the reactor feeds and products and (2) additional heat management problems which occur when housing the fuel cell and its fuel processor in a cabinet. Appellants' invention addresses these difficulties by using a coolant subsystem which is separate from the feed to the processor reactor and capable of circulating a coolant through the processor reactor, and by housing the processor reactor as well as the other constituent elements of the fuel processor in a cabinet so that the coolant subsystem is capable of cooling both the processor reactor and the interior of the cabinet. *See* Specification 2-3.

Claim 36, the sole independent claim is illustrative of the invention:

36. An apparatus, comprising:

a cabinet; and

a fuel processor contained in the cabinet, the fuel processor including:

a processor reactor;

a feed to the processor reactor; and

a coolant subsystem capable of cooling the processor reactor and the interior of the cabinet.

The Examiner relies on the following prior art references to show unpatentability:

Kawasaki	JP 62-254365	Nov. 6, 1987
Clawson	US 2002/0004152 A1	Jan. 10, 2002
Krause	US 2002/0094310 A1	Jul. 18, 2002
Allen	US 2003/0064010 A1	Apr. 3, 2003

The claims stand rejected as follows[1] (Answer (6)):

1. Claims 36-39, 42, 43, and 49-51 under 35 U.S.C. § 102(e) as anticipated by Krause.

2. Claims 36, 39, and 43 under 35 U.S.C. § 102(e) as anticipated by Allen.

3. Claims 40, 41, 45, and 46 under 35 U.S.C. § 103 as unpatentable over Allen as applied to claims 36 and 43 and further in view of JP'365.

4. Claims 44, 47, 48, and 52 under 35 U.S.C. § 103 as unpatentable over Allen as applied to claims 36 and 43 and further in view of Clawson.

[1] The Examiner has withdrawn the following rejections:

1. Claims 36, 39, and 43 under 35 U.S.C. § 102(b) as anticipated by Haltiner.

2. Claims 40, 41, 45, and 46 under 35 U.S.C. § 103 as unpatentable over Haltiner and/or Allen as applied to claims 36 and 43 and further in view of JP,'365.

3. Claims 44, 47, 48, and 52 under 35 U.S.C. § 103 as unpatentable over Haltiner and/or Allen as applied to claims 36 and 43 and further in view of Clawson.

ISSUES

I. Appellants contend that the claim language "a coolant subsystem capable of cooling the processor reactor and the interior of the cabinet" requires the presence of structural elements that would enable the cooling of both the processor reactor and the interior of the cabinet that houses the reactor and thus distinguishes the invention from the apparatuses of the prior art. (Br. 5). The Examiner contends that this language is merely a recitation of how the claimed apparatus is intended to be used and that this feature is inherent in the prior art apparatuses. The issue for us to decide is: Has the Examiner provided sufficient evidence to establish that the claimed and prior art apparatuses are identical or substantially identical? And, if so, have the Appellants demonstrated that the prior art apparatuses are not necessarily capable of cooling both a processor reactor and the interior of a cabinet containing the reactor and other constituent elements of the fuel processor?

For the reasons discussed below, we answer the first part of this question in the affirmative and the second part in the negative.

II. The Examiner contends that it would have been obvious to have combined the teachings of Allen with JP '365 or Clawson to achieve the claimed invention. Appellants contend that the Examiner has failed to identify any teachings in the references which establish that the prior art structures could be combined in the manner claimed. The issue for us to decide is: Has the Examiner properly identified the claimed features of Appellants' apparatus in the prior art and explained the motivation, teaching

or suggestion in the prior art which would enable one of ordinary skill in the art to combine those features in the manner claimed?

For the reasons discussed below, we answer this question in the affirmative.

FINDINGS OF FACT

Krause

Krause describes a plurality of reactor modules that can be stacked end to end and disposed within an outer housing. [0048].

The structure may be used with a reforming process that includes cooling steps for cooling the process stream that flows through the reactor modules. *See* [0025] and [0034].

Krause teaches that heat exchangers may be used in the modules for cooling. [0042].

Allen

Allen discloses a fuel processor that is formed between first and second plates that have a plurality of reactor apertures and fluid communication channels between the reactor apertures. [0041].

Allen discloses bonding the first and second plates together and enclosing them with a second set of plates that define coolant channels to remove heat from desired areas of the first and second plates. [0042].

Allen also teaches that the reactors housed in the apertures can be heat exchangers and may be enclosed by a set of plates for insulation purposes. [0045]-[0046].

JP '365

JP '365 discloses a fuel cell generation system including a reformer, a heat exchanger, and an air blower. (Abstract).

JP '365 teaches pre-heating atmospheric air with hot combustion exhaust gases from a reformer. The pre-heated air is then delivered to the reformer. (Abstract).

JP '365 discloses that all-around generation efficiency is provided by pre-heating the air. (Abstract).

ANALYSIS AND CONCLUSIONS

I. Rejections under 35 U.S.C. § 102

A reference is anticipatory within the meaning of 35 U.S.C. § 102 if it discloses each and every claim limitation either expressly or inherently. *In re Schreiber*, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997). Appellants argue that the Examiner failed to make a prima facie showing of inherent anticipation because the Examiner did not present objective evidence or technical reasoning which demonstrates that the prior art cooling systems of Krause and Allen are capable of cooling both a processor reactor and the interior of a cabinet containing the reactor and other constituent elements of the fuel processor as required by claim 36. (*See* Br. 7-8 and 10).

The Examiner found that the cooling elements of both Krause and Allen are inherently "capable of cooling the processor reactor and the interior of the cabinet." The basis for the Examiner's finding is two-fold. First, the Examiner notes that the cooling elements of Krause and Allen are

structurally or functionally connected to the reactors located in an outer housing (the cabinet) or are heat exchangers formed as part of a reactor housing. (Answer 11-12) (citing Krause [0042] and [0048], Allen [0042] and [0045-0046]). The Examiner concludes that because the main objective of these cooling elements is to cool the synthesis gas or the reactor itself, the interior of the outer housing (the cabinet) is necessarily cooled as well. Second, the Examiner maintains that because cooling takes place inside the outer housing (the cabinet) in Krause and Allen, further cooling of the interior of the cabinet occurs due to heat conduction, heat convection and heat radiation from one member to another, i.e., the cooling step itself also cools down the immediate vicinity of the reactor in the interior of the outer housing (the cabinet) by heat transfer including heat conduction, heat convection and heat radiation. (Answer 12).

We find that the Examiner has provided a well-reasoned basis for concluding that the claimed and prior art apparatuses are identical or substantially identical. Therefore, the Examiner properly shifted the burden to Appellants to prove that the structures disclosed in Krause and Allen do not necessarily possess the characteristics of the claimed apparatus (Answer 13-14). *See In re Schreiber*, 128 F.3d at 1477, 44 USPQ2d at 1432. *See also, In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). Appellants have not presented persuasive arguments or evidence to refute the Examiner's showing that the housings of Krause and Allen would inherently cool the processor reactor and the interior of the cabinet containing the fuel processor. Accordingly, the rejection of claims 36-39, 42, 43 and 49-51 under 35 U.S.C. § 102(e) as anticipated by Krause and the

rejection of claims 36, 39 and 43 under 35 U.S.C. § 102(e) as anticipated by Allen are affirmed.

II. Rejections under 35 U.S.C. § 103

Appellants argue that there is no teaching or suggestion in JP '365 that an air blower would be an appropriate means for cooling the interior of a cabinet containing a fuel processor or reformer. (Br. 17). Appellants also maintain that the Examiner failed to indicate the specific manner in which one of ordinary skill in the art would incorporate the air blower of JP '365 into the fuel processor of Allen (Br. 18), and has not provided any guidance as to how one of ordinary skill in the art would use Clawson's components in the system of Allen. (Br. 21).

In determining obviousness under 35 U.S.C. § 103, the relevant inquiry is "whether the person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would have been led to make the combination recited in the claims." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1337 (Fed. Cir. 2006). In our view, the Examiner properly established a motivation to combine the teachings of Allen and JP '365 based on the disclosure in JP '365 that pre-heating with an air blower improves all-around generation efficiency. (Answer 8, citing JP '365, Abstract). Appellants themselves concede that the use of an air blower to provide pre-heated reactant air to a fuel cell might improve power generating capacity of the fuel cell. (Br. 17). *See In re Beattie*, 974 F.2d 1309, 1312, 24 USPQ2d 1040, 1042 (Fed.Cir.1992) ("As long as some motivation or suggestion to combine the references is provided by the prior art taken as a

whole, the law does not require that the references be combined for the reasons contemplated by the inventor."). While Appellants suggest that one of ordinary skill in the art would actually be dissuaded from using air blowers in fuel cell systems (*see* Br. 17), they have not offered the requisite evidentiary support to demonstrate a teaching away. Appellants' attempt to overcome the § 103 rejections by asserting that the processes of Allen and JP '765/Clawson are not physically combinable is likewise unpersuasive since a prima facie showing of obviousness is based on what the combined teachings of the references would suggest to one of ordinary skill in the art.

The rejection of claims 40, 41, 45 and 46 under 35 U.S.C. § 103 as unpatentable over Allen as applied to claims 36 and 43 and further in view of JP '365 and the rejection of claims 44, 47, 48 and 52 under 35 U.S.C. § 103 as unpatentable over Allen as applied to claims 36 and 43 and further in view of Clawson are affirmed.

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

AFFIRMED

LMG/cam

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