UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN GILMAN and DANIEL A. KEARL

Appeal 2008-0743
Application 10/341,617
Technology Center 1700

Decided: May 8, 2008

Before CATHERINE Q. TIMM, JEFFREY T. SMITH, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 38-42 and 59-66. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

I. BACKGROUND

The invention relates to a fuel cell system comprising utilizing aerogels as sealing materials for fuel cell systems operating at temperatures as high as 400ºC to 1000ºC. Claims 38 and 66 are illustrative of the subject matter on appeal:

> 38. A fuel cell system comprising:
> a high temperature fuel cell contained in a housing;
> a fuel intake for providing fuel to said fuel cell;
> an oxygen intake for providing oxygen to said fuel cell;
> an exhaust path for exhaust from said fuel cell; and
> a first aerogel seal disposed between said fuel cell and said housing.
>
> 66. A fuel cell system comprising:
> a high temperature fuel cell contained in a housing;
> a fuel intake extending through said housing for providing fuel to said fuel cell;
> an oxygen intake extending through said housing for providing oxygen to said fuel cell;
> an exhaust path extending through said housing for exhausting exhaust from said fuel cell; and
> a seal comprising aerogel disposed between components of said system within said housing.

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

Grevstad et al.	US 4,212,929	Jul. 15, 1980
McPheeters et al.	US 4,761,349	Aug. 2, 1988
Cubukcu et al.	US 6,074,771	Jun. 13, 2000

The Examiner maintains the following rejections:

1. Claims 38-42 and 59-66 rejected under 35 U.S.C. § 103(a) as obvious over Grevstad et al. ("Grevstad") in view of Cubukcu et al. ("Cubukcu"); and

2. Claims 38-42 and 59-66 rejected under 35 U.S.C. § 103(a) as obvious over McPheeters et al. ("McPheeters") in view of Cubukcu.

II. DISCUSSION

The Examiner finds that "Cubukcu illustrates using the aerogel material to serve as a seal" namely due to its "low thermal conductivity and light-weight." (Ans. 7). According to the Examiner, "[i]t would be obvious to one of ordinary skill in the art at the time of the invention to extrapolate this teaching to using an aerogel seal for any area that would benefit from any of the inherent characteristics of aerogel." (Ans. 7).

Appellants respond that the Examiner overstates the teachings of Cubukcu and that "Cubucku teachings [sic, teaches] using aerogel primarily as an exterior insulation that may also perform something of a sealing function on the exterior of a fuel cell." (Reply Br. 5). Appellants also argue that "the interior of a fuel cell system is a particularly demanding environment" and that "there is no teaching of record in any of the cited prior art references of using aerogel as a material for a seal *within* a fuel cell system. (Reply Br. 5)(emphasis in original).

The issue on appeal arising from the contentions of Appellants and the Examiner is: Did the Examiner reversibly err in extrapolating the teachings of Cubukcu to find that one of ordinary skill in the art would have known to use an aerogel as a suitable material for the gasket seals taught by Grevstad or McPheeters? We answer this question in the affirmative.

We make the following Findings of Fact (FF):

1. The Summary of the Specification teaches that "a high temperature seal including an aerogel gasket is disposed between two or more components of a high temperature fuel cell system." (Spec. ¶ [0008]). The Specification describes that "gaskets made from an aerogel can provide the desired seal between fuel cell systems components." (Spec. ¶ [0027]). The Specification also uses the terms "seals" or "gaskets" interchangeably throughout the Specification. (Spec. ¶ [0024], [0025], [0030], [0032]). Further, in each of the examples in the Specification, the seals are described as "gaskets," particularly an "annular seal or gasket," a "flange gasket" and a "perimeter gasket." (Spec. ¶¶ [0033]-[0036]).

2. The Specification also describes "many interfaces between system components, one or more of which may use seals or gaskets to prevent leakage." (Spec. ¶ [0024]). The Specification identifies some of these interfaces as being located between the housing (104) and one of the following: the fuel cell (102), the fuel supply (106), the oxygen supply (108), the exhaust paths (110/112) and the electrical interconnections (114/116). (Spec. ¶ [0024]; Fig. 1).

3. The Specification also describes that

> [e]ach of the aerogel gaskets or seals described above may be made by stamping or cutting an aerogel sheet into any desired configuration. According to one embodiment, an aerogel sheet is cut to form gaskets by a water jet. However, any other forming, casting, stamping, or cutting method may also be used. Several examples of the configurations that may be useful for high temperature fuel cell system seals are discussed below with reference to the figures.

(Spec. ¶ [0032]).

4. The Specification describes that, because aerogels are otherwise typically porous, it is desirable to pulverize and reconstitute aerogels to reduce or eliminate permeability for high temperature sealing applications. (Spec. ¶ [0029]).

5. Grevstad teaches "securing a polymer seal frame between the manifold and the stack such that as the stack creeps, the seal frame creeps with it." (Grevstad, col. 3, ll. 14-16; Fig. 1). In particular, Grevstad describes "a polymer seal frame 15' is located between a lip or edge 17 of a manifold 18… and the cell stack 10'." (Grevstad, col. 3, ll. 36-39).

6. McPheeters teaches that:

> [a]s shown in FIG. 3, first and second seals 78 and 82 extend substantially along the entire length of the facing, lateral edges of the solid oxide fuel cell 20 to ensure that the oxidant and fuel gases remain confined within the respective flow channels therein. A third seal 80 is disposed generally transverse to the plane of the solid oxide fuel cell 20 and provides for separation between the inlet and outlet flow paths of the oxidant and fuel gases. Each of the first, second and third seals 78, 82 and 80 is disposed in tightfitting relation between the monolithic core 64 of the solid oxide fuel cell 20 and its outer insulating housing or sheath 40.

(McPheeters, col. 10, l. 62- col. 11, l. 5; Figs. 2-3).

7. Cubukcu teaches that "[t]o ensure sealing surrounding the incoming air and exhaust openings, Aerogel or Microtherm insulation having a very low thermal conductivity, such as 0.02 W/MK at 400ºC., and very low weight, is also preferably provided surrounding the shell 24." (Cubukcu, col. 20, ll. 5-9).

8. Cubukcu teaches a fuel cell made from foil layers sealed together to form a fluid fuel input 21 and a gas output passageway 22 extending out of an arm 12b, where a "foil patch 51 seals the incoming fuel from escaping or mixing with the outgoing exhaust fuel." (Cubukcu, col. 6, ll. 12-66; Figs. 13A-C and 16). Cubukcu also teaches using silicone rubber to form and to seal around an inlet/exhaust gas manifold 130, "to prevent the release of exhaust gas from the manifold other than through an outlet 136 provided in the manifold shell 132." (Cubukcu, col. 18, ll. 9-44; Figs. 26D-26G).

9. Cubukcu also teaches using a layer of Interam™ sealing material 168 "between the incoming duct 146 and an exhaust cap 170" and between "incoming cap openings 154 and the gas bypass openings 145," which expands when heated and forms "a nominally gas tight seal to prevent leakage." (Cubukcu, col. 19, ll. 59-64, col. 20, ll. 10-15, Figs. 26B and 26C).

A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the pertinent art. 35 U.S.C. § 103(a)(2000); *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 13-14 (1966). Factors to consider in determining obviousness include "'the scope and content of the prior art,'" "'the differences between the prior art and the claims at issue,'" and "'the level of ordinary skill in the pertinent art.'" *Dann v. Johnston*, 425 U.S. 219, 226 (1976) (*quoting Graham*, 383 U.S. at 17).

However, "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." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (*quoted with approval in KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007)).

The Examiner bears the initial burden, on review of prior art or on any other ground, of presenting a prima facie case of non-patentability. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). Here, the Examiner has not established a prima facie case of obviousness with respect to the only independent claims, claims 38 and 66. In particular, we determine that the Examiner has not adequately demonstrated that the teaching of Cubukcu would have suggested to one of ordinary skill in the art the use of an aerogel as a suitable material in seals such as those taught by Grevstad and McPheeters.

Reading the claims in light of the Specification, we determine that Appellants are using the term "aerogel seal" to mean an "aerogel gasket." Evidence on which we base our determination includes: the Summary of the Invention which designates the "high temperature seal" an "aerogel gasket"; the use of "seal or gasket" elsewhere in the Specification; and the examples which all describe gaskets (FF 1). Also, the "seal" is located at the interface between system components (FF 2), traditionally the location of gaskets, and is stamped or cut from a sheet (FF 3), which is the type of manufacture used to form gaskets. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) ("claims 'must be read in view of the specification, of which they are a part.'[citation omitted] [T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'"[citation omitted]).

The seals in both Grevstad and McPheeters appear to function as a single manufactured gasket placed at an interface between two components of a fuel cell. (FF 5 and 6). Thus, the seals taught by Grevstad and McPheeters appear to be well within the scope of the gasket-type "seal" as claimed and construed based on the Appellants' Specification.

Next, we consider the scope and content of the teachings of Cubukcu. The teachings of Cubukcu with respect to the use of aerogels is limited to the use of aerogel insulation "provided surrounding the shell 24." (FF 7). Although Cubukcu teaches that the aerogels are provided "[t]o ensure sealing surrounding the incoming air and exhaust openings" (FF 7), Cubukcu also discloses the use of other materials, such as a foil patch, Interam™, and silicone rubber RTV to form seals around air or fuel inlets and exhaust openings. (FF 8 and 9). The clearest examples of seals in Cubukcu that function most like the gasket seals of Grevstad and McPheeters are made from other materials, and not the aerogel insulation. (FF 8 and 9). For example, the gasket-type seal 168 located between the incoming duct 146 and an exhaust cap 170, as illustrated in Figure 26C, is made of Interam™ rather than aerogel. (FF 9).

We note that aerogels were known to be porous and permeable. (FF 4). We also note that low fluid permeability is a desired feature for the gasket-type seals of the present invention. (Spec. ¶ [0029]). Further, although Cubukcu teaches that the aerogel has very low weight and low thermal conductivity (FF 7), we find that these characteristics alone would not have suggested to one of ordinary skill in the art to use the aerogel as a gasket-type seal in a fuel cell environment.

The rejection fails because the evidence does not support the obviousness of using the aerogel taught by Cubucku in the gasket seals taught by Grevstad or McPheeters. *Kahn*, 441 F.3d at 988. Thus, the Examiner has not provided sufficient evidence to establish a prima facie case of obviousness over claims 38 and 66. *Oetiker*, 977 F.2d at 1445.

III. CONCLUSION

The Examiner reversibly erred in extrapolating the teachings of Cubukcu to find that one of ordinary skill in the art would have known to use an aerogel as a suitable material for the gasket seals taught by Grevstad or McPheeters. Accordingly, we cannot sustain the Examiner's rejections.

Claims 39-42 and 59-65 are all dependent from claim 38, and the rejection of these claims fails for the reasons provided above.

Accordingly, we do not sustain the rejection of all the claims.

IV. DECISION

We reverse the Examiner's decision.

REVERSED

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