

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROLF BRÜCK

Appeal 2008-1434
Application 10/457,729
Technology Center 1700

Decided: April 8, 2008

Before CHARLES F. WARREN, THOMAS A. WALTZ and
JEFFREY T. SMITH, *Administrative Patent Judges*.

WALTZ, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant seeks review under 35 U.S.C. § 134 from the Examiner's rejections of claims 1-24. This Board has jurisdiction under 35 U.S.C. § 6(b).

The invention of the present application is directed to a vehicle-mounted fuel cell and reformer for generating a hydrogen rich product gas from a hydrocarbon containing fluid. The reformer converts the hydrocarbon fluid into hydrogen gas using steam in a combination of reforming and partial oxidation reactions. Claim 1 is illustrative:

1. A fuel cell installation, comprising:

a reformer installation for generating a hydrogen-rich product gas from a hydrocarbon-containing fluid, said reformer installation including:

a housing having an interior;

at least one reformer zone disposed in said interior of said housing and having an operating temperature;

at least one feed line leading to said housing; and

a thermally insulating heat shield causing a reduction of said operating temperature in said at least one reformer zone by 50% to take at least 8 hours; and

a fuel cell disposed downstream of said reformer installation.

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

Myers	5,695,722	Dec. 9, 1997
Shimai	5,834,108	Nov. 10, 1998
Benson	6,203,764	Mar. 20, 2001
Abe	2002/0054837	May 9, 2002
Isogawa	6,390,030	May 21, 2002

Appellant requests review of the following grounds of rejection:

Claims 1-4 and 11 stand rejected under 35 U.S.C. § 102(e) as anticipated by Isogawa;

Claims 5-7 stand rejected under 35 U.S.C. § 103(a) as obvious over Isogawa in view of Shimai;

Claims 8-10, 12, 18, 19 and 21-24 stand rejected under 35 U.S.C. § 103(a) as obvious over Isogawa in view of Benson;

Claims 17 and 20 stand rejected under 35 U.S.C. § 103 (a) as obvious over Isogawa in view of Myers; and

Claims 13-16 stand rejected under 35 U.S.C. § 103(a) as obvious over Isogawa in view of Benson and Abe.

Appellant does not separately argue claims 1-4 and 11 under the § 102(e) rejection. Accordingly, these claims stand or fall together, and we select claim 1 as representative. 37 C.F.R. § 41.37(c)(1)(vii).

In the Reply Brief, Appellant argues for the patentability of claims 5-7 as a group as nonobvious under § 103 over Isogawa in view of Shimai. Accordingly, these claims stand or fall together, and we select claim 5 as representative. *Id.*

For the remaining grounds for rejection, Appellant makes no separate argument for the patentability under § 103(a) of the combinations of Isogawa and other prior art references, but merely reiterates the arguments made against Isogawa (App. Br. 14).

FINDINGS OF FACT (FF)

1. The Specification of the present application teaches, inter alia, a thermally insulating heat shield for a hydrogen gas reformer. (Spec. 5-6).
2. The Specification teaches a heat shield with a thermal conductivity of less than 55 W/mK, the thermal conductivity of unalloyed steel. Embodiments of the invention include those using coatings or alloys of alumina oxide, nickel-chromium,

zirconium oxide or porcelain as part of the heat shield. (Spec. 6:20-25).

3. The Specification teaches the heat shield (8) is disposed in the annular space between the housing (2) and a heat accumulator (15). (Spec., Fig. 2).
4. The Specification also teaches constructing the heat shield with a vacuum in the annular space as an additional feature for greater thermal insulation. (Spec. 8:4-7).
5. The purpose of the thermally insulating heat shield is to maintain higher temperatures of a unit between operating cycles, so as to shorten the startup time in a subsequent operating cycle. (Spec. 5).
6. Isogawa teaches a mobile reformer having a housing (61), at least one reformer zone (70) disposed in the interior of the housing and one feed line (36) leading to the housing. (Isogawa, Figs. 4, 39).
7. Isogawa discloses one embodiment of a reformer having a double-walled housing, with an outer casing (61b) and an inner casing (61a). (See Isogawa, Fig. 39). The space between the two casings (61c) may act as an insulation layer. (Isogawa, col. 24, ll. 59-65). The insulation layer may also be a vacuum insulation layer. (Isogawa, col. 24, ll. 64-65).
8. Shimai discloses a multilayered ceramic porous body, which can be used as a heat insulation material. (Shimai col. 4, ll. 30-46). One embodiment, referred to as “example 1,” of the

multilayered ceramic porous body has a thermal conductivity of 0.2 W/mK. (Shimai, col. 5, l. 38).

9. Cellular, porous ceramics have lower thermal conductivities than an equivalent solid (non-cellular) ceramic material. (Shimai, col. 4, ll. 35-41).

PRINCIPLES OF LAW

Under 35 U.S.C. § 102, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

Patent claims may have functional rather than structural limitations. Nothing is intrinsically wrong with the use of such a technique in drafting a patent claim. *In re Swinehart*, 439 F.2d 210, 212 (CCPA 1971). A functional limitation defines something by what it *does* rather than what it *is*. *Id.* [emphasis in original]. Functional terminology may render patent claims quite broad. By its literal terms, a claim employing such language reads on *any and all* embodiments which perform the recited function. *Id.* at 213 (emphasis in original). “Where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied upon.” *Id.* “When the PTO shows a sound basis for believing that the products of the applicant and the prior use are the same, the applicant has the

burden of showing that they are not.” *In re Spada*, 911 F.2d 705, 709 (Fed. Cir. 1990).

A prior art reference may anticipate a claim limitation not expressly found in that reference when that limitation is inherent in it. If the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates. *In re Cruciferous Sprout Litig.*, 301 F.3d 1343, 1349 (Fed. Cir. 2002). To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). The mere fact that a certain thing may result from a given set of circumstances is not enough. *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981). Whether a claim limitation is found inherently in the prior art is a question of fact. *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

Under 35 U.S.C. § 103, issuance of a patent is prohibited when the differences between the subject matter sought to be patented 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 art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734 (2007). The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. *Id.* at 1739. When 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. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Id.* at 1740.

ANALYSIS

Claims 1-4 and 11: Anticipation by Isogawa

The sole dispositive issue presented in this rejection is whether the Examiner reversibly erred in finding the limitation in claim 1, to wit, “a thermally insulated heat shield causing a reduction of said operating temperature in said at least one reformer zone by 50% to take at least 8 hours,” is anticipated by Isogawa. All other elements of claim 1 are described by Isogawa (FF 6).

The Examiner gives little, if any, weight to the latter part of this limitation, i.e., “causing a reduction of said operating temperature . . . by 50% to take at least 8 hours” (hereinafter, the “operating temperature limitation”). The Examiner identifies the operating temperature limitation as a manner of operating a disclosed device, and concludes that such a limitation does not differentiate apparatus claims from the prior art, citing MPEP §§ 2114 and 2115. (Ans. 4).

Appellant contends that the operating temperature limitation is not a manner of operating a device. Instead, he argues that the operating temperature limitation is structural, because it infers structure and “imparts distinctive structural characteristics” that satisfies the operating temperature

limitation. (App. Br. 8). Appellant reiterates this contention in his Reply Brief. (Reply Br. 4).

We agree with Appellant to an extent. The operating temperature limitation is not a method of operating a device. It does not specify how the device operates, but rather the results achieved by the design of that device. It specifies what the thermally insulating heat shield *does*, rather than what it *is*. It is a functional limitation. *Swinehart*, 439 F.2d at 212. Functional limitations are valid, and can be very broad, reading on any and all structure that fulfills the limitation. *Id.*

Appellant further contends that the anticipation rejection was improper, because the Examiner has not shown that Isogawa has “the capability or even the desire” to meet this functional limitation. (Reply Br. 5). Appellant argues the Examiner has the burden of proving the prior art reference explicitly teaches this limitation. (App. Br. 8-9). With this we disagree. The claimed invention can be anticipated if the functional limitation is inherent in the prior art. The Examiner has the initial burden of showing a “sound basis” to believe the functional limitation is inherent in the cited prior art. *Swinehart*, 439 F.2d at 213. Once a prima facie case of inherency is established, the burden then shifts to the Appellant to show that the cited reference does not contain or exhibit the functional limitation. *Spada*, 911 F.2d at 705.

The threshold questions then are whether the examiner has shown a sufficient basis to believe that the operating temperature limitation is inherent in the disclosure of Isogawa and, if so, has Appellant shown the cited reference does not inherently contain the functional limitation. Such inherencies must be shown as a necessity, and not just as a possibility.

Oelrich, 666 F.2d at 581; *Robertson*, 169 F.3d at 745. This necessity is often found by showing that the prior art contains a structure substantially identical to an example or embodiment of the claimed invention exhibiting the functional limitation.

In this regard, the Examiner first contends, “Since the instant application describes that the claimed heat shield is constructed with a vacuum, and since Isogawa teaches a thermally insulating heat shield / vacuum insulation . . . Isogawa’s heat shield would be inherently and equally capable of performing and operating the same as the heat shield of the instant application.” (Ans. 10). The Examiner also contends “the argued composition of the installation is not claimed functionally in terms of intended reduction of operating temperature nor is implied in the claims, so this argument appears moot.” (Ans. 11). He further states, “functional language in the context of an Apparatus claim is permissible. However, the instant claims do not recite or imply how the structure of the installation is modified functionally over the otherwise identical prior art installation. Therefore, [operating temperature limitation of claim 1] is construed merely to be a statement of intended results of the apparatus which do not differentiate over the otherwise identical structure of the prior art”. *Id.*

We disagree with both contentions. On one hand, a claimed functional limitation need not recite or imply how the associated claimed structure is modified functionally over the prior art to be otherwise permissible or valid. The functional limitation limits the associated claimed structure from those which do not necessarily exhibit or inherently have the functional limitation. In *Swinehart*, the invention was a composition with a claimed functional limitation of “transparent to infrared rays.” *Swinehart*,

439 F.2d at 211. The Court reversed the Board and the Examiner, who had rejected the claim because the functional claim did not otherwise define a means, a step or a distinguishing ingredient. *Id.* at 212.

On the other hand, the disclosure of Isogawa is not identical to any of the embodiments of the present invention. Isogawa teaches a reformer having a housing with an inner and an outer casing, defining an annular space between the two casings that acts as an insulation layer. The insulation layer can also be a vacuum layer. (FF 7) Isogawa does not teach any material of construction for the inner and outer casings.

The present application discloses a reformer with a thermally insulating heat shield. (FF 1). It further discloses that the heat shield has a thermal conductivity significantly lower than unalloyed steel, and may use coatings and alloys of alumina oxide, nickel-chromium, zirconium oxide or porcelain. (FF 2). The heat shield, *in addition*, may be constructed with a vacuum. (FF 4).

Upon comparing the prior art Isogawa with the disclosure of the present application, we cannot agree with the Examiner that the structure of the two are identical. While both share a double-wall shell and the possibility of a vacuum between the two shells, the present application also notes the criticality of using coatings or alloys having thermal conductivities less than unalloyed steel. Nothing in Isogawa indicates that the inner and outer casings are anything but ordinary structural metals such as unalloyed steel. There is no teaching or disclosure of using other alloys, coatings or other means with thermal conductivities lower than unalloyed steel. We cannot find, as a matter of fact, that the structures disclosed in the application and the prior art are identical or substantially identical, and

consequently cannot find that the Examiner has shown a sound basis to reasonably believe that the prior art inherently exhibits the operating temperature limitation, especially in light of his contention that such was not necessary. We therefore cannot sustain the Examiner's rejection of claims 1-4 and 11 as anticipated by Isogawa.

Claims 5-7: Obviousness over Isogawa in view of Shimai.

Claim 5 depends on claim 1, and reads as follows:

The fuel cell installation of claim 1, wherein said heat shield has a thermal conductivity of less than 35 W/mK.

The Examiner rejected claims 5-7 as obvious over Isogawa in view of Shimai.

As discussed *supra*, Isogawa discloses all the elements of claim 1 except the operating temperature limitation. Claim 5, dependant on claim 1, claims a fuel cell installation with a heat shield thermal conductivity of less than 35 W/mK.

Shimai discloses a porous ceramic body that may be used as insulating material. One embodiment of the ceramic body has a thermal conductivity of 0.2 W/mK (FF 8). The present Specification teaches that the thermal insulating heat shield may include various alloys or coating, including porcelain (FF 2). One of ordinary skill in the art would recognize porcelain as a type of ceramic, albeit non-porous. However, we determine that porosity of the insulating material not to be critical. In fact, Shimai notes that the higher porosity of the cellular structure of the ceramic body is advantageous due to its lower thermal conductivity (FF 9). Therefore, one of ordinary skill in the art would be motivated to substitute a cellular

ceramic for porcelain in the heat shield of the Isogawa reformer. The cellular ceramic material disclosed in Shimai can be combined with the heat shield of the Isogawa reformer using known methods described in Shimai and achieving predictable results. *KSR*, 127 S.Ct. at 1739. When 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. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Id.* at 1740.

We therefore sustain the examiner's rejection of claims 5-7.

Remaining Rejections

As to the remaining rejections¹, each were grounded on 35 U.S.C. § 103(a) as obvious over Isogawa in view of a secondary reference other than Shimai. As described *supra*, we have determined that Isogawa does not disclose the operating temperature functional limitation of claim 1, either explicitly or inherently. We have determined *supra*, that one of ordinary skill in the art would find the invention as claimed in dependent claims 5-7 as obvious, as *Shimai* discloses an insulation capable of the operating temperature limitations when combined with the disclosures in Isogawa. However, the remaining rejections under § 103(a) were not made over or in

¹ Claims 8-10, 12, 18, 19 and 21-24 stand rejected as obvious over Isogawa in view of Benson; claims 17 and 20 stand rejected as obvious over Isogawa in view of Myers; claims 13-16 stand rejected as obvious over Isogawa in view of Abe.

view of Shimai. Only Shimai provides a disclosure sufficient to lead a skilled artisan to combine an insulation material sufficient to satisfy the operating temperature limitation with the reformer disclosed in Isogawa.

Therefore, the operating temperature limitation lacking from Isogawa has not been provided by the prior art cited by the Examiner in the other grounds of rejection under § 103. As the Examiner has not identified each and every element of the claimed invention in every combination of the cited prior art references, the other grounds of rejection under § 103 cannot be sustained.

CONCLUSIONS

The rejection of claims 1-4 and 11 under § 102(e) is not sustained, as the Examiner has failed to show a sound basis for the inherency of the functional operating temperature limitation.

The rejection of claims 5-7 under § 103(a) is sustained, as the examiner has established a prima facie case of obviousness over Isogawa in view of Shimai, which prima facie case has not been adequately rebutted by Appellant's arguments.

The remaining rejections of claims 8-10 and 12-24 under § 103(a) are also not sustained, as the Examiner has failed to correct the deficiency in Isogawa of a teaching of the operating temperature limitation.

Accordingly, the decision of the Examiner has been affirmed-in-part.

TIME PERIOD FOR RESPONSE

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).

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AFFIRMED-IN-PART

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