

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DIETER LEHMANN, GUDRUN OEHLER, and
SABINE THIEMANN-HANDLER

Appeal 2008-1067
Application 10/312,487
Technology Center 1700

Decided: June 23, 2008

Before BRADLEY R. GARRIS, JEFFREY T. SMITH, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 16-22 and 25-30.
We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

The invention relates to Pt/Au electrodes used in sensors for
determining gaseous oxidation products in a gas mixture containing O₂.
(Spec. 2, ll. 18-20.) More specifically, the invention relates to Pt/Au
electrodes used for pumping out (i.e., removing) O₂ gas contained in exhaust

gas to allow for a subsequent measurement of NO_x content of the exhaust gas. (Spec. 1, ll. 7-13.)

At the time of the invention, one of ordinary skill in the art was familiar with the use of cermet electrodes formed from a mixture of ZrO₂ and Pt for O₂ pumping. (See, e.g., Spec. 1, ll. 6-7 and Kida, et al., EP 0 897 112 A2, February 17, 1999 (“Kida”), col. 1, ll. 21-29.) It was further known that while addition of Au to this type of electrode improved selective removal of O₂ gas, it also lowered O₂ pumping current such that a subsequent measure of NO_x current was corrupted by the presence of residual O₂ current. (Spec. 1, ll. 13-18 and Kida [0004].)

According to the inventors, they have discovered that impregnating the surface of a Pt/Au electrode with at least one compound including an alkali metal, an alkaline earth metal, and a rare earth metal “reverses the loss of O₂ pumping performance caused by the addition of Au without diminishing the effect of adding Au, which is to ensure the selectivity of pumping out O₂ in the presence of other oxygen-containing gas constituents such as NO_x” (Spec. 2, ll. 5-8). Claims 16 and 25 are illustrative of the invention and are reproduced (as written in the Claims Appendix to the Appeal Brief) below:

16. A Pt/Au electrode for electrochemical pumping of O₂, comprising:

a surface impregnated with at least one compound including one of an alkali metal, an alkaline earth metal, and a rare earth metal.

25. A method of producing a Pt/Au electrode comprising:

bringing an electrode in contact with a solution that contains at least one compound including one of an alkali metal, an alkaline earth metal, and a rare earth metal; and

removing an excess solvent.

The Examiner maintains that the invention as claimed is unpatentable, and makes the following rejections:

1. Claims 16-22 under 35 U.S.C. § 103 as unpatentable over Kida.
2. Claims 25-30 under 35 U.S.C. § 112, second paragraph, as indefinite.

Appellants present separate arguments with respect to the following groups of claims: (1) 16-18 and 20-22, (2) 19, (3) 25-28, (4) 29, and (5) 30. Accordingly, we decide the appeal on the basis of claims 16 and 19 as to the first ground of rejection and on the basis of claims 25, 29, and 30 as to the second ground of rejection.

*Rejection of claims 16-22 under 35 U.S.C. § 103
as unpatentable over Kida*

The Examiner finds that Kida discloses a method of making a Pt/Au electrode in which a mixture of Pt, Au, and ZrO₂ powders are dispersed in an organic solvent and binder. (Final Rejection 3; Ans. 3.) The Examiner further finds that Kida discloses that the Pt/Au electrode may include other components “such as yttria stabilized zirconia, rare earth metal oxides of for example La₂O₃, Gd₂O₃ as well as others, and alkaline earth metal oxides of CaO and MgO.” (Final Rejection 3; Ans. 3.) The Examiner concedes that “Kida et al does not teach surface impregnating the Pt/Au electrode with at least one compound of an alkali metal, alkaline earth metal and a rare earth metal” (Final Rejection 3). (*See* Ans. 4.) However, the Examiner contends

“that the Kida et al document at least renders obvious the instant claims as set forth, since it appears that [] mixing the powders of the platinum and gold with anyone [sic] of the rare earth oxides, or alkaline earth oxides to form the Pt/Au electrode would achieve the same end resultant Pt/Au electrode” (Final Rejection 3-4). More specifically, the Examiner contends that “whether the compound is mixed into the electrode or whether it is impregnated into the surface of the electrode, the same end result will occur with the surface of the electrode still having some of the compound material on the surface and the rest within the electrode body” (Ans. 3).

Appellants contend that the Examiner’s obviousness determination is improperly based on speculation or conjecture. (Reply Br. 1.) In particular, Appellants argue that the Examiner “relies on apparent speculation or conjecture” (Reply Br. 1) in finding that “some of the compound that is mixed with the Pt/Au material will be found on the surface of the electrode” (*id.* (quoting Ans. 5)).

With respect to claim 19, Appellants additionally argue that Kida fails to “disclose or suggest an electrode that includes Pr, whether surface impregnated or not” (App. Br. 6). The Examiner concedes that Pr is not explicitly taught, but maintains that “one having ordinary skill in the art [would] know what rare earth metals and there [sic] oxides are and one having ordinary skill in the art would recognize that other examples of rare earth oxides would be with in [sic] the scope of the invention from the teaching in Kida” (Ans. 6).

The contentions of the Examiner and the Appellants present the following issues for our consideration:

1. Have Appellants shown reversible error in the Examiner's determination that Kida's Pt/Au electrode reasonably appears to be have the same, or substantially the same structure as Appellants' claim 16 electrode?

2. Have Appellants identified reversible error in the Examiner's determination that one of ordinary skill in the art would have been motivated to select Pr for use in Kida's Pt/Au electrode as claimed in Appellants' claim 19?

We answer both of these questions in the negative for the reasons discussed below.

The following findings of fact ("FF") are of particular relevance:

1) Kida discloses:

a method of manufacturing an electrode of a gas sensor, the method comprising the steps of impregnating, as a first constituent component, a solution containing one or more elements selected from the group consisting of Au and Cu into solid electrolyte powder having oxygen-ion conductivity; drying and firing the solid electrolyte powder in order to obtain first-constituent-component carrying powder in which fine particles formed of the first constituent component are carried on the solid electrolyte powder; mixing the first-constituent-component carrying powder with powder of one or more kinds of precious metal components selected from the group consisting of Pt, Pd, Rh, Ir and Re; preparing paste from the resultant mixed powder; applying the paste onto a surface of a compact that becomes, after firing, a solid electrolyte layer constituting the first oxygen-ion pump cell; and firing the paste in order to form the electrode.

(Kida [0015].)

2) According to Kida, "[t]he first constituent component may be carried such that the first constituent component adheres to the surface of particles of the electrode constituent component, or such

that fine particles formed of the first constituent component such as Au exist within fine pores of the particles.” (Kida [0018].) According to Kida, “Au is finely and uniformly dispersed throughout the electrode.” (Kida [0018].)

3) Kida discloses that the electrode constituent component may be oxygen-ion-conductive particles of an inorganic metallic oxide such as

ZrO₂ powder, CeO₂ powder, HfO₂ powder, or ThO₂ powder, which is partially or completely stabilized. Also, a mixture of partially stabilized powder and completely stabilized powder may be used. One or more kinds of rare earth oxides of CaO, MgO, or Y₂O₃ (e.g., La₂O₃ and Gd₂O₃) may be used as the stabilizer for partial or complete stabilization. Preferably, yttrium-partially-stabilized ZrO₂ powder (i.e., ZrO₂ powder partially stabilized through use of yttrium) is used.

(Kida [0019].)

4) Kida discloses that

[t]he electrode . . . may be formed such that, in at least a portion including a surface intended for contact with exhaust gas, the first constituent component . . . exists in a larger amount as compared with the remaining portion. Further, the electrode may be such that the electrode itself is formed of the second constituent component . . . and a layer containing a large amount of the first constituent component is formed on the surface thereof. Furthermore, Au and/or Cu or the like may be added in order to decrease the catalytic activity of, e.g., Pt. Moreover, a metallic coating layer containing Au or Ag as a main component or a coating layer of oxide such as SnO₂, ZnO, In₂O₃, WO₃, Bi₂O₃ may be applied on the surface of the electrode.”

(Kida [0020].)

5) According to Kida, an electrode manufactured in accordance with the invention has a texture which differs from that of a conventional electrode in that the Au component is finely dispersed rather than existing in locally uneven concentrations. (Kida [0024].)

The following principles of law apply to our analysis of the issues presented in the first ground of rejection:

“The patentability of a product does not depend on its method of production.” *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985). When a claimed product reasonably appears to be identical or substantially identical to a product disclosed by the prior art, the burden is on the Appellants to prove that the product of the prior art does not necessarily or inherently possess characteristics or properties attributed to the claimed product. *See In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990) and *In re Best*, 562 F.2d 1252, 1255 (CCPA 1977); *see also, In re Ludtke*, 441 F.2d 660, 664 (CCPA 1971). “Whether [a] rejection is based on ‘inherency’ under 35 U.S.C. § 102, on ‘prima facie obviousness’ under 35 U.S.C. § 103, jointly or alternatively, the burden of proof is the same “and its fairness is evidenced by the PTO’s inability to manufacture products or to obtain and compare prior art products.” *Best*, 562 F.2d at 1255 (footnote and citation omitted). An obviousness “analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740-41 (2007). “[W]hen the prior art evidence reasonably allows the PTO to conclude that a claimed feature is present in the prior art, the evidence

‘compels such a conclusion if the applicant produces no evidence or argument to rebut it.’” *In re Crush*, 393 F.3d 1253, 1259 (Fed. Cir. 2004) (quoting *Spada*, 911 F.2d at 708 n.3)). “[W]hen unexpected results are used as evidence of nonobviousness, the results must be shown to be unexpected compared with the closest prior art.” *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991).

We have thoroughly considered Appellants’ arguments and evidence, but conclude that a preponderance of the evidence weighs in favor of the Examiner’s determination that Kida renders obvious an electrode having the same, or substantially the same structure as Appellants’ claimed electrode. Therefore, we adopt the Examiner’s findings of fact and reasoning, as set forth in the Examiner’s Answer, in sustaining the rejection of claims 16-22. We add the following discussion for the sake of completeness.

Appellants maintain that the claim 16 recitation “a surface impregnated with at least one compound” requires a structure in which “[t]he at least one compound of the electrode . . . makes good contact with the Au of the electrode since it is impregnated into the electrode surface, which provides for a fine and uniform dispersion of the at least one compound similar to the dispersion of the Au particles” (App. Br. 4). Appellants contend that Kida’s electrode does not possess this structure because it “includes finely dispersed particles with which good contact is not made by rare earth oxides, which are inside the ceramic particles” (App. Br. 4). We disagree.

Kida discloses that Au particles may be either adhered to, or exist within the fine pores of the electrode constituent component. (FF 2.) Kida’s electrode constituent component may be ZrO₂ powder partially or

completely stabilized through use of yttrium or one or more kinds of rare earth oxides. (FF 3.) The electrode constituent component may also be CeO₂ powder, a rare earth oxide. (FF 3.) Therefore, it is reasonable to conclude that the rare earth compound of Kida's electrode "makes good contact with the Au of the electrode" (*see above*, p. 8, reference to App. Br. 4). Likewise, because Kida describes Au as being "finely and uniformly dispersed throughout the electrode" (FF 2), it would be expected that the rare earth compound of the electrode constituent component carrying the Au particles would be present as "a fine and uniform dispersion . . . similar to the dispersion of the Au particles" (*see above*, p. 8, reference to App. Br. 4).

Appellants rely on comparison testing in the Specification as evidence of a difference in structure between an electrode of the type disclosed in Kida and the claimed electrode. (App. Br. 4.) According to Appellants, the testing shows that a conventional Pt/Au electrode containing ZrO₂ stabilized with yttrium as the ceramic component has a lower pumping current than the claimed Pt/Au electrode (also containing ZrO₂ stabilized with yttrium as the ceramic component) in which the surface has been impregnated with yttrium. (App. Br. 4-5.)

This evidence is not persuasive because Specification Figure 2 does not appear to provide a comparison between the claimed invention and the closest prior art (*see Ans. 6*). According to Appellants, Figure 2 is a comparison between the claimed electrode and a conventional Pt/Au electrode containing ZrO₂ stabilized with yttrium as the ceramic component. However, Kida's method is said to provide an electrode structure which differs from that of conventional Pt/Au electrodes. (FF 5.) Therefore, in order to establish a difference in structure between the claimed electrode and

Kida's electrode, Appellants must provide an appropriate comparison between the claimed electrode and an electrode prepared in accordance with Kida's method.

With respect to claim 19, we are in agreement with the Examiner's determination that the rare earth oxides specifically disclosed in Kida are merely exemplary (*see* FF 3 ("One or more kinds of rare earth oxides of CaO, MgO, or Y₂O₃ (e.g., La₂O₃ and Gd₂O₃) may be used.")) and that one of ordinary skill in the art would have recognized the suitability of utilizing a Pr compound in Kida's electrode, thereby achieving the claim 19 electrode. (*See* Ans. 6.) Appellants have not presented arguments or evidence to refute this finding. (*See* App. Br. 5-6 *and* Reply Br. 1.)

In view of the foregoing, we affirm the decision of the Examiner rejecting claims 16-22 under 35 U.S.C. § 103 as unpatentable over Kida.

*Rejection of claims 25-30 under 35 U.S.C. § 112,
second paragraph, as indefinite*

The Examiner maintains that "it is unclear as to how the electrode [of claims 25-30] is made into a Pt/Au electrode, since the starting electrode materials brought into contact with the solution are never disclosed." (Ans. 3.) The Examiner contends that because Appellants "failed to provide the criticality with respect to the starting materials necessary to produce the Pt/Au electrode, the claims are deficient and are indefinite." (Ans. 7.) The Examiner contends that claims 29 and 30 are indefinite for the additional reasons that the terms "when" and "if" create uncertainty as to precisely what steps are being claimed. (Ans. 4.)

Appellants maintain that the claimed method steps are clear and that “an explanation of how to practice the method recited in the claims to produce a Pt/Au electrode is delineated in the specification.” (App. Br. 6). Appellants contend that “even if the claims are broad in scope so that they are interpreted as reading on, both, a method where ‘the Pt and/or gold [is] in the solution that contains the at least one compound of materials’ and a method where ‘the electrode [is] to start with Pt/Au,’ the claims are, nevertheless, clear, give no rise to ambiguity, and therefore definite.” (App. Br. 7 (quoting Ans. 3).) Appellants further maintain that

[t]he scope of claim 29 is clear so the public is informed of the boundaries of what constitutes infringement of the claim, i.e., when the Pt/Au electrode is in a state, during its production, in which it is applied to a freely accessible surface of a substrate, the claim requires the immersion of the substrate in the solution, removal of the substrate from the solution, and drying of the substrate; otherwise (where the Pt/Au electrode is not in a state, during its production, in which it is applied to a freely accessible surface of the substrate), the claim does not require the immersion, removal, and drying.

(App. Br. 8.) Likewise, Appellants contend that “claim 30 clearly requires that (upon satisfaction of a condition) a sensor is to be immersed, etc. during the production of the Pt/Au electrode.” (App. Br. 9.)

The contentions of the Examiner and the Appellants present the following issue for our consideration:

Have Appellants shown reversible error in the Examiner's determination that claims 25-30 are indefinite within the meaning of 35 U.S.C. § 112, second paragraph?

We answer this question in the negative for the reasons discussed below.

The following additional finding of fact ("FF") is of particular relevance:

6) The Specification states the following with respect to the method of making a Pt/Au electrode in accordance with the invention:

Production of the electrodes according to the present invention which are installed in a sensor, as illustrated in a detail in Figure 3, is based on the known sensor produced according to the related art. This sensor is immersed in an approx. 2.5% preferably aqueous solution of a SE salt such as $\text{Pr}(\text{NO}_3)_3$, then vacuum impregnated, and finally the water in the interior of the sensor is evaporated while heating gently after removing it from the solution. As an alternative (see above), a solution of at least one alkali metal compound, a solution of at least one compound of an alkaline earth metal, or a solution containing at least two compounds from the groups of alkali metal compounds, alkaline earth metal compounds, and SE compounds is used for the impregnation.

(Spec. 5, l. 26 – 6, l. 9.)

The following principles of law apply to our analysis of the issue presented in the second ground of rejection:

35 U.S.C. § 112, second paragraph, provides that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." During examination, claims terms must be given their broadest

reasonable construction consistent with the specification. *In re Icon Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007). A claim is considered indefinite if it does not reasonably apprise those skilled in the art of its scope. *Amgen, Inc. v. Chugai Pharm. Co., Ltd.*, 927 F.2d 1200, 1217 (Fed. Cir. 1991); *see also, Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 624 (Fed. Cir. 1985) (noting that claims must “reasonably apprise those skilled in the art” as to their scope and be “as precise as the subject matter permits”). If claims do not “particularly point[] out and distinctly claim[]”, in the words of section 112, . . . the appropriate PTO action is to reject the claims for that reason. *In re Zletz*, 893 F.2d 319, 322, (Fed. Cir. 1989); *see In re Wiggins*, 488 F.2d 538, 541 (CCPA 1973) (“If the scope of the invention sought to be patented is unclear from the language of the claim, a second paragraph rejection will properly lie.”).

As acknowledged by Appellants, the claims of a patent application fail to meet the requirements of 35 U.S.C. § 112, second paragraph, where the inventors have “otherwise indicated that they intend the invention to be of a scope different from that defined in the claims” (App. Br. 7). It is clear from the Specification that the intended scope of Appellants’ invention is the specific method steps involved in impregnating the surface of a Pt/Au electrode with at least one compound including one of an alkali metal, an alkaline earth metal, and a rare earth metal. Indeed, the Specification states that the inventive method steps are used to treat a “substrate [], printed with the electrode material and sintered in the usual manner” and a “known sensor.” (FF 6.) We are in agreement with the Examiner that the language of claim 25 does not clearly define what appears to be the intended scope of

the invention sought to be patented and, therefore, sustain the Examiner's rejection of claims 25-30 as indefinite under 35 U.S.C. § 112, second paragraph.

Claim 25 broadly recites the steps of "bringing *an electrode* in contact with a solution" containing an alkali metal, an alkaline earth metal and/or a rare earth metal and "removing an excess solvent" (claim 25). While the claim language might be interpreted as corresponding to the intended scope of Appellants' invention, we agree with the Examiner that other, broader interpretations are possible that are not unreasonable in light of the words of the claims. In other words, because the claims do not include sufficient information regarding starting materials, process conditions, and the like (*see* Ans. 6), it is impossible to determine whether the claimed method will produce a Pt/Au electrode within the intended scope of the invention, i.e., a Pt/Au electrode having a surface impregnated with an alkali metal, an alkaline earth metal and/or a rare earth metal. Rather, broadly interpreted, the claims would appear to encompass methods which produce Pt/Au electrodes having surfaces which are not impregnated with a compound, for example, a Pt/Au electrode having a coated surface.

Accordingly, we conclude that the Examiner properly established that claims 25-30 are indefinite within the meaning of 35 U.S.C. § 112, second paragraph.¹

¹ Because we determine that the language of claim 25 does not clearly define the scope of the invention, we are unable to determine whether claims 29 and 30 are drafted in proper dependent claim format. Therefore, we cannot determine whether claims 29 and 30 are indefinite for the additional reasons stated by the Examiner.

Appeal 2008-1067
Application 10/312,487

ORDER

The decision of the Examiner rejecting claims 16-22 under 35 U.S.C. § 103 as unpatentable over Kida and claims 25-30 under 35 U.S.C. § 112, second paragraph, as indefinite, is 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)(1)(iv).

AFFIRMED

PL Initial:
sld

KENYON & KENYON
ONE BROADWAY
NEW YORK, NY 10004