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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte LETA YAR-LI WOO, ROBERT S. GLASS, ROBERT F. NOVAK, JACOBUS HENDRICK VISSER, ERICA PERRY MURRAY, and LOUIS PETER MARTIN

Appeal 2015-006156
Application 12/427,194
Technology Center 1700

Before BEVERLY A. FRANKLIN, GEORGE C. BEST, and LILAN REN, *Administrative Patent Judges*.

REN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants[1] appeal under 35 U.S.C. § 134(a) from a Rejection[2] of claims 1, 11, and 27. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] The real party in interest is identified as Lawrence Livermore National Security, LLC and the United States of America as represented by the United States Department of Energy (DOE). (Appeal Brief, filed February 5, 2015 ("App. Br."), 2.)

[2] Final Office Action mailed January 23, 2015 ("Final Rejection"; cited as "Final Act.").

CLAIMED SUBJECT MATTER

The claims are directed to "a multiple frequency method for operating electrochemical sensors." (Spec. ¶ 4.)[3] The claimed invention may be applicable to "the detection of pollutant gases in a hot, flowing gas stream," "the monitoring of industrial exhaust gases and vehicle emissions" and other areas "where electrochemical sensors are of interest." (*Id.* ¶ 12.)

Claims 1 and 11, reproduced below, are illustrative of the claimed subject matter:

> 1. An electrochemical sensor apparatus for monitoring gaseous NO_x emissions in a monitored gaseous O_2 environment, consisting of:
>
> two individual electrodes comprising a first electrode and a second electrode, wherein both of said individual electrodes are exposed to the monitored gaseous environment and wherein at least one of said individual electrodes is made of $La_{0.85}Sr_{0.15}MnO_3$ for sensing NO_x in a background of O_2;
>
> an electrolyte material operatively connected to said first electrode and said second electrode, wherein said electrolyte material is an ionically conductive material wherein said first electrode and said second electrode, in conjunction with the electrolyte, comprises the active sensing element; and
>
> an electronic control and data processing unit operatively connected to said first electrode and said second electrode, said electronic processing unit configured to apply an alternating current excitation component at predetermined frequencies to both of said individual electrodes and receive a response;
>
> said electronic control and data processing unit also configured to receive said response generated by said active sensing element wherein said response includes the effect of changing polarization as a result of electrochemical reactions at

[3] Application 12/427,194, *Frequency Technique for Electrochemical Sensors*, filed April 23, 2012. We refer to the "'194 Specification," which we cite as "Spec."

said individual electrodes that are produced when said individual electrodes are exposed to the gaseous NO_x emissions.

11. An electrochemical sensor apparatus for monitoring gaseous NO_x emissions in a monitored O_2 gaseous environment, consisting of:

two individual electrodes comprising a first electrode and a second electrode, wherein both of said individual electrodes are exposed to the monitored gaseous environment and wherein at least one of said individual electrodes is made of $La_{0.85}Sr_{0.15}MnO_3$ for sensing NO_x in a background of O_2;

an electrolyte material operatively connected to said first electrode and said second electrode, wherein said electrolyte material is an ionically conductive material;

an inert substrate supporting said electrolyte material operatively connected to said first electrode and said second electrode, wherein said inert substrate, electrolyte, first electrode, and second electrode comprises a sensing element; and

an electronic control and data processing unit operatively connected to said first electrode and said second electrode, said electronic processing unit configured to apply an alternating current excitation component at predetermined frequencies to both of said individual electrodes;

said electronic control and data processing unit also configured to receive said response generated by said sensing element wherein said response includes the effect of changing polarization as a result of electrochemical reactions at said individual electrodes that are produced when said individual electrodes are exposed to the gaseous NO_x emissions.

(Claim Appendix, App. Br. 33–34.)

REFERENCES

The Examiner relies upon the following references in rejecting the claims on appeal:

Garzon	US 2007/0193883 A1	Aug. 23, 2007

Martin, *Impedancemetric NO_x Sensing Using YSZ Electrolyte and YSZ/Cr_2O_3 Composite Electrodes*, Journal of the Electrochemical Society (2007).

Lawrenz, *Investigations on the determination of NO with galvanic ZrO_2 solid electrolyte cells*, Fresenius Journal of Analytical Chemistry (1994).

REJECTIONS

Claims 1 and 27 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Martin and Lawrenz. (Final Act. 2; Ans. 2.)[4]

Claim 11 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Martin, Garzon, and Lawrenz. (Final Act. 7; Ans. 7.)

OPINION

Findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

Claim 1[5]

Appellants do not dispute that all claim limitations are found in the prior art teachings. (App. Br. 15–21.) Appellants argue instead that the Examiner reversibly erred because claim 1 recites an apparatus "consisting

[4] Examiner's Answer mailed May 20, 2015 ("Ans.").
[5] Consistent with the provisions of 37 C.F.R. § 41.37(c)(1)(iv) (2013), claim 27 stands or falls with claim 1, as Appellants make no distinct arguments for the patentability of any claim other than claim 1. (App. Br. 15.)

of" various elements where each prior art reference teaches elements beyond those recited. (*Id.*)[6] Appellants provide a list of purported "extra elements" for each reference. (*Id.*)

The Examiner responds by explaining why each of the elements at issue in Martin meets the limitations of claim 1. (Ans. 11–15.) The Examiner finds that the YSZ-based sensor having a "planar YSZ electrolyte" taught in Martin meets the "electrolyte material" recited in claim 1. (*Compare* Ans. 11–12 *with* App. Br. 15–16.) The Examiner finds that Martin's sensor having "identical YSZ/Cr_2O_3 composite electrodes" meets the "two individual electrodes" recited in claim 1. (*Compare* Ans. 12–13 *with* App. Br. 16–17.) The Examiner finds that Martin's teaching of "a quartz tube heated in a tube furnace" is not part of the sensor but rather a housing for sensor testing. (*Compare* Ans. 13 *with* App. Br. 17.) The Examiner finds that the "dense Au foil . . . overlaid on top of the sensor electrodes" and "held in place by an Al_2O_3 flat placed on top of the foils" meets the "electronic control and data processing unit" recited in claim 1. (*Compare* Ans. 13–14 *with* App. Br. 17–18.)

The Examiner further responds that Lawrenz teaches that perovskite type oxides $La_{1-x}Sr_xMeO_3$ (x = 0.1 . . . 0.5; Me = Co, Mn, Fe, Cr) is a known electrode material for a NO_x sensor. (Ans. 14.) The Examiner determines that claim 1 is obvious because a skilled artisan would have found it obvious

[6] The Examiner notes that unlike claim 1 which recites an apparatus "consisting of" various elements, claim 27 is an open-ended claim and recites "an active sensing element comprising" various elements. (Ans. 12.) Appellants do not respond to this issue and we affirm the rejection of claim 27 because Appellants do not provide arguments beyond those for claim 1.

to substitute the electrode in Martin with the one taught in Lawrenz. (*Id.*; *see also* Final Act. 3.)

"[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (citing *United States v. Adams*, 383 U.S. 39, 50-51 (1966)). In an obviousness inquiry, all of the features of the secondary reference need not be bodily incorporated into the primary reference and the skilled artisan is not compelled to blindly follow the teaching of one prior art reference over the other without the exercise of independent judgment. *See Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889 (Fed. Cir. 1984).

Here, Appellants attempt to establish non-obviousness by "attacking references individually where the rejection is based upon the teachings of a combination of references." *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Appellants quote prior art teachings but do not provide more than a bare assertion that claim 1 differs from the prior art teachings. (*See, e.g.*, Reply 2–6; *see also In re Kemps*, 97 F.3d 1427, 1429 (Fed. Cir. 1996).)[7] Appellants do not respond to the Examiner's analysis with regard to the sensor in Martin and the sensor of claim 1. (*See, e.g.,* Reply 2–6.) Appellants do not address the Examiner's "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" – namely, that it would have been obvious to substitute the electrode in Martin with the electrode taught in Lawrenz. (*See e.g., id*; *compare* App. Br. 15–21

[7] Reply Brief failed June 2, 2015 ("Reply").

with Final Act. 2–7; *see also KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).)

No reversible error has been identified by Appellants with regard to the rejection of claim 1.

Claim 11

Appellants argue that the rejection of claim 11 is in error by repeating the assertion that each of the prior art references teaches elements additional to those recited. (App. Br. 22–31.)

As with claim 1, Appellants do not respond to the Examiner's articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" – namely, that it would have been obvious to substitute the electrode in Martin with the electrode taught in Lawrenz and to include the alumina substrate taught in Garzon to facilitate the assembly of the sensor. (*See* Reply 8–15; *compare* App. Br. 22–31 *with* Final Act. 7–10; *see also KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).)

No reversible error has been identified by Appellants with regard to the rejection of claim 11.

DECISION

The Examiner's rejections of claims 1, 11, and 27 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). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED