UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/696,617	04/04/2007	Zvi Yaniv	21545-159001	4795

75589 7590 01/30/2013

Matheson Keys & Kordzik PLLC
7004 Bee Cave Rd.
Bldg. 1, Suite 110
Austin, TX 78746

EXAMINER	
BOYER, RANDY	

ART UNIT	PAPER NUMBER
1771	

NOTIFICATION DATE	DELIVERY MODE
01/30/2013	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

kkordzik@mathesonkeys.com
jkeys@mathesonkeys.com
claney@mathesonkeys.com

UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT TRIAL AND APPEAL BOARD

Ex parte APPLIED NANOTECH HOLDINGS, INC.[1]
(Application 11/696,617)

Appeal 2011-011832
from Technology Center 1700
Randy Boyer, Examiner

Before RICHARD TORCZON, CATHERINE Q. TIMM and CHRISTOPHER L. CRUMBLEY, *Administrative Patent Judges*.

TORCZON, *Administrative Patent Judge*.

DECISION ON APPEAL

The appellant (ANHI) seeks relief from the final rejection of claims 6-8.[2] We REVERSE.

OPINION

BACKGROUND

ANHI's disclosure is generally directed to methods and systems of modulating step function phenomena by varying nanoparticle size.[3] Such methods

---

[1] Br. 1 (Real Party in Interest), *but see* http://assignments.uspto.gov/assignments/q?db=pat&pub=20070238209 (visited January 2013) (showing assignment to "NANO-PROPRIETARY, INC.").
[2] 35 U.S.C. § 134.

and systems find particular application in palladium nanowire hydrogen sensors.[4]

Claim 6, the only independent claim, defines the invention as:[5]

> A hydrogen sensor comprising *a plurality of nanoparticles on a substrate in the form of at least one discontinuous film* and spanning source and drain electrodes,
>
> wherein the nanoparticles are configured to undergo a crystalline phase change and expand upon exposure to a threshold concentration of hydrogen, thereby completing a circuit between the source and drain electrodes,
>
> wherein the nanoparticles are present in a range of diameters such that nanoparticles of different diameters are configured to undergo the crystalline phase change at different threshold concentrations of hydrogen, and
>
> wherein the sensor is configured to provide continuous sensing over a range of hydrogen concentrations from 10^{-5} atm to 10^{-2} atm in air at atmospheric pressure by virtue of the range of nanoparticle diameters.

Claim 7 further requires the nanoparticles be metal, while claim 8 further requires them to comprise palladium.

The examiner finally rejected the claims as having been anticipated by the Favier article[6] cited in ANHI's specification.

FACTS AND FINDINGS

Favier reports on hydrogen sensors and hydrogen-activated switches made from electrodeposited mesoscopic palladium wire arrays. Exposure to hydrogen gas caused a rapid, reversible resistance decrease in the array correlated to

---

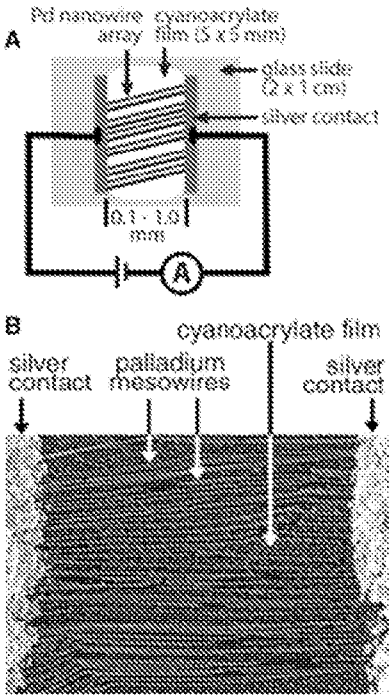
[3] Spec. ¶¶0002 & 0021.

[4] *Id.* ¶¶0004, citing F. Favier et al., *Hydrogen Sensors and Switches from Electrodeposited Palladium Mesowire Arrays*, 293 SCIENCE 2227 (2001) ("Favier").

[5] Br. 9 (Appendix of Claims), on which we rely for all claim language. Emphasis added at a principal point of disagreement.

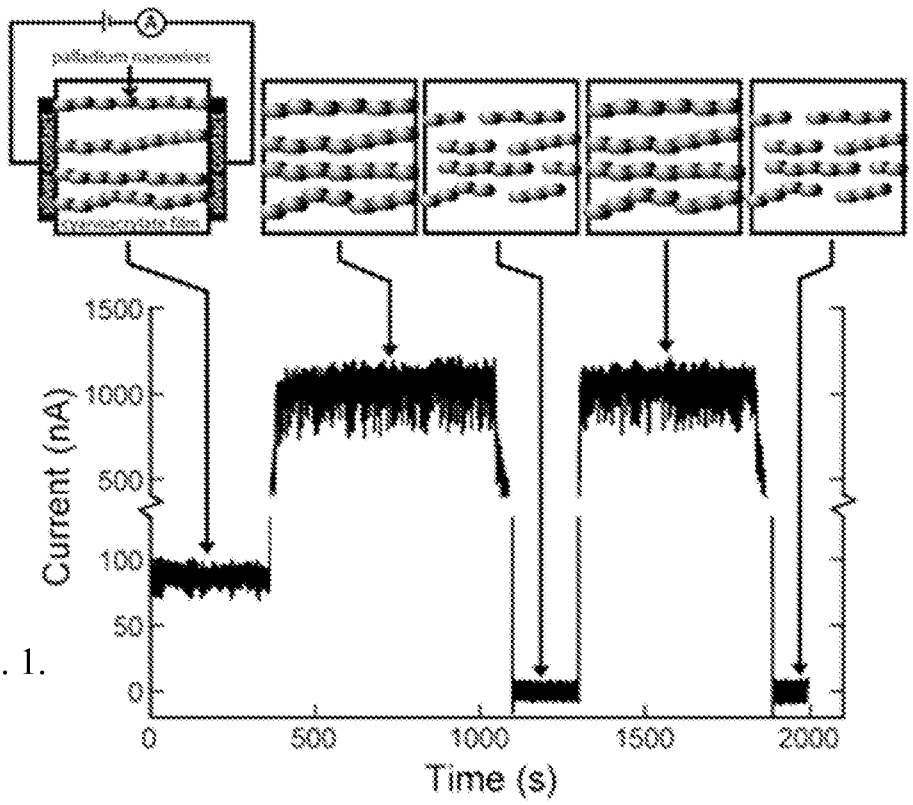
[6] Final Rej. 2, rejecting under 35 U.S.C. §102(b).

hydrogen concentration. The study reported that hydrogen exposure caused dilation of the palladium grains, closing closed nanoscopic gaps in the wires, which reverted in the absence of hydrogen gas.[7]



Favier Figure 1A (right) is a schematic diagram of switch with a palladium parallel nanowire array disposed on a cyanoacrylate film substrate on a glass support. Silver contacts provide a common electrical source and drain for the wires. An ammeter provides current information. Figure 1B (below, right) is a scanning electron microscope image showing a portion of a sensor, including wires on the film between the contacts.[8] The size and regularity of the nanowires depended on the deposition technique, with the smallest regular array having nanowires as thin as 55 nm, consisting of grains with 10-50 nm diameters.[9] Only nanowires spanning between the contacts were involved in sensor function.[10]

Favier Figure 5 (right) is a time series of nanowire state cartoons correlated to a current graph. The array displayed two modes of operation. In mode I (leftmost cartoon), the nanowires remained



[7] Favier, abstract.
[8] *Id.* at 2228:col. 1 & 2229:col. 1.
[9] *Id.* at 2228-2229.
[10] *Id.* at 2229:col. 1.

conductive, but the resistance varied with hydrogen concentration, with a detection limit of 0.5% H_2. In mode II, the array operated as a switch below 2.0% H_2, with nanoscopic gaps in the nanowires (middle and rightmost cartoons), while above this threshold resistance varied with hydrogen concentration.[11]

Favier uses "film" to describe an essentially two-dimensional structure.[12] The palladium structure is a parallel array of essentially one-dimensional structures. We have not been directed to a definition in the specification or from the art indicating that a nanowire array would have been understood to be a film. The only evidence—Favier—does not support a reading of a nanowire array as a "film", discontinuous or otherwise.

Favier does not anticipate the use of "a plurality of nanoparticles on a substrate in the form of at least one discontinuous film and spanning source and drain electrodes".

ANALYSIS

Anticipation under 35 U.S.C. §102(b) requires an interpretation of the claim language and a finding that each limitation was expressly or inherently present in a single prior art reference.[13] The first contested limitation, the discontinuous nanoparticle film, would have been understood to have been a film, not a nanowire array. While a claim limitation must be given its broadest reasonable interpretation in context, the starting point for the analysis is the plain language of the claim, refined in view of particularly pertinent definitions. ANHI insists that its claimed film is a film.[14] On the record before us, ANHI's interpretation of this limitation is the better supported one.

---

[11] *Id.* at 2229.
[12] *E.g.*, Favier Fig. 1 & text.
[13] *Yorkey v. Diab*, 605 F.3d 1297, 1300 (Fed. Cir. 2010).
[14] Br. 4.

The examiner makes many good points about the similarity in the operation of Favier's sensor and the claimed sensor. The examiner is also correct that many of ANHI's points of distinction are attorney argument rather than evidence. Anticipation provides a narrow test, however: we do not get to questions of inherency and burden shifts regarding function if, as here, a claimed structure is missing. The question is not whether a discontinuous film spanning a source and a drain would have been obvious from a nanowire array with nanoscopic gaps spanning a source and a drain, but rather whether the film was necessarily present in the reference. The examiner prejudicially erred in find that the array was the claimed film.

HOLDING

The final rejection of claims 6-8 is—

REVERSED

For the appellant: KELLY KORDZIK, Matheson Keys Garsson & Kordzik PLLC, of Austin, Texas.

cam