Paper No. 24

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN A. NIX, ROBERT A. WILKS, RICHARD E. KUGLER and LEONARD E. HENRY, JR.

Appeal No. 1997-3142
Application No. 08/323,660

HEARD: April 7, 2000

Before HAIRSTON, LALL, and GROSS, Administrative Patent Judges.

HAIRSTON, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1, 5, 6, 10, 12 through 15, 23 and 24. In an Amendment After Final (paper number 12), claims 1 and 6 were amended, and claims 23 and 24 were canceled. The amendment had the effect

of overcoming all of the rejections under 35 U.S.C. § 112 (paper number 13). Accordingly, claims 1, 5, 6, 10 and 12 through 15 remain before us on appeal.

The disclosed invention relates to a method and apparatus for substantially simultaneously determining amounts of CO_2, O_2, and N_2 gases dissolved in a liquid sample.

Claim 1 is illustrative of the claimed invention, and it reads as follows:

1. A method for substantially simultaneously determining amounts of CO_2, O_2 and N_2 gases dissolved in a liquid sample, comprising the steps of:

(a) evacuating a sample cell, including a phosphorescent material capable of being excited by primary light to emit secondary light, via vacuum pressure;

(b) extracting a gas sample from the liquid sample, the extracted gas sample then entering the evacuated sample cell;

(c) transmitting infrared (IR) radiation, at at least one wavelength absorbed by CO_2 gas, through the extracted gas sample in the sample cell;

(d) transmitting primary light into the phosphorescent material in the sample cell;

(e) measuring an amount of IR radiation absorbed as an indication of the concentration of CO_2 gas in the gas sample;

(f) measuring, substantially simultaneous to step (e), an amount of secondary light emitted by the phosphorescent material, quenched by O_2 in the gas sample, as an indication of the concentration of O_2 gas in the gas sample, the

transmitted IR radiation and emitted secondary light traveling through the sample cell in substantially orthogonal directions;

(g) measuring the total pressure of the gas sample;

(h) measuring the temperature of the gas sample;

(i) determining the partial pressure of CO_2 gas from the absorbed amount of IR radiation measured in step (e) and the temperature measured in step (h);

(j) determining the partial pressure of O_2 gas from the amount of omitted secondary light measured in step (f) and the temperature measured in step (h);

(k) subtracting the sum of the partial pressures of CO_2 and O_2 determined in steps (i) and (j) from the total pressure measured in step (g) to determine the partial pressure of N_2; and

(l) determining the concentration of CO_2, O_2 and N_2 gases dissolved in the liquid sample from the respective partial pressures determined in steps(i), (j) and (k) and the temperature measured in step (h).

The references relied on by the examiner are:

Billetdeaux et al. (Billetdeaux) 3,539,804 Nov. 10, 1970
Stanley et al. (Stanley) 3,725,658 Apr. 3, 1973
Gysi et al. (Gysi) 5,365,771 Nov. 22, 1994
(filed July 7, 1993)
Seiden et al. (Seiden) 5,426,593 June 20, 1995
(filed Apr. 2, 1993)
Liu et al. (Liu), “Evaluation of Some Immobilized Room-Temperature Phosphorescent Metal Chelates as Sensing Materials

for Oxygen," Analytical Chemistry, Vol. 66, No. 6, Mar. 15, 1994, pages 836 through 840.

Claims 1, 6, 12 and 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Seiden in view of Stanley and Billetdeaux.

Claims 5 and 10 stand rejected under 35 U.S.C. § 103 as being unpatentable over Seiden in view of Stanley, Billetdeaux and Liu.

Claims 14 and 15 stand rejected under 35 U.S.C. § 103 as being unpatentable over Seiden in view of Stanley, Billetdeaux and Gysi.

Reference is made to the brief (paper number 17), the reply brief and the answer for the respective positions of the appellants and the examiner.

OPINION

The obviousness rejection of claims 1, 5, 6, 10 and 12 through 15 is reversed.

Our review of Seiden reveals that the examiner has correctly concluded (Answer, page 4) that Seiden discloses a method and device for measuring concentrations of O_2, CO_2 and N_2 in a liquid sample in a vacuum, and that Seiden teaches

"extracting the gas sample from the liquid sample, measuring the CO_2 concentration directly (which may be done by measuring IR absorption), measuring the O_2 concentration directly, measuring the total pressure of the sample, [and] measuring the temperature of the sample." We agree with the examiner (Answer, page 4) that "[w]hat Seiden et al. lacks is the steps (and corresponding means) of measuring the O_2 concentration by measuring the quenching of the light emitted by a phosphorescent material (ie. employing a sample cell containing a phosphorescent material, transmitting primary light into the material, and measuring the amount of secondary light emitted by the material as indicative of the concentration of O_2), measuring the CO_2 concentration by IR absorption in which the transmitted light is at a wavelength of 2.7 microns, and having the IR radiation and emitted light orthogonal to each other."

The examiner turns to Billetdeaux for a teaching of measuring CO_2 by infrared absorption. Billetdeaux discloses an "infrared absorption band of CO_2 that has a central wavelength of around 2.72 microns" (column 2, lines 2 through 4). In Billetdeaux (Figure 3), infrared radiation from

infrared source 1 is directed through sample chamber 2 with CO_2 therein (column 3, lines 66 through 75). A detector 6 at the other end of the sample chamber detects CO_2 wavelengths (column 4, lines 3 through 26).

The examiner then turns to Stanley for a teaching of measuring O_2 based on quenching of fluorescent emissions from a sensor film 15, 25 and 37 (Figures 1, 2 and 9, respectively). In the Figure 1 embodiment, light from source 20 passes through glass tube 14 and excites the fluorescent material 15. Fluorescent radiation emitted by the film 15 is detected by detector 21 (column 5, lines 53 through 55). The detector measures "the extent of fluorescent quenching due to oxygen" in the tube 14 (column 5, lines 59 through 66). In the Figure 2 embodiment, light from source 27 strikes the sensor film 25 at an angle, and the fluorescence therefrom is reflected to detector 28 (column 6, lines 55 through 68).

The examiner indicates (Answer, page 5) that it would have been obvious to one of ordinary skill in the art to employ the sensors of Stanley and Billetdeaux with the method of Seiden because "the sensors of Stanley et al. and Billetdeaux et al. would provide accurate and advantageous

implementation of the method of Seiden et al." The examiner is also of the opinion (Answer, page 6) that "it would have been obvious to one of ordinary skill in the art to mount the sensors of Stanley et al. and Billetdeaux et al. in positions in which they were least likely to interfere with each other and to provide the sensors so that they had orthogonal paths would be the geometrically optimum position given the optical nature of both sensors."

In response, appellants argue (Brief, page 14) that:

> [N]one of Seiden et al., Billetdeaux et al. and Stanley et al. provide the necessary motivation for arriving at the present invention. In fact, the Examiner has acknowledged that there is not a single reference or teaching in the art which would provide one of ordinary skill in the art with the incentive to make the particular modifications of the present invention, <u>including the transmission of IR radiation and emitted secondary light which travel through the sample cell in substantially orthogonal directions</u> to permit the substantially simultaneous measuring of an amount of IR radiation absorbed as an indication of the concentration of CO_2 gas in the gas sample and an amount of secondary light emitted as an indication of the concentration of O_2 gas in the gas sample.

Appellants also argue (Brief, page 14) that "[i]t is Appellants who have discovered that if IR and emitted

secondary light travel in orthogonal directions, interference is avoided."

In the absence of any evidence in the record that the benefits of orthogonal travel of the IR radiation and the emitted secondary light were known in the art, we must assume that the examiner is relying solely on the teachings and suggestions of appellants' disclosed and claimed invention. As a consequence thereof, we agree with the appellants' argument (Brief, pages 16 and 17) that the use of "impermissible hindsight is not adequate motivation to arrive at the present invention and thus the Examiner has improperly combined the teachings of Seiden et al., Stanley et al. and Billetdeaux et al."

In view of the foregoing, the obviousness rejection of claims 1, 6, 12 and 13 is reversed.

The obviousness rejection of claims 5, 10, 14 and 15 is reversed because the O_2 sensing teachings of Liu and the simultaneous removal of gas samples from a plurality of bottles teachings of Gysi do not cure the noted shortcomings in the teachings and suggestions of Seiden, Billetdeaux and Stanley.

DECISION

The decision of the examiner rejecting claims 1, 5, 6, 10 and 12 through 15 under 35 U.S.C. § 103 is reversed.

REVERSED

KENNETH W. HAIRSTON Administrative Patent Judge	)
PARSHOTAM S. LALL Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
ANITA PELLMAN GROSS Administrative Patent Judge	)

lp

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DECISION: REVERSED
Send Reference(s): Yes No
or Translation (s)
Panel Change: Yes No
Index Sheet-2901 Rejection(s):

Prepared: December 8, 2000

Draft Final

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OB/HD GAU

PALM / ACTS 2 / BOOK
DISK (FOIA) / REPORT