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11/275,242

12/20/2005

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EXAMINER

HOBAN, MATTHEW E

ART UNIT

PAPER NUMBER

1793

MAIL DATE

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PAPER

**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.

|                              |                                      |                                           |  |
|------------------------------|--------------------------------------|-------------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>11/275,242 | <b>Applicant(s)</b><br>CROSBIE, GARY MARK |  |
|                              | <b>Examiner</b><br>Matthew E. Hoban  | <b>Art Unit</b><br>1793                   |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3, 8-10 and 27 is/are pending in the application.
- 4a) Of the above claim(s) 4-7 and 11-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 8-10 and 27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                        |                                                                   |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2/28/2006</u> .                                               | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of Claims 1-14 and 23-27 in the reply filed on 1/07/2008 is acknowledged. The election was further characterized by two elections of species where, this election makes the current claims presented for consideration claims 1-3, 8-10, and 27. Claims 4-7, 11-14 and 23-26 represent species of more generic claims which were not elected, but may be rejoined upon the allowance of a generic claim.

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1,8 and 27 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. The term "high" as it refers to both the "operating temperature" and the "thermal expansion" in claims 1, 8, is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term "high" is not explicitly defined in the specifications or the claims. The term is purely relative and there is no

standard in the claims to measure what actually constitutes a high "temperature" or "thermal expansion" rate.

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if 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. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-3 and 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Morrissey in 3,022,179 in view of Budd in WO 98/46540.

The instant claims are directed towards a SOFC having stabilized zirconia components, where a sealing glass is used with the glass matrix having a composition as described in claim 1.

Morrissey discloses a range of glass compositions, which exhibit overlapping ranges with the instant claims. Specifically Morrissey's compositions can be found in column 2 of his patent, where it includes in weight percent MgO from 3-35%, SiO<sub>2</sub> from 25-50%, BaO from 3-35% and additional fluxing agents from 10-35%. Among possible fluxing agents are MgF<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>. A theoretical composition within this range made of 50 wt% SiO<sub>2</sub>, 5% Al<sub>2</sub>O<sub>3</sub>, 5% MgO, 30% BaO, and 10% BaF<sub>2</sub> converts to mol% as 61% SiO<sub>2</sub>, 3.6% Al<sub>2</sub>O<sub>3</sub>, 9.18% MgO, 14.36% BaO and 11.78% BaF<sub>2</sub>. This composition, which is within Morrissey's range, also falls within the scope of the instant claims. Overlapping ranges have been shown to sufficiently establish a prima facie case of obviousness.

The reference discloses the presence of additional "fluxing agents" where the instant claims include the phrase "consisting essentially of". However, there is nothing of record to suggest that alumina and MgF<sub>2</sub> would negatively impact the essential properties of the glass. It has only been made of record that alkali metals and bismuth oxide negatively effect the composition.

Morrissey fails to disclose the use of this glass in a SOFC, or in any high operating temperature electrochemical conversion device, which includes a high thermal expansion solid component comprising zirconia, ceria, stabilized zirconia, or doped ceria.

However, Budd describes glasses of similar compositions, which are useful as sealing glasses in SOFC. The glasses of Budd are comprised mainly of MgO, BaO and silica with other minor components, which is the same basic composition of those of Morrissey. Budd's glasses are used primarily for joining different types of materials, where high temperature changes are seen and it's necessary to account of thermal expansion characteristics and also the chemical and wear resistance to the seal. Such seals, Budd explains, necessary in high temperature electro-chemical cells, e.g. SOFC's (See Page1-Page 2, paragraph 2). Budd ensures that his glasses are useful in such applications by testing them as a bonding media between high expansion ceramics such as stabilized zirconia (See Paragraph 2, Page 13).

One of ordinary skill in the art would realize the similarities between the glass frits of Morrissey and Budd and apply those frits of Morrissey to the testing procedures of Budd. Therefore, one of ordinary skill in the art would immediately realize at the time the invention was made that Morrissey's composition would also be useful as a sealing glass in a SOFC. Furthermore, one would test these compositions with stabilized zirconia to simulate its use in a SOFC. One of ordinary skill would have an expectation of success in this endeavor due to the fact that the compositions of both Budd and Morrissey. This expectation of success is ample motivation to combine these two

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references. Furthermore, since the combination of these two references created a sealed stabilized zirconia, it is deemed that the property of being tolerant to temperatures above 850C and having a high coefficient of thermal expansion to match that of stabilized zirconia is inherent. Budd explicitly states that using glass-ceramic sealing compositions with closely matched or slightly lower expansion coefficients is an important aspect of his tests (See Paragraph 2, Page 13). The tailoring of thermal expansion coefficients within this field is a matter of routine optimization in the field, as it is well known that the thermal expansion characteristics of a seal greatly impact the final properties of the SOFC. The stability of these glasses above 850C would also be inherent as Morrissey states in Column 2 that his glass compositions melt at over 1350C.

5. Claims 8-10 rejected under 35 U.S.C. 103(a) as being unpatentable over Morrissey in 3,022,179 in view of Budd in WO 98/46540 as applied to claims 1-3 above, and further in view of Larsen et al in EP 1010675.

The instant claims are much like those of claims 1-3, with a major difference arising in the sealing composition. Previously, in claims 1-3, the composition was directed towards the glassy matrix phase of the sealing composition. In claims 9-10, the composition now refers to the composition of a glassy matrix phase as well as a forsterite phase (which is dispersed in the glassy matrix), where the particular forsterite has the composition of  $Mg_2SiO_4$ .

Morrissey in view of Budd teaches a sealing glass composition, which would be equivalent to the glassy matrix phase of the instant claims. This composition is designed to be applied to a SOFC as a sealing composition and has a thermal expansion coefficient tailored to the stabilized zirconia used by Budd. Furthermore, this composition would inherently be stable at high operating temperatures.

Morrissey in view of Budd fails to disclose the addition of forsterite to their composition.

However, Larsen teaches the addition of refractive filler such as forsterite to a sealing composition. The addition of these fillers is to increase the TEC of the sealing glass-ceramic, as well as to improve its stability and increase its viscosity (See Paragraph [0011]-[0015]). One of ordinary skill in the art would realize the benefits of adding Forsterite to the composition of Morrissey in view of Budd, and add enough Forsterite to improve the properties of the seal. This is a matter of routine optimization, as adding filler to alter viscosity, stability, and expansion coefficient has far reaching impact on the seals of the SOFC. After adding an optimal amount of forsterite to the composition of Morrissey in view of Budd (readable on claim 1), one would attain the composition of claim 8. For these reasons, it would have been obvious for one of ordinary skill in the art to combine these three references as there is a reasonable expectation of success in making a SOFC with a good sealing composition. One of ordinary skill would have appreciated the effects of adding forsterite and the increased

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control of thermal expansion coefficient that this addition created, giving clear motivation for the combination of references.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Hoban whose telephone number is (571) 270-3585. The examiner can normally be reached on Monday - Friday from 7:30 AM to 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jerry A Lorengo/  
Supervisory Patent Examiner, Art Unit 1793

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