



US006876123B2

(12) **United States Patent**
Martinovsky et al.

(10) **Patent No.:** **US 6,876,123 B2**
(45) **Date of Patent:** **Apr. 5, 2005**

(54) **THERMOTUNNEL CONVERTER WITH SPACERS BETWEEN THE ELECTRODES**

6,064,137 A * 5/2000 Cox 310/306
6,489,704 B1 * 12/2002 Kuchеров et al. 310/306
2003/0042819 A1 * 3/2003 Martinovsky 310/306

(75) Inventors: **Artemy Martinovsky**, St. Petersburg (RU); **Avto Tavkhelidze**, Tbilisi (GE); **Isaiah Watas Cox**, London (GB)

FOREIGN PATENT DOCUMENTS

WO 99/10974 * 3/1999 H02N/10/00
WO 99/13562 * 3/1999 H02N/2/00
WO WO03/021758 * 3/2003

(73) Assignee: **Borealis Technical Limited** (GI)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 103 days.

OTHER PUBLICATIONS

Huffman, F.N. & Haq, Z. "Preliminary Investigations of a Thermotunnel Converter", (1988) 23rd Intersociety Energy Conversion Engineering Conference vol. 1, pp. 573-579.

* cited by examiner

Primary Examiner—Karl Tamai

(21) Appl. No.: **10/232,436**

(22) Filed: **Aug. 28, 2002**

(65) **Prior Publication Data**

US 2003/0042819 A1 Mar. 6, 2003

Related U.S. Application Data

(60) Provisional application No. 60/315,537, filed on Aug. 28, 2001.

(51) **Int. Cl.**⁷ **H02N 3/00**

(52) **U.S. Cl.** **310/306; 136/205**

(58) **Field of Search** 310/306, 307; 136/200, 201, 202, 205; 313/310; 376/321

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,510,397 A * 6/1950 Hansell 374/174
3,169,200 A * 2/1965 Huffman 310/306
3,173,032 A * 3/1965 Maynard 310/306
3,821,462 A * 6/1974 Kaufman et al. 174/15 C
4,188,571 A * 2/1980 Brunson 322/2 R
4,373,142 A * 2/1983 Morris 310/306
4,667,126 A * 5/1987 Fitzpatrick 310/307
5,994,638 A * 11/1999 Edelson 136/205

(57) **ABSTRACT**

A thermotunneling converter is disclosed comprising a pair of electrodes having inner surfaces substantially facing one another, and a spacer or plurality of spacers positioned between the two electrodes, having a height substantially equal to the distance between the electrodes, and having a total cross-sectional area that is less than the cross-sectional area of either of the electrodes. In a preferred embodiment, a vacuum is introduced, and in a particularly preferred embodiment, gold that has been exposed to cesium vapor is used as one or both of the electrodes. In a further embodiment, the spacer is made of small particles disposed between the electrodes. In a yet further embodiment, a sandwich is made containing the electrodes with an unoxidized spacer. The sandwich is separated and the spacer is oxidized, which makes it grow to a required height whilst giving it insulatory properties, to allow for tunneling between the electrodes.

52 Claims, 7 Drawing Sheets

