



US007893422B2

(12) **United States Patent**
Tavkhelidze

(10) **Patent No.:** **US 7,893,422 B2**

(45) **Date of Patent:** **Feb. 22, 2011**

(54) **TRANSISTOR ON THE BASIS OF NEW QUANTUM INTERFERENCE EFFECT**

(58) **Field of Classification Search** 257/9,
257/14
See application file for complete search history.

(75) Inventor: **Avto Tavkhelidze**, Tbilisi (GE)

(56) **References Cited**

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

U.S. PATENT DOCUMENTS

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 151 days.

4,888,622 A * 12/1989 Ishibashi et al. 257/31
5,497,015 A * 3/1996 Ishibashi et al. 257/287
5,682,041 A * 10/1997 Kawakubo et al. 257/38
7,166,786 B2 * 1/2007 Tavkhelidze et al. 216/54

* cited by examiner

(21) Appl. No.: **12/075,943**

Primary Examiner—Douglas M Menz

(22) Filed: **Mar. 13, 2008**

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2008/0224124 A1 Sep. 18, 2008

A quantum interference transistor comprising a thin metal film having a protrusion and a thin insulating layer between the metal film and protrusion. A potential barrier is formed in the region beneath the protrusion as a result of quantum interference caused by the geometry of the film and protrusion. A voltage applied between the electrically isolated protrusion (“island”) and the thin film leads to a change in the electron wave function of the island which in turn leads to a change in the Fermi level of the metal film in the entire region beneath the protrusion. Consequently, a potential barrier may or may not exist depending on the applied voltage, thus providing the present invention with the transistor-like property of switching between open and closed states.

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/901,549, filed on Sep. 18, 2007, now Pat. No. 7,566,897.

Foreign Application Priority Data

(30) Mar. 13, 2007 (GB) 0704784.8

(51) **Int. Cl.**
H01L 29/06 (2006.01)

12 Claims, 1 Drawing Sheet

(52) **U.S. Cl.** 257/9; 257/14

