

US008287247B2

US 8,287,247 B2

Oct. 16, 2012

(12) United States Patent

Bonucci et al.

(54) COMBINED PUMPING SYSTEM COMPRISING A GETTER PUMP AND AN ION PUMP

(75) Inventors: Antonio Bonucci, Milan (IT); Andrea

Conte, Milan (IT); Paolo Manini, Milan

(IT)

(73) Assignee: SAES Getters S.p.A., Lainate (MI) (IT)

(*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

(21) Appl. No.: 13/202,890

(22) PCT Filed: Mar. 9, 2010

(86) PCT No.: **PCT/EP2010/052975**

§ 371 (c)(1),

(2), (4) Date: Sep. 15, 2011

(87) PCT Pub. No.: WO2010/105944

PCT Pub. Date: Sep. 23, 2010

(65) **Prior Publication Data**

US 2012/0014814 A1 Jan. 19, 2012

(30) Foreign Application Priority Data

Mar. 17, 2009 (IT) MI2009A0402

(51) Int. Cl.

F04B 37/02 (2006.01) **F04F 99/00** (2009.01)

 $\textbf{(58)} \quad \textbf{Field of Classification Search} \ \dots \dots \ 417/48,$

See application file for complete search history.

(56) References Cited

(10) Patent No.:

(45) Date of Patent:

U.S. PATENT DOCUMENTS

2,993,638 A	* 7/1961	Helmer et al 417/49
3,327,929 A	6/1967	Dillenbeck et al.
3,377,499 A	4/1968	Lloyd
5,221,190 A	6/1993	Romer et al.
5,324,172 A	6/1994	Manini et al.
5,993,165 A	11/1999	Lorimer et al.
6,074,171 A	* 6/2000	Giannantonio et al 417/51
6,149,392 A	* 11/2000	Conte 417/51
6,309,184 B1	* 10/2001	Moraja et al 417/51
7,635,943 B2	* 12/2009	Kamio et al 313/7
2006/0231773 A1	10/2006	Katagiri et al.

FOREIGN PATENT DOCUMENTS

EP	0719609	3/1996	
GB	2164788	3/1986	
JP	58-117371	7/1983	
	(Continued)		

OTHER PUBLICATIONS

PCT International Search Report issued for PCT Application No. PCT/EP2010/052975 filed Mar. 9, 2010 in the name of SAES Getters

(Continued)

Primary Examiner — Devon Kramer Assistant Examiner — Bryan Lettman (74) Attorney, Agent, or Firm — Steinfl & Bruno LLP

(57) ABSTRACT

A combined pumping system comprising a getter pump and an ion pump is described. The getter pump and the ion pump are mounted in series on a same flange and are respectively arranged on opposite sides thereof so that both getter and ion pumps conductance are maximized towards gas flux sources in a vacuum chamber in order to improve the vacuum level of the system.

11 Claims, 4 Drawing Sheets



