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Sexton et al.

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(54) **METHOD FOR IMPROVING LUNG DELIVERY OF PHARMACEUTICAL AEROSOLS**

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4,734,646 A	3/1988	Shenoy et al.	
4,926,852 A	5/1990	Zoltan et al.	
5,040,527 A	8/1991	Larson et al.	
5,203,323 A	4/1993	Tritle	
5,311,131 A	5/1994	Smith	
5,320,094 A	6/1994	Laube et al.	
5,364,838 A	11/1994	Rubsamen	
5,419,315 A	5/1995	Rubsamen	
5,427,089 A	6/1995	Kraemer	
5,494,030 A	* 2/1996	Swartz et al.	324/316
5,672,581 A	9/1997	Rubsamen et al.	
5,694,934 A	12/1997	Edelman	
5,789,921 A	* 8/1998	Albert et al.	324/300
5,988,168 A	11/1999	Bair	

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OTHER PUBLICATIONS

Fleming J.S. et al., "Three-Dimensional Description of Pulmonary Deposition of Inhaled Aerosol Using Data From Multimodality Imaging", *Journal of Nuclear Medicine*, vol. 37, No. 5, May 1996 pp. 873-877.

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(57) **ABSTRACT**

(60) Provisional application No. 60/194,235, filed on Apr. 3, 2000.

Disclosure is made of a method employing real-time imaging techniques such as Magnetic Resonance Imaging in order to investigate the effect of air way structures or administration and respiratory drugs when administered by oral inhalation. The information obtained from the practice of this method yields the criteria that can be used, among other things, to design more efficient aerosol drug delivery systems which optimize the amount of medicine delivered to the lung.

(51) **Int. Cl.**⁷ **A61B 5/05**

(52) **U.S. Cl.** **600/420; 128/922**

(58) **Field of Search** 600/420, 419, 600/410, 398, 407; 128/922

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,642,778 A 2/1987 Hieftje et al.

14 Claims, 11 Drawing Sheets

