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(54) **INTERACTIVE SIMULATION OF A PNEUMATIC SYSTEM**

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 561 days.

4,964,804	A *	10/1990	Carr et al. ....	434/219
5,299,568	A *	4/1994	Forare et al. ....	128/205.11
5,931,160	A *	8/1999	Gilmore et al. ....	128/204.21
6,000,396	A *	12/1999	Melker et al. ....	128/204.21
6,158,432	A *	12/2000	Biondi et al. ....	128/204.21
6,321,748	B1 *	11/2001	O'Mahoney ....	128/204.21
6,390,091	B1 *	5/2002	Banner et al. ....	128/204.21
6,450,818	B1 *	9/2002	Ogawa et al. ....	434/118
6,463,930	B1 *	10/2002	Biondi et al. ....	128/204.21
6,656,127	B1 *	12/2003	Ben-Oren et al. ....	600/532
6,969,357	B1 *	11/2005	Colman et al. ....	600/529
2005/0098178	A1 *	5/2005	Banner et al. ....	128/204.23

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**G09B 25/00** (2006.01)

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See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,828,787 A \* 5/1989 Distler et al. .... 376/245

\* cited by examiner

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(57) **ABSTRACT**

A method, system and apparatus for simulating a pneumatic system. The method can include dividing a pneumatic system into logical component sections. Each of the logical component sections can be visually rendered in a graphical user interface. Also, user modification of control element settings in the logical component sections can be permitted. Subsequently, gas flows within the logical component sections can be animated using individually rendered gas molecule icons coupled to corresponding animation scripts. Each of the scripts can determine an animation direction and animation rate for a corresponding one of the gas molecule icons. In particular, the actual pneumatic system can be an anesthesia machine.

**33 Claims, 7 Drawing Sheets**

