Respiratory Metering with Integrated MEMS Flow Sensor

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Precise respiratory measurement is desired for the state-of-the art healthcare technology. In addition to the often pulsed flowrate, the human respiratory contains mainly oxygen and carbon dioxide where the variation of the composition is also an indication of the metabolism state of a human being which is particularly important in critical intensive care practice. These desired data are however still unavailable instantly with current technologies. In this paper, a composite MEMS mass sensor was presented to accurately and simultaneously measure the volumetric and mass flowrate as well as the composition of respiratory with integration of a calorimetric mass flow sensor, a thermal time-of-flight sensor and a thermal conductivity sensor. The design, experimental data as well as field test data are presented. The data acquired by this multifunctional sensor can provide all medical parameters needed in less than 10 milliseconds. This composite sensor is particularly useful for the improvement of the functionality and performance for the massively deployed consumer class medical assisting equipment for CPAP (continuous positive airway pressure) patients.