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(54) **MANIPULATION OF FLUIDS AND REACTIONS IN MICROFLUIDIC SYSTEMS**

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USPC 422/502–505
See application file for complete search history.

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(57) **ABSTRACT**

Microfluidic structures and methods for manipulating fluids and reactions are provided. Such structures and methods may involve positioning fluid samples, e.g., in the form of droplets, in a carrier fluid (e.g., an oil, which may be immiscible with the fluid sample) in predetermined regions in a microfluidic network. In some embodiments, positioning of the droplets can take place in the order in which they are introduced into the microfluidic network (e.g., sequentially) without significant physical contact between the droplets. Because of the little or no contact between the droplets, there may be little or no coalescence between the droplets. Accordingly, in some such embodiments, surfactants are not required in either the fluid sample or the carrier fluid to prevent coalescence of the droplets. Structures and methods described herein also enable droplets to be removed sequentially from the predetermined regions.

25 Claims, 18 Drawing Sheets