Directing Motion of Droplets Using Differential Wetting

ABSTRACT

Apparatus for controlling motion of liquid droplets. A set of electrode pads is arranged to define one or more tracks over which liquid droplets may be induced to move over a sequence of the electrode pads. A surface over the electrode pads is dielectric, smooth, and slippery to the droplets. In some cases, the smooth surface is formed as a thin layer of a second liquid that is immiscible with the liquid of the droplets. The surface has wetting affinity to the liquid that can be individually varied in a controlled manner by application of voltage to respective electrode pads. A control is designed to alter the wetting characteristic of varying-wettability portions of the surface over respective electrode pads to effect induced motion of the droplets over the surface. The apparatus is designed with the smooth hydrophobic surface open, with no overlying or facing electrode or plate above the droplets.

Figs. 10A, 10B, 10C