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- (54) **SURFACE-MICROMACHINED MICROFLUIDIC DEVICES**
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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 143 days.

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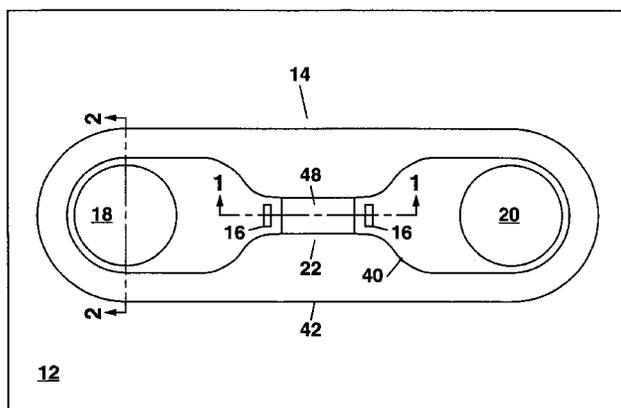
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- (52) **U.S. Cl.** **204/600; 204/601; 204/606; 204/660**
- (58) **Field of Search** **204/600, 601, 204/606, 660**

(57) **ABSTRACT**

Microfluidic devices are disclosed which can be manufactured using surface-micromachining. These devices utilize an electroosmotic force or an electromagnetic field to generate a flow of a fluid in a microchannel that is lined, at least in part, with silicon nitride. Additional electrodes can be provided within or about the microchannel for separating particular constituents in the fluid during the flow based on charge state or magnetic moment. The fluid can also be pressurized in the channel. The present invention has many different applications including electrokinetic pumping, chemical and biochemical analysis (e.g. based on electrophoresis or chromatography), conducting chemical reactions on a microscopic scale, and forming hydraulic actuators.

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53 Claims, 12 Drawing Sheets



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