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(54) **SYSTEM AND METHODS FOR ACTUATION USING ELECTRO-OSMOSIS**

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See application file for complete search history.

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(57) **ABSTRACT**

The invention exploits a widely used device in microfluidics, the electro-osmotic pump (EOP), to create very low energy micro-scale and macro-scale mechanical actuators. The EOP uses electrical fields to move naturally occurring charged particles (ions) through a fluid medium. As the ions move in response to the applied field, they drag the (non-charged) fluid along, establishing bulk flow. When confined to a narrow chamber, a pressure gradient can be established. The combination of pressure gradient and flow performs mechanical work. With the use of electro-osmotic pumps, the invention enables actuators to be constructed in a variety of embodiments, including for example, a sheet structure, a piston structure, and a cellular structure to name a few.

12 Claims, 4 Drawing Sheets