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**A coin vibrational motor swimming at low Reynolds number** ALICE QUILLEN, HESAM ASKARI, DOUG KELLEY, Univ of Rochester, TAMAR FRIEDMANN, Smith College, PATRICK OAKES, Univ of Rochester — Low-cost coin vibrational motors, used in haptic feedback, exhibit rotational internal motion inside a rigid case. Because the motor case motion exhibits rotational symmetry, when placed into a fluid such as glycerin, the motor does not swim even though its oscillatory motions induce steady streaming in the fluid. However, a piece of rubber foam stuck to the curved case and giving the motor neutral buoyancy also breaks the rotational symmetry allowing it to swim. We measured a 1 cm diameter coin vibrational motor swimming in glycerin at a speed of a body length in 3 seconds or at 3 mm/s. The swim speed puts the vibrational motor in a low Reynolds number regime similar to bacterial motility, but because of the oscillations of the motor it is not analogous to biological organisms. Rather the swimming vibrational motor may inspire small inexpensive robotic swimmers that are robust as they contain no external moving parts. A time dependent Stokes equation planar sheet model suggests that the swim speed depends on a steady streaming velocity that depends on the streaming Reynolds number.

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