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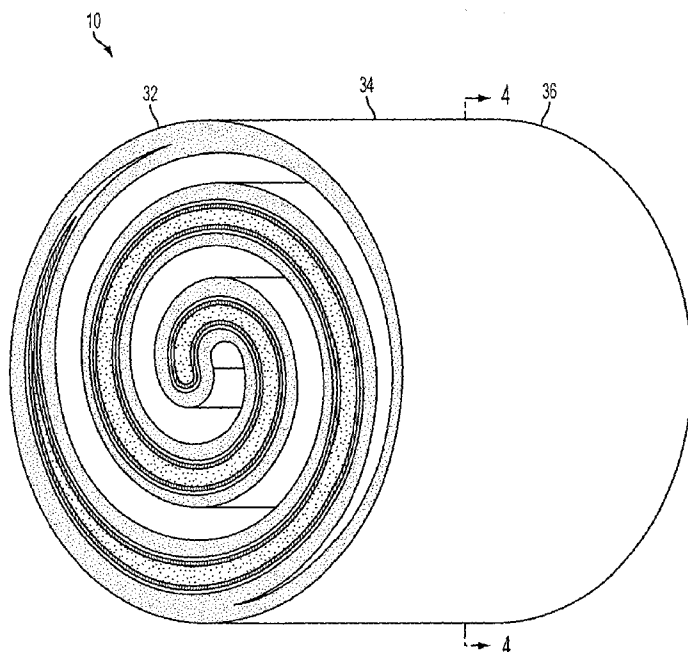


FIG. 3

(57) Abstract: The present teachings relate to an electrochemical cell having a closed Fermat spiral shape. The electrochemical cell comprises an anode, a cathode, an electrolyte, a fuel channel, an oxidant channel, and optionally a reforming layer. The electrochemical cell can be made through extrusion, gel-casting, or 3-D printing. The electrochemical cell can be a solid oxide fuel cell.