



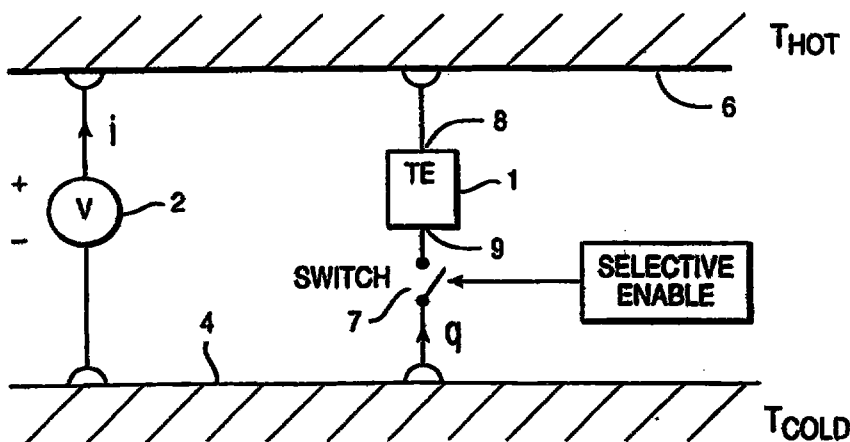
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(54) Title: THERMOELECTRIC COOLING APPARATUS WITH DYNAMIC SWITCHING TO ISOLATE HEAT TRANSPORT MECHANISMS



(57) Abstract

Apparatus and method for sub-ambient cooling using thermoelectric element dynamics in conjunction with pulsed electrical power and selectively enabled thermal coupling to the cold sink. In one form, Peltier devices (1) are dynamically enabled using pulses of electrical power while the thermal path between the cold side of the Peltier device (1) and the cold sink (4) is selectively switched in relative synchronism between conductive states responsive to the dynamics of the Peltier device temperatures. Switched coupling of the thermal connection between the cold sink (4) and the Peltier device materially improves efficiency by decoupling Joule heating and conductive heat transfer losses otherwise conveyed from the Peltier device. Preferable implementations utilize MEMS to accomplish the selective thermal switching, whereby sub-ambient cooling capacity is increased by parallel operation of multiple Peltier devices and MEMS switches.