

THERMOELECTRIC COOLING WITH PLURAL DYNAMIC SWITCHING TO ISOLATE HEAT TRANSPORT MECHANISMS

ABSTRACT

Apparatus and method for sub-ambient cooling using thermoelectric element dynamics in conjunction with pulsed electrical power and multiple selectively enabled thermal switches. In one form, Peltier devices (1) are dynamically enabled using pulses of electrical power while the thermal paths, between the cold and hot sides (12,11 respectively) of the device (1) are selectively switched conduction state responsive to the temperature dynamics within the Peltier device. Switched coupling of the thermal connections in relative synchronism to the Peltier device electrical and thermal dynamics materially improves efficiency by decoupling Joule heating and conductive heat transfer losses otherwise affecting the net heat transfer. Preferable implementations utilizes MEMS to accomplish the selective switching, whereby sub-ambient cooling capacity is increased by parallel operation of multiple Peltier devices and MEMS switches (23,24).

Fig 2