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(54) **COOLING MODULE WITH INTEGRATED PUMP FOR IMMERSION COOLING IN ELECTRONICS**

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(57) **ABSTRACT**

Embodiments of the present invention provide a cooling module for cooling heat-generating electronic devices in an immersion cooling system. The cooling module includes an integrated pump, which draws immersion fluid from the surrounding dielectric bath and drives it into a pressurized plenum to pressurize the coolant fluid and drive the pressurized coolant fluid through a nozzle plate containing a microconvective nozzle array. The array accelerates the fluid to produce a multiplicity of microjets that impinge on a surface of the heat-generating electronic device to be cooled. The effluent from the cooling module may be directed to flow into and wash over nearby heat-generating devices to help cool the nearby heat-generating devices. The effluent may also be directed to the inlets of daughter cooling modules attached to other heat-generating electronic devices. In some embodiments, cooling modules of the present invention may include fluid collection and fluid discharge manifolds that may be configured and arranged to target specific regions of an immersion bath that might otherwise become relatively stagnant, thereby enhancing overall system circulation and convective environment for other nearby server components. In some embodiments, cooling modules of the present invention may include daughter cooling modules connected to the pressurized inlet plenum of the parent cooling module pressurized by its coolant pump. The addition of the cooling module to immersion bath cooling systems achieves much higher rates of cooling than can be achieved with immersion baths alone.