TECHNOLOGY

Flat Thin, Orientation Independent Thermosyphon Heat Spreader

OVERVIEW

Current technology for cooling electronics in thin space enclosures such as portables, involves metal plates to spread heat. Very high effective thermal conductivity can be achieved by employing liquid-vapor phase change to transport heat from the evaporator to the condenser. This concept can be exploited to create thin thermal spreader plates based on two-phase flow. Specifically, thermosyphons and heat pipes, which employ a phase-change mechanism for heat transfer, have been implemented in the thermal management of electronic systems.

Thermosyphons are fluid filled, closed loop devices that incorporate an interconnected evaporator and condenser. The performance of a passive thermosyphon requires that the condenser unit be located above the evaporator, which is not always a desirable or practical configuration in the cooling of electronic systems. Heat pipes are hollow sealed devices containing a working fluid and a wick structure. Heat is transferred from electronic packages to the working fluid at one end of the heat pipe, and then carried by the working fluid to the other end of the pipe where it is rejected to the environment. Although the use of heat pipes in the cooling of electronic and semiconductor devices is common, it is often desirable to surpass the performance limits of conventional heat pipe designs.

Researchers at the University of Maryland have developed a novel cooling apparatus for heat dissipating components. Specifically, they have designed a phase-change thermosyphon system for cooling of electronic systems that enables operation in any orientation with respect to the gravitational field. The orientation independent nature of the invention overcomes limitations regarding the applicability of thermosyphons, which require that the condenser be placed on top of the evaporator at all times, and the employment of boiling heat transfer as the phase change mechanism pushes the performance envelope of the present design beyond that of heat pipe limits. The invention results in an enhanced evaporator through the use of micromachined porous surfaces, and provides an improved mechanism for cooling electronic components in space-constrained applications. The compact geometry and the high thermal performance achieved by the thermosyphon design make it an attractive candidate for many modern day high-density electronic applications with space constraints.

For additional information, please contact the Office of Technology Commercialization, University of Maryland. Telephone: (301) 405-3947. E-mail: otc@umd.edu

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Additional Information

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PATENT STATUS

Issued

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Industrial Processing

EXTERNAL RESOURCES

- US Patent 7,556,086

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