Centro Italiano Ricerche Aerospaziali

AN ADAPTIVE HEAT EXCHANGE PIN FOR A HEAT SINK, AND HEAT SINK HAVING SUCH AN ADAPTIVE HEAT EXCHANGE PIN

Summary:

The invention relates to an adaptive pin for the thermal management of electrical and electromechanical devices. The pin incorporates a central shape memory alloy (SMA) element that contracts when the temperature exceeds a predefined threshold, pulling a cap connected to an outer metallic structure composed of elongated segments. The resulting compression alters the geometry of the pin, increasing its heat exchange surface area and thereby enhancing heat dissipation.

Benefits:

The system improves heat dissipation performance while simultaneously providing a direct indication of thermal rise within the system.

Problem Addressed:

The present application pertains to thermal management systems, including heat sinks, and more specifically to structures and configurations to enhance heat transfer performance in electrical and electromechanical devices, such as power electronic converters.

Proposed use:

The invention is directed to improving heat transfer efficiency through the adaptive modification of thermal management pins' geometry in response to temperature variations, to maintain optimal operating conditions and enhance controlled device thermal stability.

Technology overview:

The invention relates to a heat sink incorporating adaptive pins made by a shape memory alloy (SMA). When the temperature exceeds a predefined threshold, a central SMA element contracts, elastically deforming the surrounding metallic structure and increasing the effective heat transfer surface area, enhancing heat dissipation. The pins' deformation is visually detectable, allowing operators to identify overheating conditions and plan maintenance activities. Moreover, the condition of the device can be monitored through measurements of variations in the system's electrical resistivity.

Reference Project:

H2020 ORCHESTRA

Intellectual property information:

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