



A System and Method for a Heat Transfer Device with enhanced efficiency and thermal management

IITM Technology Available for Licensing

Problem Statement

- Generally, thermal management plays a vital role in maintaining optimum operating temperatures for components such as lithium-ion batteries in electric vehicles, where **excess heat can negatively impact performance and lifespan**.
- Further, existing systems **do not succeed** in adequately addressing the **heat dissipation requirements** of these advanced technologies and often fall short of efficiently managing the high heat fluxes generated by modern electronic devices.
- Other existing systems have tried to address said problem.
- Present invention addresses above issues in efficient manner.

Technology Category/ Market

Technology: System and Method for a Heat Transfer Device;

Industry & Applications: Petrochemical, Electric Power & Metallurgy, Shipbuilding Industry

Market: The global heat transfer equipment Market is projected to grow **\$21.40B** at a **CAGR** of **4.4%** during the period **(2024-31)**.

Technology

- Present invention describes a **heat transfer device and method** designed for efficient thermal management & high heat dissipation.
- (Refer figs 1 & 2)
- It consists of a **flat plate** with **mini channels** forming a closed loop for a working fluid to flow through.
- A heat dissipation unit is connected to the flat plate to transfer heat to the environment.
- The mini channels have a super hydrophilic coating to **enhance thin film evaporation & boiling heat transfer**.

- The device further comprises a heat source & the **mini channels** which can have different shapes. (Refer fig 3)
- A cover plate is attached to the flat plate to create a vacuum-tight seal. There's also a port for filling and evacuating the working fluid & a sensor unit to monitor temperature & pressure.
- Various working fluids can be used.

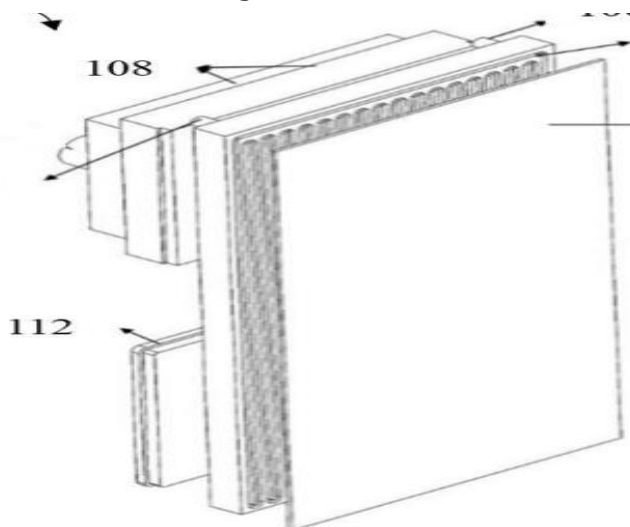


Fig.1 shown a

Intellectual Property

IITM IDF Ref. 2532;
IN Patent No. 511897 (Granted)

TRL (Technology Readiness Level)

TRL-4, Proof of Concept ready, tested and validated in Laboratory

Research Lab

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Key Features / Value Proposition

❖ Technical Perspective:

Efficient Techniques:

- The claimed invention enabling **enhanced performance, improved reliability, and extended** lifespan for electronic components and energy storage systems.
- Facilitates **improved** heat dissipation & thermal regulation in energy-intensive devices.

Heat Transfer Device:

- The claimed heat transfer device that utilizes liquid-vapour phase change, such as **boiling and condensation**, for **efficient** heat transfer.

Improved Performance:

- Enhance the overall performance and reliability of electronic components and systems by effectively managing their thermal characteristics.

Other Key Features:

- Additional features like **fins, thermal paste, & different types of heat dissipation units** can be included.
- The **materials** used for the device are typically **copper or aluminum**.
- The **inner surface** of the **mini channels** which is coated with a **super hydrophilic coating** to facilitate **thin film evaporation and improve boiling heat transfer process** occurring within the mini channels

Test Results (Experimental Data)

- A significant reduction in overall resistance (by **62%**) and temperature (by **53°C**) when tested at **200W-240W**.

❖ Industrial Perspective:

Utility:

- Provides a versatile heat transfer device that can be implemented in various applications, such as **electronic devices, electric vehicles, & other energy-intensive systems**.

Images

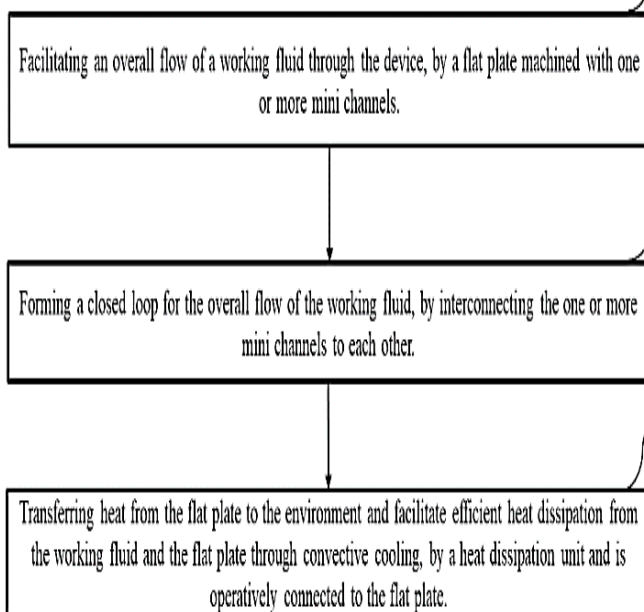


FIG.2(above): Illustrates a flow chart of a method for a heat transfer device

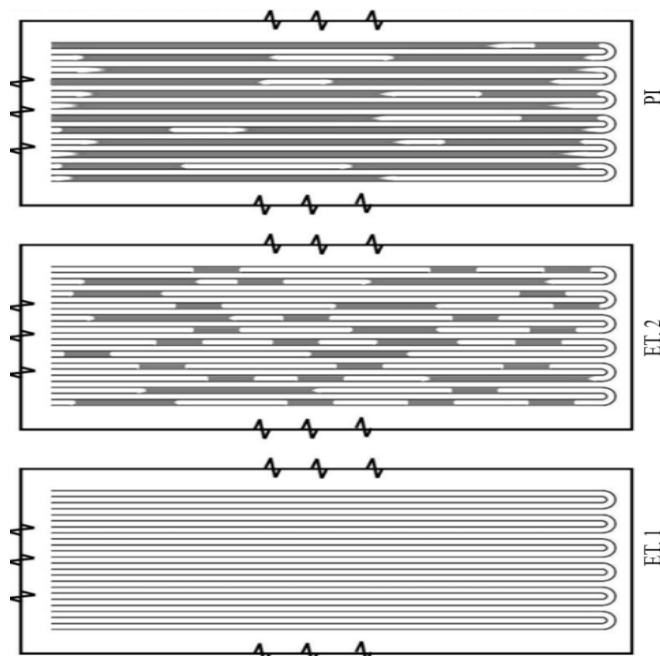


FIG.3: Illustrates different heat-transferring devices tested comprising existing technologies (ET) and the present invention (PI),

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