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(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2022/0369513 A1****Franz et al.**(43) **Pub. Date: Nov. 17, 2022**(54) **TEMPERATURE CONTROL OF CLOSELY
PACKED ELECTRONIC ASSEMBLIES**(52) **U.S. Cl.**
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1/0201 (2013.01); *H05K 5/0213* (2013.01)(71) Applicant: **HEWLETT PACKARD
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Ernesto Ferrer, Aguadilla (PR)(21) Appl. No.: **17/237,732**(22) Filed: **Apr. 22, 2021****Publication Classification**(51) **Int. Cl.**
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H05K 5/02 (2006.01)(57) **ABSTRACT**

A thin, single-layer thermally conductive jacket surrounds a PCA. One or more living springs integrated in the jacket exert compressive force on PCA components where cooling is desired. The compressive force creates and maintains a thermal contact through which heat is conducted out of the PCA components and into the jacket. The jacket conducts the heat (either directly or indirectly) to a liquid-cooled cold plate configured as a cooling frame surrounding one or more of the jacketed PCAs. The jacket, optionally through intermediate thermal transfer devices such as heat spreaders or heat pipes, transfers heat from components on the PCA to the cooling frame. Liquid flowing through the cooling frame's internal channels convects the heat out of the electronic device. Turbulence encouraged by turbulence enhancing artifacts including bends and shape-changes along the internal channels increases the efficiency of the convection.

