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(54) Title: FLIP CHIP AND PRE-MOLDED CLIP POWER MODULES

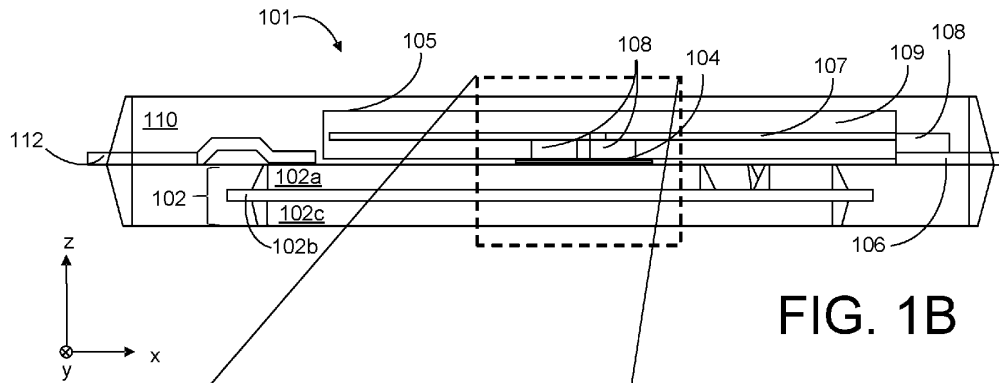


FIG. 1B

(57) **Abstract:** Devices and methods are disclosed for high power inverter modules (100) with enhanced thermal and mechanical performance, for use in electric vehicles. The disclosed devices feature enlarged clips (108) that cover an entire die (104), to distribute mechanical forces, thus preventing die cracks for improved reliability. In these power modules, semiconductor dies (104) are sandwiched between a three-layer direct bond metal (DBM) structure (102) and the enlarged clip. A pre-molded clip assembly (105) can be used that includes integrated metallization (107) to eliminate the need for external wire bonds. Alternatively, semiconductor dies (104) can be inverted in a flip-chip configuration (701) to face a modified DBM structure (702) that integrates the metallization (707). Simulations of the disclosed power inverters indicate improved efficiency in dissipating heat.

[Continued on next page]

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