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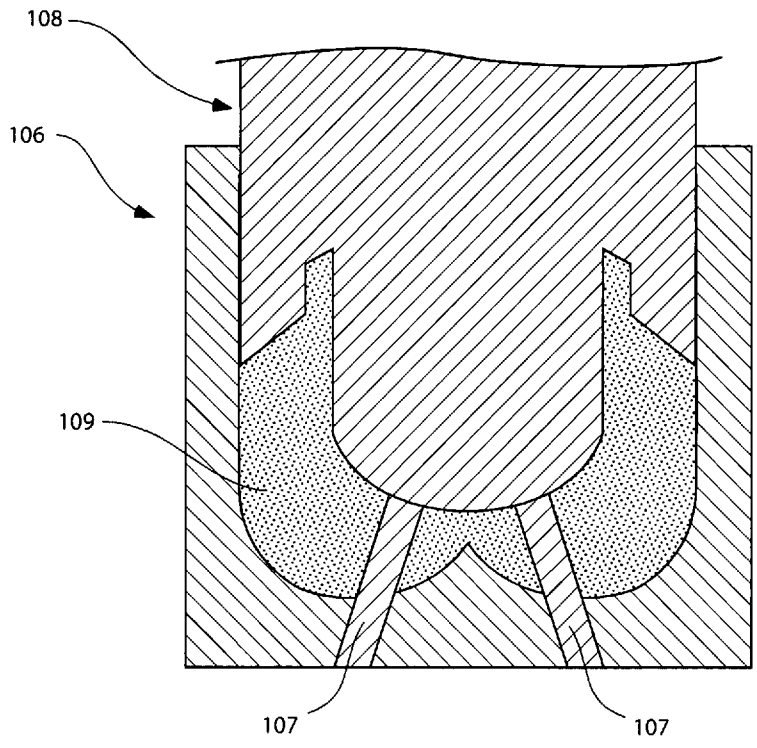
(54) Title: EARTH-BORING ROTARY DRILL BITS INCLUDING BIT BODIES HAVING BORON CARBIDE PARTICLES IN ALUMINUM OR ALUMINUM-BASED ALLOY MATRIX MATERIALS, AND METHODS FOR FORMING SUCH BITS



(57) Abstract: Rotary drill bits (10) for drilling subterranean formations include a bit body (12) and at least one cutting structure (34) disposed on a face (18) thereof. The bit body includes a crown region (14) comprising a particle-matrix composite material (52) that includes a plurality of boron carbide particles (50) dispersed throughout an aluminum or aluminum-based alloy matrix material. In some embodiments, the matrix material may include a continuous solid solution phase and a discontinuous precipitate phase. Methods of manufacturing rotary drill bits for drilling subterranean formations include infiltrating a plurality of boron carbide particles with a molten aluminum or aluminum-based material. In additional methods, a green powder component is provided that includes a plurality of particles each comprising boron carbide and a plurality of particles each comprising aluminum or an aluminum-based alloy material. The green powder component is at least partially sintered to provide a bit body, and a shank is attached to the bit body.

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