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(54) **HIGH PERFORMANCE SRF ACCELERATOR STRUCTURE AND METHOD**

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(57) **ABSTRACT**

A high performance accelerator structure and method of production. The method includes precision machining the inner surfaces of a pair of half-cells that are maintained in an inert atmosphere and at a temperature of 100 K or less. The method includes removing thin layers of the inner surfaces of the half-cells after which the roughness of the inner surfaces in measured with a profilimeter. Additional thin layers are removed until the inner surfaces of the half-cell measure less than 2 nm root mean square (RMS) roughness over a 1 mm^2 area on the profilimeter. The two half-cells are welded together in an inert atmosphere to form an SRF cavity. The resultant SRF cavity includes a high accelerating gradient (E_{acc}) and a high quality factor (Q_0).

7 Claims, 3 Drawing Sheets