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(54) **SURFACE ACOUSTIC WAVE FILTER WITH A CAP LAYER FOR IMPROVED RELIABILITY**

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(57) **ABSTRACT**

Embodiments of a Surface Acoustic Wave (SAW) device, or filter, and methods of fabrication thereof are disclosed. In some embodiments, the SAW filter comprises a piezoelectric substrate and an Interdigitated Transducer (IDT) on a surface of the piezoelectric substrate. The IDT includes multiple fingers, each comprising a metal stack. The SAW filter further includes a cap layer on a surface of the IDT opposite the piezoelectric substrate and on areas of the surface of the piezoelectric substrate exposed by the IDT. The cap layer has a thickness in a range of and including 10 to 500 Angstroms and a high electrical resistivity (and thus a low electrical conductivity). For instance, in some embodiments, the electrical resistivity of the cap layer is greater than 10 kilo-ohm meters (KΩ·m). The SAW filter further includes an oxide overcoat layer on a surface of the cap layer opposite the IDT and the piezoelectric substrate.

18 Claims, 8 Drawing Sheets