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(19) **United States**(12) **Patent Application Publication**  
**Yantchev**(10) **Pub. No.: US 2022/0407495 A1**(43) **Pub. Date: Dec. 22, 2022**(54) **XBAR DEVICES WITH EXCESS  
PIEZOELECTRIC MATERIAL REMOVED**(71) Applicant: **Resonant Inc.**, Austin, CA (US)(72) Inventor: **Ventsislav Yantchev**, Sofia (BG)(21) Appl. No.: **17/894,001**(22) Filed: **Aug. 23, 2022****Related U.S. Application Data**

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(57)

**ABSTRACT**

A filter device has a substrate with a first cavity and a second cavity on a single die; and a bonding layer formed on the substrate but not spanning the first cavity or the second cavity. A piezoelectric plate is bonded to the bonding layer and spans the first and the second cavity. However, excess portions of piezoelectric plate are removed that extend a certain length past the perimeter of the first cavity and of the second cavity. Excess portions may be piezoelectric material that extends in the length and width direction past the perimeter of a cavity by more than between 2 and 25 percent of the cavity perimeter. An interdigital transducer (IDT) is on a front surface of the piezoelectric plate and having interleaved fingers over the first cavity.

