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**Blum et al.**

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(54) **HERMETICALLY SEALED IMPLANTABLE OPTHALMIC DEVICES AND METHODS OF MAKING SAME**

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(58) **Field of Classification Search**  
CPC combination set(s) only.  
See application file for complete search history.

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(57) **ABSTRACT**

Many modern implantable ophthalmic devices include electronic components, such as electro-active cells, that can leak harmful substances into the eye and/or surrounding tissue. In the implantable ophthalmic devices disclosed herein, electronic components are hermetically sealed within cavities formed by bonding together two or more glass wafers. Bonding the glass wafers together with laser fusion bonding, pressure bonding, or anodic bonding creates a seal that leaks at a rate of less than about  $5 \times 10^{-12}$  Pa m<sup>3</sup> s<sup>-1</sup> when subjected to a helium leak test. Hermetically sealed feedthroughs formed of conductive material running through channels in the wafers provide electrical connections to components inside the sealed cavities. In some cases, the conductive material has a coefficient of thermal expansion (CTE) that is roughly equal to (e.g., within 10% of) the CTE of the glass wafers to minimize leakage due to thermally induced expansion and contraction of the conductive material and the glass wafer.

**15 Claims, 14 Drawing Sheets**

