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Galle et al.

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(54) **DAMAGE TOLERANT CASING HANGER SEAL**

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277/511, 529, 530, 531
See application file for complete search history.

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 13 days.

(Continued)

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(51) **Int. Cl.**

(57) **ABSTRACT**

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- E21B 33/04** (2006.01)
- F16J 15/20** (2006.01)
- F16J 15/26** (2006.01)
- F16J 15/16** (2006.01)
- F16J 15/18** (2006.01)

A seal assembly is inserted within an annulus between inner and outer coaxially disposed annular members having a common axis. The seal assembly includes a seal stack having a compliant element sandwiched between two anti-extrusion elements that contain the flow of the compliant element. The seal assembly also includes a sealing ring and a locking ring coupled to the sealing ring. The seal assembly also includes an energizing ring configured to be moved axially in a first direction by a ring tool to apply an axial force to the locking ring, which in turn acts on the sealing ring to radially deform the sealing ring into sealing engagement with the annular members. Continued axial movement of the locking ring in the first direction radially deforms the locking ring into locking engagement with the annular members.

(52) **U.S. Cl.**

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(58) **Field of Classification Search**

CPC E21B 33/03; E21B 33/035; E21B 33/04; E21B 33/043

20 Claims, 6 Drawing Sheets

