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(54) **POSITIONLESS EXPANDING LOCK RING FOR SUBSEA ANNULUS SEALS FOR LOCKDOWN**

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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 501 days.

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Primary Examiner — David Andrews

(65) **Prior Publication Data**

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(51) **Int. Cl.**
E21B 33/04 (2006.01)

(57) **ABSTRACT**

(52) **U.S. Cl.**
USPC **166/379**; 166/208; 166/368

Wellhead assemblies, seal assemblies, and methods of locking down an annulus seal disposed within an annulus between outer and inner wellhead members, are provided. A seal assembly is positioned in an annulus. An energizing member is axially translated downward to energize an annulus seal element and outwardly radially compress a high-strength lockdown member into contact with an inner diameter surface of a wellhead member. The wellhead member can include a set of wickers. During compression, the outer diameter surface of the lockdown member is plastically deformed onto the set of wickers.

(58) **Field of Classification Search**
USPC 166/379, 75.14, 75.13, 368, 85.3, 208; 277/323, 328

See application file for complete search history.

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21 Claims, 6 Drawing Sheets

