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**Terrill et al.**

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(54) **POLYAXIAL LOCKING MECHANISM**

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CPC ..... **A61B 17/8057** (2013.01); **A61B 17/8605** (2013.01); **A61B 17/866** (2013.01)

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(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,147,361 A 9/1992 Ojima et al.  
5,520,690 A 5/1996 Errico et al.  
(Continued)

FOREIGN PATENT DOCUMENTS

CN 105555213 A 5/2016  
DE 4343117 A1 6/1995  
(Continued)

OTHER PUBLICATIONS

"International Application Serial No. PCT/US2014/050712, International Search Report mailed Feb. 6, 2015", 3 pgs.

(Continued)

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(57) **ABSTRACT**

A bone plate system comprises a bone plate including a first surface and a second surface, the bone plate including at least one threaded aperture, the threaded aperture being tapered between the first surface and the second surface. The bone plate system further comprises at least one fastener including an elongate shaft and a threaded head, the threaded head being tapered between a proximal end of the threaded head and a distal end of the threaded head, wherein a plurality of circumferentially spaced recesses are formed in the threaded head and define a plurality of threaded tabs. The at least one fastener is configured for insertion within the at least one threaded aperture at a plurality of different insertion angles while achieving a locking engagement between the threaded head and the threaded aperture.

**20 Claims, 10 Drawing Sheets**

