

**United States Patent** [19][11] **4,171,544****Hench et al.**[45] **Oct. 23, 1979**

- [54] **BONDING OF BONE TO MATERIALS PRESENTING A HIGH SPECIFIC AREA, POROUS, SILICA-RICH SURFACE**
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- [51] Int. Cl.<sup>2</sup> ..... **A61F 1/24; A61B 17/18; C03C 3/04; C03C 3/22**
- [52] U.S. Cl. .... **3/1.9; 3/1.912; 128/92 C; 128/92 B; 128/92 D; 32/10 A; 106/52; 106/40 R; 156/89; 156/325**
- [58] Field of Search ..... **106/52, 54, 40 R, 40 V, 106/39.6, 89, 85; 3/1.9, 1.91-1.913; 32/10 A; 128/92 C, 92 CA, 92 B, 92 D**

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*Primary Examiner*—O. R. Vertiz*Assistant Examiner*—Mark Bell*Attorney, Agent, or Firm*—Dennis P. Clarke[57] **ABSTRACT**

Compositions possessing a porous, high specific area, silica-rich surface, or capable of developing such a surface in vivo, form strong bonds with bone tissue. These compositions are thus excellent materials for dental and surgical implants, or the coatings thereof. Examples of such compositions include highly porous glasses and glass-ceramics comprising at least about 80 weight percent silicon dioxide, hardened inorganic cements such as Portland cement and known silicon dioxide-based biologically active glasses and glass-ceramics. Neither calcium, sodium nor phosphorus compounds are necessary ingredients. Cements which develop the above described surface characteristics in vivo form a strong bond with both bone and implant when used in the fixation of dental and surgical implants, especially those made or coated with a biologically active silicon dioxide-based glass or glass-ceramic.

**13 Claims, No Drawings**