US005614587A

United States Patent [19]

Rhee et al.

[11] **Patent Number: 5,614,587**

[45] **Date of Patent: Mar. 25, 1997**

[54] **COLLAGEN-BASED BIOADHESIVE COMPOSITIONS**

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[21] Appl. No.: **476,825**

[22] Filed: **Jun. 7, 1995**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 147,227, Nov. 3, 1993, which is a continuation-in-part of Ser. No. 922,541, Jul. 30, 1992, Pat. No. 5,328,955, which is a continuation-in-part of Ser. No. 433,441, Nov. 14, 1989, Pat. No. 5,162,430, which is a continuation-in-part of Ser. No. 274,071, Nov. 21, 1988, abandoned.

[51] **Int. Cl.**[6] **A61F 13/00**; A61B 17/04

[52] **U.S. Cl.** **525/54.1**; 602/52; 602/54; 606/229

[58] **Field of Search** 525/54.1; 602/52, 602/54; 606/229

[56] **References Cited**

U.S. PATENT DOCUMENTS

5,024,742	6/1991	Nesburn et al. .	
5,156,613	10/1992	Sawyer	606/213
5,162,430	11/1992	Rhee et al.	525/54.1
5,192,316	3/1993	Ting	623/5
5,209,776	5/1993	Bass et al.	106/124
5,219,895	6/1993	Kelman et al.	522/68
5,290,552	3/1994	Sierra et al.	424/94.64
5,328,955	7/1994	Rhee et al.	525/54.1
5,475,052	12/1995	Rhee et al.	525/54.1

FOREIGN PATENT DOCUMENTS

341007	11/1989	European Pat. Off. .
466383	1/1992	European Pat. Off. .
575273	12/1993	European Pat. Off. .
60-70972	3/1994	Japan .
WO92/13578	8/1992	WIPO .

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[57] **ABSTRACT**

Collagen-based compositions useful in the attachment of tissues, or the attachment of tissues to synthetic implant materials, are disclosed. The compositions comprise collagen crosslinked using a multifunctionally activated synthetic hydrophilic polymer. A particularly preferred composition comprises fibrillar collagen, a fiber disassembly agent, and a multifunctionally activated synthetic hydrophilic polymer. Methods are disclosed for using the compositions to effect the attachment of a native tissue to the surface of another native tissue, a non-native tissue, or a synthetic implant.

8 Claims, 3 Drawing Sheets