United States Patent [19]

Battista

[11] **4,416,814**

[45] * **Nov. 22, 1983**

[54] **PROTEIN POLYMER HYDROGELS**

[76] Inventor: **Orlando A. Battista,** 3725 Fox Hollow Rd., Fort Worth, Tex. 76109

[*] Notice: The portion of the term of this patent subsequent to Apr. 28, 1998 has been disclaimed.

[21] Appl. No.: **416,475**

[22] Filed: **Sep. 10, 1982**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 246,660, Mar. 23, 1981, Pat. No. 4,349,470, which is a continuation-in-part of Ser. No. 74,014, Sep. 14, 1979, Pat. No. 4,264,493, which is a continuation-in-part of Ser. No. 952,303, Oct. 18, 1978, abandoned.

[51] **Int. Cl.**[3] **C07G 7/00;** C08H 1/00; C08H 1/06; C08H 9/00

[52] **U.S. Cl.** ..... **260/117;** 3/1.9; 106/125; 106/135; 106/154 R; 106/161; 128/92 C; 260/112 R; 260/123.5; 260/123.7; 264/1.1; 351/160 H; 351/160 R; 351/161; 351/162; 424/177; 424/359; 424/360

[58] **Field of Search** ..... 260/112 R, 123.5, 123.7, 260/117; 106/161, 125; 264/1.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,099,562	7/1963	Rogers	260/112 R X
3,157,524	11/1964	Artandi	106/122
3,393,080	7/1968	Erdi et al.	260/123.7 X
3,443,261	5/1969	Battista et al.	260/123.7 UX
3,607,860	9/1971	Yamato et al.	260/123.5
3,628,974	12/1971	Battista	260/123.7 X
3,649,347	3/1972	Battista	260/123.7 X
3,691,281	9/1972	Battista	260/123.7
3,767,437	10/1973	Cruz	106/161
3,823,212	7/1974	Chvapil	260/123.7 X
3,965,063	6/1976	Holcombe	264/1 X
4,096,870	6/1978	Manfuso	264/1 X
4,121,885	10/1978	Erickson et al.	264/1 X
4,123,408	10/1978	Gordon	264/1 X
4,264,493	4/1981	Battista	260/123.7 X
4,349,470	9/1982	Battista	260/123.7 X

Primary Examiner—Howard E. Schain
Attorney, Agent, or Firm—George F. Mueller

[57] **ABSTRACT**

Protein hydrogel structures formed from natural proteins having an average molecular weight of about 100,000 or less by dissolving the protein in an aqueous acidic solution, subjecting the protein to vapor phase crosslinking with at least two crosslinking agents, and air drying to a moisture content not exceeding 10 percent. The drying may be effected by treatment with a water-miscible organic solvent or by air drying. The structures may be in the form of soft contact lenses, films, fibers, and prosthetics.

20 Claims, No Drawings