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(54) **THERMAL AND PH STABLE PROTEIN THICKENING AGENT AND METHOD OF MAKING THE SAME**

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(58) **Field of Search** 426/573, 41, 42, 426/564, 565, 583; 435/68.1; 530/365

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,930,039	12/1975	Kuipers	426/271
3,970,520	7/1976	Feldman et al.	195/29
4,036,999	7/1977	Grindstaff	426/549
4,088,791	5/1978	Jones	426/99
4,251,562	2/1981	LeGrand et al.	426/573
4,444,793	4/1984	Schwartz et al.	426/41
4,460,615	7/1984	Furukawa et al.	426/657
4,636,388	1/1987	Lin et al.	426/7
4,847,096	7/1989	Mellqvist et al.	426/41
4,855,156	8/1989	Singer et al.	426/565
4,985,270	1/1991	Singer et al.	426/515
5,039,532	8/1991	Jost et al.	426/41
5,147,677	9/1992	Ziegler	426/614
5,217,741	6/1993	Kawachi et al.	426/573
5,232,729	8/1993	Katsuta et al.	426/573
5,350,590	9/1994	McCarthy et al.	426/549
5,413,804	5/1995	Rhodes	426/583
5,416,196 *	5/1995	Kitabatake et al.	530/366
5,494,696	2/1996	Holst et al.	426/583
5,503,864	4/1996	Uchida et al.	426/583
5,589,357	12/1996	Martinez et al.	435/68.1
5,643,622	7/1997	Sawhill	426/41
5,656,309	8/1997	Sawhill	426/41
5,744,179	4/1998	Shimamura et al.	426/41
5,750,183	5/1998	Yamamoto et al.	426/656
5,882,705	3/1999	Sato et al.	426/41

OTHER PUBLICATIONS

Ju et al., "Gelation of hydrolysates of a whey protein . . . ", International Dairy Journal (abstract only), 8(4): 303–309, Apr. 1998.*

Elofsson et al., "Characterization of a cold–setting whey protein . . . ", International Dairy Journal, 7(8–9):601–608, 1997.*

Ju et al., "Effects of limited proteolysis on Gelation . . . ", J. Dairy Sci., 78(10): 2119–2128, 1995.*

Otte et al., J. Dairy Sci., 79(5): 782–790, 1996.*

Fennema, O., Food Chemistry, Marcel–Dekker, Inc. Pub., 3rd. Ed., p. 204, 1996.*

Pelletier, C., "A Comparison of Consistency and Taste of Five Commercial Thickeners," *Dysphagia*, 1997, 12:74–78.

Bryant et al., "Molecular basis of protein functionality with special consideration of cold–set gels derived from heat–denatured whey," *Trends in Food Science & Technology*, 1998, 9, 143–151.

* cited by examiner

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(57) **ABSTRACT**

A dry protein product useful as a thickening agent and fat substitute is provided. The powder can be readily reconstituted at room temperature, or refrigerated conditions, and can be used in frozen or refrigerated foods, at room temperature, and in cooking applications. When reconstituted the product preferably has a creamy, non-gritty texture, although texture and consistency of the product can be adjusted depending upon the desired application. The dry powder of the invention may be prepared by hydrolyzing a protein preparation (typically, a whey protein preparation) to produce a hydrolyzed whey protein preparation; then gelling the hydrolyzed whey protein preparation to form a whey protein gel; then drying the whey protein gel; and powdering the whey protein gel. Food products containing the powder in hydrated form, including both frozen dessert products, beverages and cooked products, are also disclosed.

44 Claims, 10 Drawing Sheets