METHODS FOR EXTRUDING POWDERED NUTRITIONAL PRODUCTS USING A HIGH SHEAR ELEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and any benefit of U.S. Provisional Application No. 61/737,470, filed December 14, 2012, the entire contents of which are incorporated by reference in its entirety.

Technical Field

[0002] The present disclosure relates to extruders and related extrusion methods for manufacturing powdered nutritional products using an internal high shear element, and, more specifically, to extruders and related extrusion methods designed to provide a stable emulsion to be used to produce powdered nutritional products.

Background

[0003] Nutritional formulas today are well known for a variety of nutritional or disease specific applications in infants, children, and adults. These formulas most typically contain a balance of proteins, carbohydrates, lipids, vitamins, minerals, and other nutrients tailored to the nutritional needs of the intended user, and include product forms such as reconstitutable powders, ready-to-feed liquids, dilutable liquid concentrates, nutritional bars, and others.

[0004] Powdered nutritional products, including both powdered infant formulas and powdered adult nutritional products generally contain from about 0.5% to about 35% (by weight) fat. In order for the finished product to be package stable (*i.e.*, not subject to significant oxidation and rancidity) and not have significant fat separation when reconstituted, during manufacturing the fat component is generally sheared to globules having a size of between about 0.1-100 microns while simultaneously emulsifying the sheared fat globules with hydrated protein with or without other additional emulsifiers.

[0005] This shearing and emulsifying has traditionally been accomplished by preparing a high solids water slurry (*i.e.* 30% to 60% total solids) and pumping the slurry through a high pressure homogenizer located external to the extruder with a homogenization

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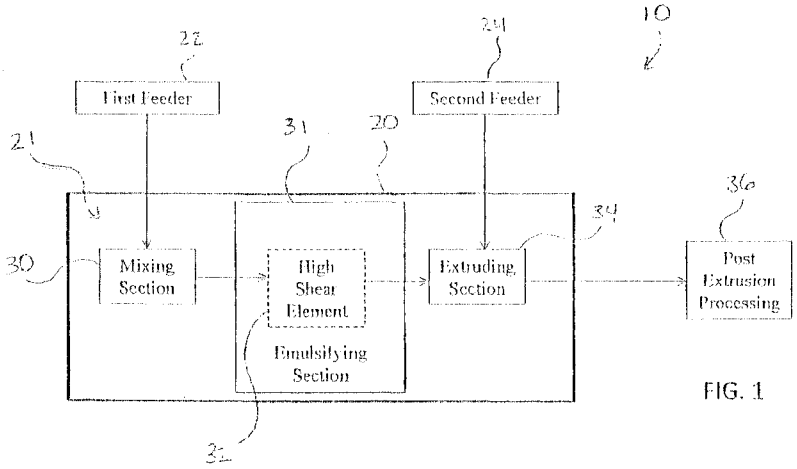


FIG. 1

(57) Abstract: A method of producing an emulsion and an extrudate for a powdered nutritional product is provided. The method includes utilizing an extruder (10) that contains a high shear element (32) positioned within the barrel of the extruder (20). The use of a high shear element (32) positioned within the barrel of the extruder (20) allows both emulsification and extrusion of the ingredients to occur within the barrel of the extruder (20). A first portion of ingredients comprising a slurry is processed by the high shear element (32) to form an emulsion. The emulsion is then combined with a second portion of ingredients and extruded to form an extrudate for the desired powdered nutritional product. In some embodiments, the high shear element (32) may comprise a shearing disc or a pair of shearing discs. The extruder (10) may comprise a single screw extruder, a twin screw extruder, or any other suitable type of extruder.

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