

1

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**STABLE FOOD PIECES**

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No Drawing. Continuation-in-part of application Ser. No. 478,407, Aug. 9, 1965, which is a continuation-in-part of application Ser. No. 262,327, Mar. 4, 1963. This application Mar. 8, 1967, Ser. No. 621,473

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20 Claims

**ABSTRACT OF THE DISCLOSURE**

Compact food units designed to provide a completely balanced diet provided by incorporating essential nutrients into a unitary, flexible food piece containing a continuous external phase of a hydrophilic film former, water and an edible humectant. The external phase encapsulates an internal phase of minute fat globules. The food pieces are resistant to physical, chemical, and bacteriological degradation.

This application is a continuation-in-part of a prior application bearing the title, "Protective Coating," having Ser. No. 478,407, now Patent No. 3,323,922, filed Aug. 9, 1965, which is a continuation-in-part of a prior application bearing the same title having Ser. No. 262,327, filed Mar. 4, 1963, now abandoned.

This invention relates generally to unitary food pieces and more particularly to flexible food pieces of a unitary construction which are stable against degradation.

Heretofore, the need for providing a shelf stable, compact, nutritious food product for individuals such as campers, soldiers and spacetravelers and the like has long been recognized. Food products that contain the maximum nutritional value especially in respect to protein and caloric content without concomitant, unnecessary bulk and weight (i.e., the minimum volume to weight ratio) are deemed essential for such a utility.

Solely on a volume to weight basis, the edible fats are most suitable in providing the necessary caloric requirements in such a food product. However, from a physical, chemical and bacteriological stability viewpoint, the utilization of fats presents many problems which prevents the use thereof. A major problem with fats is its incompatibility with other solid food ingredients. Considerable difficulty has been encountered in preventing fat separation from the other solid constituents especially when the food products are subjected to abnormal conditions (e.g., temperature and humidity). Once separated from the other constituents, the fat readily degrades (e.g., oxidative degradation).

An additional requirement for such a food product is that it maintain its product identity until consumed. Palatability in respect to flavor, texture and the like should remain substantially unchanged notwithstanding exposure to abnormal conditions over prolonged periods of time. Also, it has been desired to provide a solid food product which contains a homogenous distribution of the caloric and proteinaceous requirements (preferably along with the other essential nutrients). Such a food product can be orally consumed in such a manner that a given amount of the product will provide ordinary and necessary nutritional food requirements for the consumer.

An object of the present invention is to provide food pieces which have an ability to withstand temperatures substantially in excess of body temperature for significant periods of time without deteriorating.

Another object of the present invention is to provide food pieces that are relatively stable against substantial

2

changes in flexibility when subjected to changes in relative humidity.

An additional object of the invention is to provide flexible food pieces which contain the necessary nutrients to sustain life over prolonged periods of time.

According to the present invention there is provided a solid, flexible, water-dispersible, unitary food piece consisting essentially of an external phase and an internal phase, said external phase comprising a homogeneous dispersion of a hydrophilic film former, an edible humectant which has a boiling point and decomposition temperature in excess of 300° F. in an amount ranging from at least 1 part by weight to about 70 parts by weight humectant for each 10 parts by weight hydrophilic film former and water in an amount or at least 1 to about 30 parts by weight water for each 10 parts by weight hydrophilic film former, said internal phase comprising edible fat globules encapsulated by said external phase in an amount ranging from about 150 parts by weight fat to about 1 part by weight fat for each 10 parts by weight hydrophilic film former.

The food pieces of the present invention are characterized by flexibility, impact strength against shattering, lack of hygroscopicity and a low permeability to gases and moisture. The food pieces are stable against substantial reduction or increased flexibility when subjected to humidity variations of the surrounding atmosphere. At elevated temperatures (e.g., 300° F.) the food pieces will ultimately degrade by charring rather than separation of the internal phase from the external phase. Similarly, the food pieces are not deformed when subjected to elevated temperatures (e.g., 100° F. to 200° F.). Since the fat is totally encapsulated and protected by the external phase, the pieces are not subject to rancidification (e.g., oxidative degradation).

Examples of suitable edible film forming substances for the external phase include egg albumin, human serum albumin, sodium proteinate of soybean, wheat germ, gelatin, sodium caseinate, nonfat dry milk solids, whole egg, pea flour, bean flour, corn germ, gelatinized starch-carboxymethyl cellulose, agar agar, fish protein, gelsoy (soybean protein), whey, dextran, dextrans, bran protein, polyvinyl alcohol, polyvinyl-pyrrolidone, calcium alginate, potassium alginate, sodium alginate, carrageenan and salts thereof, hydroxypropyl cellulose, methyl cellulose, methyl ethyl cellulose, gum acacia, locust bean gum, gum ghatti, guar gum, gum karaya, oat gum, gum tragacanth, mixtures thereof and the like.

In addition to the edible film forming substances, the external phase contains water and an edible humectant. The edible humectants employable herein have an affinity for water and maintain a narrow range moisture content fluctuation when exposed to a wide and varied range of humidity. In general, the humectants adaptable herein exhibit either solid or liquid properties (i.e., non-gaseous) at temperatures in excess of 300° F. at 760 mm. pressure. Preferably, those humectants which are solid or liquid at 760 mm. pressure at 350° F. or above are employed. Suitable humectants which are normally liquid at room temperature but possess a definite boiling point are glycerine and propylene glycol. These normally liquid humectants provide a permanent plasticizing effect and are preferably employed herein as the humectant component. Other materials which exhibit humectant properties are those which in the dry form decompose at elevated temperatures rather than volatilizing. Suitable solid humectants include the dry solids of invert sugar-containing materials such as molasses, honey, brown sugar, papyon, fruit juices, starch hydrolyzates (e.g., corn syrup), sorghum, etc., as well as the aqueous solutions thereof and invert sugar itself. Other solid humectants include such edible materials as calcium chloride, fruc-