PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number:
A23L 1/308, 1/236, A23G 3/00 A23G 3/30	A1	WO 92/02149
		(43) International Publication Date: 20 February 1992 (20.02.92)

(21) International Application Number: PCT/US91/05102

(22) International Filing Date: 19 July 1991 (19.07.91)

(30) Priority data:
563,230 3 August 1990 (03.08.90) US

(71) Applicant: WARNER-LAMBERT COMPANY [US/US]; 201 Tabor Road, Morris Plains, NJ 07950 (US).

(72) Inventors: CHERUKURI, Subraman, Rao ; 10 Jean Drive, Towaco, NJ 07950 (US). FAUST, Steven, Michael ; 4-51 Audubon Court, Stanhope, NJ 07950 (US).

(74) Agents: BELL, Craig, M. et al.; Warner-Lambert Company, 201 Tabor Road, Morris Plains, NJ 07950 (US).

(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), NO, SE (European patent).

Published
With international search report.

(54) Title: REDUCED-CALORIE, LOW-MOISTURE ABSORBING BULKING AGENT COMPOSITIONS AND METHODS FOR PREPARING SAME

(57) Abstract

This invention pertains to a reduced-calorie, low-moisture absorbing bulking agent composition which comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol. The bulking agent compositions may be used in a wide variety of ingestible compositions such as chewing gums, confections, and the like. This invention also pertains to methods for preparaing these reduced-calorie, low-moisture absorbing bulking agent compositions and the ingestible compositions in which they may be employed.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**ES**	Spain	**MG**	Madagascar
AU	Australia	**FI**	Finland	**ML**	Mali
BB	Barbados	**FR**	France	**MN**	Mongolia
BE	Belgium	**GA**	Gabon	**MR**	Mauritania
BF	Burkina Faso	**GB**	United Kingdom	**MW**	Malawi
BG	Bulgaria	**GN**	Guinea	**NL**	Netherlands
BJ	Benin	**GR**	Greece	**NO**	Norway
BR	Brazil	**HU**	Hungary	**PL**	Poland
CA	Canada	**IT**	Italy	**RO**	Romania
CF	Central African Republic	**JP**	Japan	**SD**	Sudan
CG	Congo	**KP**	Democratic People's Republic of Korea	**SE**	Sweden
CH	Switzerland			**SN**	Senegal
CI	Côte d'Ivoire	**KR**	Republic of Korea	**SU+**	Soviet Union
CM	Cameroon	**LI**	Liechtenstein	**TD**	Chad
CS	Czechoslovakia	**LK**	Sri Lanka	**TG**	Togo
DE	Germany	**LU**	Luxembourg	**US**	United States of America
DK	Denmark	**MC**	Monaco		

+ It is not yet known for which States of the former Soviet Union any designation of the Soviet Union has effect.

REDUCED-CALORIE, LOW-MOISTURE ABSORBING BULKING AGENT COMPOSITIONS AND METHODS FOR PREPARING SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to reduced-calorie, low-moisture absorbing bulking agent compositions for use in edible compositions. More particularly, this invention pertains to bulking agent compositions which comprise Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol. The bulking agent compositions have improved firmness and reduced moisture absorption properties and may be used in a wide variety of ingestible compositions such as chewing gums and confections.

2. Description of the Prior Art

Polydextrose is a low-calorie sugar substitute (containing about 1 calorie per gram) which has many of the technological properties of sugar without the sweetness. This non-sweet bulking agent is useful when

used in combination with high intensity sweeteners to provide low-calorie food products.

Polydextrose is a randomly bonded highly branched glucose polymer prepared by polymerizing glucose or maltose, or both, by anhydrous melt polymerization techniques using non-volatile, edible, organic polycarboxylic acids and polyols as catalysts, cross-linking agents or polymerization activators. Polydextrose has a number average molecular weight between about 1,500 and 18,000 and contains (a) from about 0.5 to about 5 mole percent of a polycarboxylic acid ester group wherein the acid is selected from the group consisting of citric, fumaric, tartaric, succinic, adipic, itaconic, and malic acids, and (b) from about 5% to about 20% by weight of an edible polyol selected from the group consisting of sorbitol, glycerol, erythritol, xylitol, mannitol, and galactitol, which is chemically bonded to the acid.

United States patents nos. 3,766,165 and 3,876,794, issued to Rennhard, disclose procedures for preparing Polydextrose. Polydextrose is commercially available from Pfizer Chemical Company.

Polydextrose is commercially available in three forms: Polydextrose A, an amorphous, slightly acidic (pH of 2.5-3.5) fusible powder; Polydextrose N, a potassium hydroxide partially neutralized (pH of 5-6) light-colored 70% aqueous solution of Polydextrose A; and Polydextrose K, a potassium bicarbonate partially neutralized (pH of 5-6) powder form of Polydextrose A.

All of these Polydextrose products contain quantities of unreacted monomers, such as glucose, sorbitol, as well as citric acid, 1,6-anhydroglucose (levoglucosan) and 5-hydroxymethylfurfural. For example, the amount of citric acid (or citric acid salts) present in Polydextrose A is about 0.9%, by weight.

Polydextrose has recently become available in a fourth form: Improved Polydextrose, a form of Polydextrose A which is substantially free of certain low molecular weight organic acids (pH of 3-4). In general, the acids are present in the bulking agent in an amount of less than about 0.3%, by weight. Removal of these low molecular weight acids helps to eliminate the off-taste associated with Polydextrose.

A problem with using Polydextrose in large amounts to prepare reduced-calorie, bulking agent compositions in gum is that Polydextrose tends to be soft and hygroscopic. When used in chewing gums, for instance, the reduced-calorie gums have an unsatisfactory chew texture and mouth feel. During storage, the gums absorb moisture which further reduces the firmness of the gum.

Polydextrose Research Product Bulletin, Pfizer, Central Research, Groton, Connecticut (1981), p. 11, discloses that a chewing gum composition can be prepared by micronizing a mixture of Polydextrose A, sodium bicarbonate, sorbitol and an intense sweetener, adding the milled mixture to a melted gum base mixture, and then adding peppermint oil and glycerin to the mixture in portions.

United States patent no. 4,382,963, issued to Klose et al. and assigned to General Foods Corporation, discloses a low-calorie, sugar-free chewing gum composition wherein a flavoring agent is added to a mixture of softened gum base and spray-dried Polydextrose N bulking agent.

United States patent no. 4,765,991, issued to Cherukuri et al. and assigned to Warner-Lambert Company, discloses a reduced-calorie chewing gum composition wherein a flavoring agent is added to a mixture of a high

percentage of a non-styrene-butadiene copolymer/polyvinyl acetate elastomer chewing gum base and a small percentage of a polysaccharide selected from the group consisting of Polydextrose, polymaltose, modified Polydextrose, and mixtures thereof.

United States patent applications serial nos. 043,793 and 193,961, both of which are assigned to Warner-Lambert Company, disclose methods for purifying Polydextrose.

United States patent no. 4,622,233, issued to Torres, discloses methods for purifying Polydextrose and the preparation of a tabletop sweetener which comprises Alitame and Polydextrose.

United States patent no. 4,688,519, issued to Dartey et al. and assigned to Nabisco Brands, discloses a cookie which comprises from about 5% to about 20% Polydextrose. Polydextrose is added to replace shortening or fat and sugar to avoid lumpiness.

United States patent no. 4,631,196, issued to Zeller, discloses a low calorie dairy product which contains from 5% to 30% sugars consisting of a mixture of 10% to 90% Polydextrose and 90% to 10% fructose.

United States patent application serial no. 336,678, filed April 12, 1989, to Cherukuri et al. discloses sugarless low moisture absorbing chewing gum compositions comprising isomalt.

Other methods for promoting chewing gum firmness have focused on the preparation of substantially anhydrous gum compositions such as those disclosed in United States patent no. 4,514,422, issued to Yang et al., United States patent no. 4,579,738, issued to Cherukuri et al., United States patent no. 3,262,784, issued to Bucher, United States patent no. 4,035,572,

issued to Stubits et al., United States patent no. 4,150,161, issued to Rudolph et al., and United States patent no. 4,638,138, issued to Glass et al.

While the above references disclose a variety of compositions containing Polydextrose, none of the above compositions has overcome the problem of employing Polydextrose in major amounts. Thus it would be commercially advantageous to provide a Polydextrose containing composition which has satisfactory firmness and low moisture absorption properties. Such a composition would have improved organoleptic properties and would be easier to process and package. The present invention provides such improved reduced-calorie, low-moisture absorbing compositions having improved firmness without the disadvantages characteristic of previously known products. This invention also pertains to methods for preparing these bulking agent compositions and the ingestible compositions in which they may be employed.

SUMMARY OF THE INVENTION

This invention pertains to a reduced-calorie, low-moisture absorbing bulking agent composition which comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol. The bulking agent compositions may be used in a wide variety of ingestible compositions such as chewing gums, confections, and the like. This invention also pertains to methods for preparing these reduced-calorie, low-moisture absorbing bulking agent compositions and the ingestible compositions in which they may be employed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 depicts in graphic format the moisture absorption over a five week period of chewing gum compositions containing as the bulking agent, mixtures of Polydextrose and sorbitol, in varying amounts, by weight of the bulking agent (Examples 1-3).

FIGURE 2 depicts in graphic format the moisture absorption over a five week period of chewing gum compositions containing as the bulking agent, mixtures of 70% Polydextrose and 30% of a second bulking agent, by weight of the bulking agent (Examples 4-9).

FIGURE 3 depicts in graphic format the moisture absorption over a five week period of chewing gum compositions containing as the bulking agent, mixtures of Polydextrose and Palatinit, in varying amounts, by weight of the bulking agent, (Examples 10-13).

FIGURE 4 depicts in graphic format the moisture absorption over a four week period of chewing gum compositions containing as the bulking agent, mixtures of Polydextrose and maltitol, in varying amounts, by weight of the bulking agent (Examples 14-16).

FIGURE 5 depicts in graphic format the chewing texture and mouth feel over time of various chewing gum compositions containing as the bulking agent, combinations of 70% Polydextrose and 30% of a second bulking agent, by weight of the bulking agent (Examples 17-23).

DETAILED DESCRIPTION OF THE INVENTION

Applicants have discovered that when isomalt, mannitol or maltitol are admixed as a second bulking agent into Polydextrose, an edible product having reduced moisture absorption properties is obtained. The texture of the combination of maltitol and Polydextrose is soft, the texture of the combination of mannitol and Polydextrose is firm, and the texture of the combination of isomalt and Polydextrose is very firm. Accordingly, the combination of Polydextrose with isomalt or mannitol provides an edible product having both a firm chew and reduced moisture absorption properties. Because the inventive edible compositions absorb less moisture during storage, the compositions retain their firmness for longer periods. The improved firmness and moisture absorption properties of the novel compositions provides the edible products with better mouth feel and facilitates the processing and packaging of the products. The bulking agent compositions may be used in a wide variety of ingestible compositions such as chewing gums, confections, and the like. This invention also pertains to methods for preparing these bulking agent compositions and the ingestible compositions in which they may be employed.

Applicants define the terms "ingestible" and "edible" to include all materials and compositions which are used by or which perform a function in the body. These include materials and compositions which are adsorbed and those which are not absorbed as well as those which are digestible and non-digestible.

The Polydextrose bulking agent component in the present invention may be any of the commercially available forms of Polydextrose such as Polydextrose A, an amorphous, slightly acidic (pH of 2.5-3.5) fusible powder, Polydextrose N, a potassium hydroxide partially

neutralized (pH of 5-6) light-colored 70% aqueous solution of Polydextrose A, and Polydextrose K, a potassium bicarbonate partially neutralized (pH of 5-6) powder form of Polydextrose A.

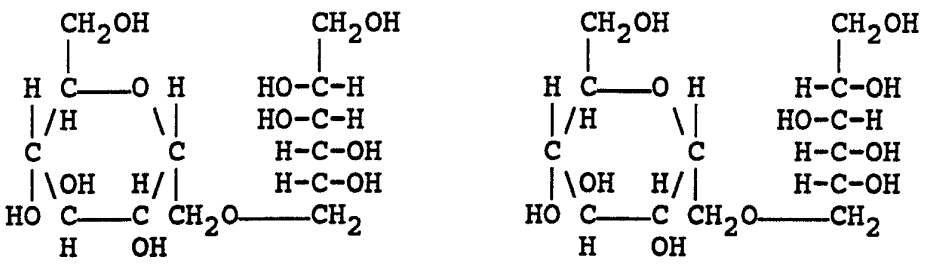
The Polydextrose bulking agent component may also be Improved Polydextrose, a form of Polydextrose A which is substantially free of certain low molecular weight organic acids (pH of 3-4). In general, the acids are present in Improved Polydextrose in an amount of less than about 0.3%, preferably less than about 0.2%, and more preferably less than about 0.1%, by weight.

The Polydextrose bulking agent component may also be pulverized Improved Polydextrose having a particle size of under about 125 microns in diameter. Pulverized Improved Polydextrose may be prepared from Improved Polydextrose by (a) admixing Improved Polydextrose with an anti-caking agent to form a mixture, and (b) pulverizing the mixture to form the pulverized Improved Polydextrose. Methods for preparing pulverized Improved Polydextrose are more fully described in commonly assigned United States patent application serial no. 354,650, filed May 19, 1989, which disclosure is incorporated herein by reference. The Polydextrose bulking agent component in the present invention is preferably Improved Polydextrose.

The second bulking agent component in the present invention is a bulking agent which will contribute substantial non-hygroscopic properties (low moisture absorption) and firmness to the edible product. The second bulking agent may be selected from the group consisting of isomalt and mannitol. Preferably, the second bulking agent is isomalt.

The isomalt second bulking agent component of the present invention is a sugarless, substantially anhydrous, non-hygroscopic powdered bulking agent. More

particularly, isomalt comprises a racemic mixture of alpha-D-glucopyranosyl-1,6-mannitol and alpha-D-glucopyranosyl-1,6-sorbitol, which has the following chemical structure:

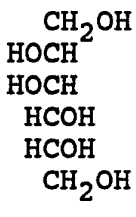


alpha-D-glucopyranosyl-1,6-mannitol

alpha-D-glucopyranosyl-1,6-sorbitol

In a preferred embodiment, the isomalt bulking agent component in the present invention comprises the racemic mixture of alpha-D-glucopyranosyl-1,6-mannitol and alpha-D-glucopyranosyl-1,6-sorbitol that is the commercially available non-hygroscopic isomalt bulking agent manufactured under the tradename PALATINIT, by Suddeutsche Zucker. PALATINIT has a relative sweetness to sucrose of about 0.50-0.60x, contains 2 calories per gram, and has a solubility of 28.7g/100ml water at 25° C.

The mannitol second bulking agent component of the present invention is a straight chain hexahydric alcohol which is derived by hydrogenation of corn sugar or glucose. Mannitol has the chemical formula:



The amount of the second bulking agent component present in the reduced-calorie, low-moisture absorbing bulking agent composition of the present invention is an amount sufficient to provide a firm texture in the edible product and to contribute

substantial non-hygroscopic properties to the composition. The amount of the second bulking agent component present should not be so high as to contribute a significant amount of calories to the reduced-calorie bulking agent composition. In a preferred embodiment, the bulking agent composition of the present invention comprises Polydextrose and a second bulking agent wherein the second bulking agent is present in an amount from about 20% to about 40%, and preferably in an amount of about 30%, by weight of the bulking agent composition.

The reduced-calorie, low-moisture absorbing bulking agent compositions of the present invention are prepared by admixing Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol.

Once prepared, the inventive reduced-calorie, low-moisture absorbing bulking agent composition may be stored for future use or may be formulated in effective amounts with conventional additives, such as pharmaceutically acceptable carriers or confectionery ingredients to prepare a wide variety of ingestible compositions, such as foodstuffs, powdered drinks, jellies, extracts, confectionery products, tabletop sweeteners, orally administered pharmaceutical compositions, and hygienic products such as toothpastes and chewing gums.

The amount of the inventive reduced-calorie, low-moisture absorbing bulking agent composition employed in an edible composition is an effective amount to act as a satisfactory bulking agent in the edible composition. The exact amount of the bulking agent composition employed is a matter of preference, subject to such factors as the type of carrier employed in the composition and the other ingredients in the composition. Thus, the amount of bulking agent composition may be varied in order to obtain the result desired in the final

product and such variations are within the capabilities of those skilled in the art without the need for undue experimentation. In general, the amount of reduced-calorie, low-moisture absorbing bulking agent composition normally present in an edible composition will be up to about 70%, preferably from about 20% to about 60%, and more preferably from about 35% to about 55%, by weight of the edible composition.

The present invention extends to methods of making the ingestible compositions. In such a method, a composition is made by admixing an effective amount of the reduced-calorie, low-moisture absorbing bulking agent composition of the present invention with a pharmaceutically acceptable carrier or confectionery material and the other ingredients of the final desired ingestible composition. Other ingredients will usually be incorporated into the composition as dictated by the nature of the desired composition as well known by those having ordinary skill in the art. The ultimate ingestible compositions are readily prepared using methods generally known in the food technology and pharmaceutical arts.

An important aspect of the present invention includes an improved reduced-calorie chewing gum composition incorporating the inventive bulking agent composition and a method for preparing the chewing gum composition, including both chewing gum and bubble gum formulations. In general, the improved chewing gum compositions will contain a gum base, an effective amount of the inventive reduced-calorie, low-moisture absorbing bulking agent composition, an intense sweetener and various additives such as a flavoring agent.

Preferably, the chewing gum compositions will comprise a gum base present in an amount up to about 55%, preferably from about 15% to about 40%, and more preferably from about 20% to about 35%, by weight of the

chewing gum composition. The chewing gum compositions may also comprise high levels of a chewing gum base having an enhanced hydrophilic character. These chewing gums will comprise a gum base present in an amount from about 50% to about 85%, preferably from about 50% to about 75%, and more preferably from about 60% to about 70%, by weight of the chewing gum composition.

As used herein, the term "reduced-calorie composition" means a composition having a caloric value one third or less than that of a conventional composition. The term "tight" or "rubbery" chew refers to a chewing gum composition which requires a large amount of muscular chewing effort to masticate or to a composition which provides a gum bolus with high elasticity and bounce and which is difficult to deform.

Gum bases having an enhanced hydrophilic character include polyvinyl acetate gum bases which may also contain a low melting point wax. Such gum bases do not require a high level of bulking agent to plasticize the gum base and render it soft during chewing. These gum bases may be used at higher than normal levels in chewing gum compositions in place of a bulking and/or a bulk sweetening agent to prepare high base-low bulking agent reduced-calorie gums which do not have rubbery or tight chew characteristics. These gum bases possess increased hydrophilic properties over conventional gum bases and appear to increase in size during chewing releasing flavoring and sweetening agents which would normally be entrapped in the gum base while maintaining a soft chew texture. Reduced-calorie chewing gum compositions prepared with such gum bases in high levels are less hygroscopic (have lower moisture-pickup) and are less prone to becoming stale than conventional reduced-calorie gum compositions while having comparable firmness and texture.

The elastomers (rubbers) employed in the gum base will vary greatly depending upon various factors such as the type of gum base desired, the consistency of gum composition desired and the other components used in the composition to make the final chewing gum product. The elastomer may be any water-insoluble polymer known in the art, and includes those gum polymers utilized for chewing gums and bubble gums. Illustrative examples of suitable polymers in gum bases include both natural and synthetic elastomers. For example, those polymers which are suitable in gum base compositions include, without limitation, natural substances (of vegetable origin) such as chicle, natural rubber, crown gum, nispero, rosidinha, jelutong, perillo, niger gutta, tunu, balata, guttapercha, lechi capsi, sorva, gutta kay, and the like, and mixtures thereof. Examples of synthetic elastomers include, without limitation, styrene-butadiene copolymers (SBR), polyisobutylene, isobutylene-isoprene copolymers, polyethylene, and the like, and mixtures thereof.

The amount of elastomer employed in the gum base will vary greatly depending upon various factors such as the type of gum base used, the consistency of the gum composition desired and the other components used in the composition to make the final chewing gum product. In general, the elastomer will be present in the gum base in an amount from about 0.5% to about 20%, and preferably from about 2.5% to about 15%, by weight of the gum base.

The polyvinyl acetate polymer employed in the gum base is a polyvinyl acetate polymer having a medium molecular weight, specifically, having a mean average molecular weight in the range from about 35,000 to about 55,000. This medium molecular weight polyvinyl acetate polymer will preferably have a viscosity from about 35 seconds to about 55 seconds (ASTM designation D1..0-82 using a Ford cup viscometer procedure). The medium molecular weight polyvinyl acetate polymer will be present in the gum base in an amount from about 10% to

about 25%, and preferably from about 12% to about 27%, by weight of the gum base.

The medium molecular weight polyvinyl acetate polymer may also be blended with a low molecular weight polyvinyl acetate polymer. The low molecular weight polyvinyl acetate polymer will have a mean average molecular weight in the range from about 12,000 to about 16,000. This low molecular weight polyvinyl acetate polymer will preferably have a viscosity from about 14 seconds to about 16 seconds (ASTM designation D1200-82 using a Ford cup viscometer procedure). The low molecular weight polyvinyl acetate polymer will be present in the gum base in an amount up about 17%, and preferably from about 12% to about 17%, by weight of the gum base.

When a low molecular weight polyvinyl acetate polymer is blended with a medium molecular weight polyvinyl acetate polymer, the polymers will be present in a mole ratio from about 1:0.5 to about 1:1.5, respectively.

The medium molecular weight polyvinyl acetate polymer may also be blended with a high molecular weight polyvinyl acetate polymer. The high molecular weight polyvinyl acetate polymer will have a mean average molecular weight in the range from about 65,000 to about 95,000. The high molecular weight polyvinyl acetate polymer will be present in the gum base in an amount up to about 5%, by weight of the gum base.

The acetylated monoglycerides, like the polyvinyl acetate polymer, serve as plasticizing agents. While the saponification value of the acetylated monoglycerides is not critical, preferable saponification values are 278 to 292, 316 to 331, 370 to 380, and 430 to 470. A particularly preferred acetylated monoglyceride has a saponification value above about 400. Such

acetylated monoglycerides generally have an acetylation value (percentage acetylated) above about 90 and a hydroxyl value below about 10 (Food Chemical Codex (FCC) III/P508 and the revision of AOCS).

The use of acetylated monoglycerides in the present gum base is preferred over the use of bitter polyvinyl acetate (PVA) plasticizers, in particular, triacetin. The acetylated monoglycerides will be present in the gum base in an amount from about 4.5% to about 10%, and preferably from about 5% to about 9%, by weight of the gum base.

The wax in the gum base softens the polymeric elastomer mixture and improves the elasticity of the gum base. The waxes employed will have a melting point below about 60° C., and preferably between about 45° C. and about 55° C. A preferred wax is low melting paraffin wax. The wax will be present in the gum base in an amount from about 6% to about 10%, and preferably from about 7% to about 9.5%, by weight of the gum base.

In addition to the low melting point waxes, waxes having a higher melting point may be used in the gum base in amounts up to about 5%, by weight of the gum base. Such high melting waxes include beeswax, vegetable wax, candelilla wax, carnauba wax, most petroleum waxes, and the like, and mixtures thereof.

In addition to the components set out above, the gum base includes a variety of traditional ingredients, such as a component selected from the group consisting of elastomer solvents, emulsifiers, plasticizers, fillers, and mixtures thereof. These ingredients are present in the gum base in an amount to bring the total amount of gum base to 100%.

The gum base may contain elastomer solvents to aid in softening the elastomer component. Such elastomer

solvents may comprise those elastomer solvents known in the art, for example, terpinene resins such as polymers of alpha-pinene or beta-pinene, methyl, glycerol and pentaerythritol esters of rosins and modified rosins and gums, such as hydrogenated, dimerized and polymerized rosins, and mixtures thereof. Examples of elastomer solvents suitable for use herein include the pentaerythritol ester of partially hydrogenated wood and gum rosin, the pentaerythritol ester of wood and gum rosin, the glycerol ester of wood rosin, the glycerol ester of partially dimerized wood and gum rosin, the glycerol ester of polymerized wood and gum rosin, the glycerol ester of tall oil rosin, the glycerol ester of wood and gum rosin and the partially hydrogenated wood and gum rosin and the partially hydrogenated methyl ester of wood and rosin, and the like, and mixtures thereof. The elastomer solvent may be employed in the gum base in amounts from about 2% to about 15%, and preferably from about 7% to about 11%, by weight of the gum base.

The gum base may also include emulsifiers which aid in dispersing the immiscible components into a single stable system. The emulsifiers useful include glyceryl monostearate, lecithin, fatty acid monoglycerides, diglycerides, propylene glycol monostearate, and the like, and mixtures thereof. A preferred emulsifier is glyceryl monostearate. The emulsifier may be employed in amounts from about 2% to about 15%, and preferably from about 7% to about 11%, by weight of the gum base.

The gum base may also include plasticizers or softeners to provide a variety of desirable textures and consistency properties. Because of the low molecular weight of these ingredients, the plasticizers and softeners are able to penetrate the fundamental structure of the gum base making it plastic and less viscous. Useful plasticizers and softeners include lanolin, palmitic acid, oleic acid, stearic acid, sodium stearate, potassium stearate, glyceryl triacetate, glyceryl

lecithin, glyceryl monostearate, propylene glycol monostearate, acetylated monoglyceride, glycerine, and the like, and mixtures thereof. Waxes, for example, natural and synthetic waxes, hydrogenated vegetable oils, petroleum waxes such as polyurethane waxes, polyethylene waxes, paraffin waxes, microcrystalline waxes, fatty waxes, sorbitan monostearate, tallow, propylene glycol, mixtures thereof, and the like, may also be incorporated into the gum base. The plasticizers and softeners are generally employed in the gum base in amounts up to about 20%, and preferably in amounts from about 9% to about 17%, by weight of the gum base.

Preferred plasticizers are the hydrogenated vegetable oils and include soybean oil and cottonseed oil which may be employed alone or in combination. These plasticizers provide the gum base with good texture and soft chew characteristics. These plasticizers and softeners are generally employed in amounts from about 5% to about 14%, and preferably in amounts from about 5% to about 13.5%, by weight of the gum base.

In another preferred embodiment, the softening agent is anhydrous glycerin, such as the commercially available United States Pharmacopeia (USP) grade. Glycerin is a syrupy liquid with a sweet warm taste and has a sweetness of about 60% of that of cane sugar. Because glycerin is hygroscopic, it is important that the anhydrous glycerin be maintained under anhydrous conditions throughout the preparation of the chewing gum composition and that the bulking agent in the chewing gum composition resist moisture absorption.

The gum base may also include effective amounts of mineral adjuvants which may serve as fillers and textural agents. Useful mineral adjuvants include calcium carbonate, magnesium carbonate, alumina, aluminum hydroxide, aluminum silicate, talc, tricalcium phosphate, dicalcium phosphate, and the like, and mixtures thereof.

These fillers or adjuvants may be used in the gum base compositions in various amounts. Preferably the amount of filler, when used, will be present in an amount from about 15% to about 40%, and preferably from about 20% to about 30%, by weight of the gum base.

A variety of traditional ingredients may be optionally included in the gum base in effective amounts such as coloring agents, antioxidants, preservatives, flavoring agents, and the like. For example, titanium dioxide and other dyes suitable for food, drug and cosmetic applications, known as F. D. & C. dyes, may be utilized. An anti-oxidant such as butylated hydroxytoluene (BHT), butylated hydroxyanisole (BHA), propyl gallate, and mixtures thereof, may also be included. Other conventional chewing gum additives known to one having ordinary skill in the chewing gum art may also be used in the gum base.

The manner in which the gum base components are admixed is not critical and is performed using standard techniques and apparatus known to those skilled in the art. In a typical method, an elastomer is admixed with an elastomer solvent and/or a plasticizer and/or an emulsifier and agitated for a period of from 1 to 30 minutes. After blending is complete, the polyvinyl acetate component is admixed into the mixture. The medium molecular weight polyvinyl acetate is preferably admixed prior to addition of the optional low molecular weight polyvinyl acetate to prevent the creation of pockets of polyvinyl acetate within the elastomer mixture. The remaining ingredients, such as the low melting point wax, are then admixed, either in bulk or incrementally, while the gum base mixture is blended again for 1 to 30 minutes.

In one embodiment, the gum base having an enhanced hydrophilic character comprises (a) an elastomer present in an amount from about 0.5% to about 20%, by

weight of the gum base, (b) a medium molecular weight polyvinyl acetate polymer having a molecular weight from about 35,000 to about 55,000 present in an amount from about 10% to about 25%, by weight of the gum base, (c) an acetylated monoglyceride present in an amount from about 4.5% to about 10%, by weight of the gum base, (d) a wax having a melting point below about 60° C. present in an amount from about 6% to about 10%, by weight of the gum base, and (e) a material selected from the group consisting of elastomer solvents, emulsifiers, plasticizers, fillers, and mixtures thereof, present in an amount to bring the total amount of gum base to 100%, by weight of the gum base.

Chewing gum compositions employing a high level of a chewing gum base having an enhanced hydrophilic character are more fully described in United States patent no. 4,872,884, filed December 10, 1986, which disclosure is incorporated herein by reference.

Other gum bases having an enhanced hydrophilic nature and suitable for use in chewing gum compositions in high levels may also be employed in the present invention. In general, these gum bases may be employed in amounts up to 99%, preferably from about 40% to about 85%, and more preferably from about 40% to about 75%, by weight of the chewing gum composition. Suitable gum bases having an enhanced hydrophilic nature include, for example, those disclosed in United States patent no. 4,698,223, which disclosure is incorporated herein by reference.

The amount of gum base employed in the chewing gum composition will vary depending on such factors as the type of gum base used, the consistency desired, and the other components used to make the final chewing gum product. In general, the gum base having an enhanced hydrophilic character will be present in the chewing gum composition in an amount from about 50% to about 85%,

preferably from about 50% to about 75%, and more preferably from about 60% to about 70%, by weight of the chewing gum composition.

In a preferred embodiment, the invention pertains to a chewing gum composition which contains lower amounts of a chewing gum base. In general, the gum base in these chewing gum compositions will be present in an amount up to about 55%, preferably from about 15% to about 40%, and more preferably from about 20% to about 35%, by weight of the chewing gum composition. In this embodiment, the gum base will comprise an elastomer and a variety of traditional ingredients such as an elastomer solvent, waxes, emulsifiers, plasticizers or softeners, mineral adjuvants which may serve as fillers and textural agents, coloring agents, antioxidants, preservatives, flavoring agents, and the like, and mixtures thereof. Illustrative examples of these gum base components have been set out above.

Once prepared, the gum base may be formulated with the reduced-calorie, low-moisture absorbing bulking agent composition of the present invention and effective amounts of conventional additives to prepare a wide variety of chewing gum compositions. The conventional additives may be selected from the group consisting of plasticizers, softeners, emulsifiers, waxes, fillers, mineral adjuvants, flavoring agents (flavors, flavorings), coloring agents (colorants, colorings), antioxidants, acidulants, thickening agents, and the like, and mixtures thereof. These ingredients are present in the chewing gum composition in an amount to bring the total amount of chewing gum composition to 100%. Some of these additives may serve more than one purpose. For example, in sugarless gum compositions, a sweetener, such as sorbitol or other sugar alcohol, may also function as a bulking agent.

The plasticizers, softening agents, mineral adjuvants, waxes and antioxidants discussed above, as being suitable for use in the gum base, may also be used in the chewing gum composition. Examples of other conventional additives which may be used include emulsifiers, such as lecithin and glyceryl monostearate, thickening agents, used alone or in combination with other softeners, such as methyl cellulose, alginates, carrageenan, xanthan gum, gelatin, carob, tragacanth, and locust bean, acidulants such as malic acid, adipic acid, citric acid, tartaric acid, fumaric acid, and mixtures thereof, and fillers, such as those discussed above under the category of mineral adjuvants.

The flavoring agents which may be used include those flavors known to the skilled artisan, such as natural and artificial flavors. These flavorings may be chosen from synthetic flavor oils and flavoring aromatics and/or oils, oleoresins and extracts derived from plants, leaves, flowers, fruits, and so forth, and combinations thereof. Nonlimiting representative flavor oils include spearmint oil, cinnamon oil, oil of wintergreen (methyl salicylate), peppermint oil, clove oil, bay oil, anise oil, eucalyptus oil, thyme oil, cedar leaf oil, oil of nutmeg, allspice, oil of sage, mace, oil of bitter almonds, and cassia oil. Also useful flavorings are artificial, natural and synthetic fruit flavors such as vanilla, and citrus oils including lemon, orange, lime, grapefruit, and fruit essences including apple, pear, peach, grape, strawberry, raspberry, cherry, plum, pineapple, apricot and so forth. These flavoring agents may be used in liquid or solid form and may be used individually or in admixture. Commonly used flavors include mints such as peppermint, menthol, artificial vanilla, cinnamon derivatives, and various fruit flavors, whether employed individually or in admixture.

Other useful flavorings include aldehydes and esters such as cinnamyl acetate, cinnamaldehyde, citral

diethylacetal, dihydrocarvyl acetate, eugenyl formate, p-methylamisol, and so forth may be used. Generally any flavoring or food additive such as those described in Chemicals Used in Food Processing, publication 1274, pages 63-258, by the National Academy of Sciences, may be used.

Further examples of aldehyde flavorings include but are not limited to acetaldehyde (apple), benzaldehyde (cherry, almond), anisic aldehyde (licorice, anise), cinnamic aldehyde (cinnamon), citral, i.e., alpha-citral (lemon, lime), neral, i.e., beta-citral (lemon, lime), decanal (orange, lemon), ethyl vanillin (vanilla, cream), heliotrope, i.e., piperonal (vanilla, cream), vanillin (vanilla, cream), alpha-amyl cinnamaldehyde (spicy fruity flavors), butyraldehyde (butter, cheese), valeraldehyde (butter, cheese), citronellal (modifies, many types), decanal (citrus fruits), aldehyde C-8 (citrus fruits), aldehyde C-9 (citrus fruits), aldehyde C-12 (citrus fruits), 2-ethyl butyraldehyde (berry fruits), hexenal, i.e., trans-2 (berry fruits), tolyl aldehyde (cherry, almond), veratraldehyde (vanilla), 2,6-dimethyl-5-heptenal, i.e., melonal (melon), 2,6-dimethyloctanal (green fruit), and 2-dodecenal (citrus, mandarin), cherry, grape, strawberry shortcake, mixtures thereof and the like.

The flavoring agent may be employed in either liquid form and/or dried form. When employed in the latter form, suitable drying means such as spray drying the oil may be used. Alternatively, the flavoring agent may be absorbed onto water soluble materials, such as cellulose, starch, sugar, maltodextrin, gum arabic and so forth or may be encapsulated. The actual techniques for preparing such dried forms are well known and do not constitute a part of this invention.

The flavoring agents of the present invention may be used in many distinct physical forms well known in

the art to provide an initial burst of flavor and/or a prolonged sensation of flavor. Without being limited thereto, such physical forms include free forms, such as spray dried, powdered, and beaded forms, and encapsulated forms, and mixtures thereof.

Encapsulated delivery systems for flavoring agents or sweetening agents comprise a hydrophobic matrix of fat or wax surrounding a sweetening agent or flavoring agent core. The fats may be selected from any number of conventional materials such as fatty acids, glycerides or polyglycerol esters, sorbitol esters, and mixtures thereof. Examples of fatty acids include hydrogenated and partially hydrogenated vegetable oils such as palm oil, palm kernel oil, peanut oil, rapeseed oil, rice bran oil, soybean oil, cottonseed oil, sunflower oil, safflower oil, and mixtures thereof. Glycerides which are useful include monoglycerides, diglycerides, and triglycerides.

Waxes useful may be chosen from the group consisting of natural and synthetic waxes, and mixtures thereof. Non-limiting examples include paraffin wax, petrolatum, carbowax, microcrystalline wax, beeswax, carnauba wax, candellila wax, lanolin, bayberry wax, sugarcane wax, spermaceti wax, rice bran wax, and mixtures thereof.

The fats and waxes may be use individually or in combination in amounts varying from about 10 to about 70%, and preferably in amounts from about 40 to about 58%, by weight of the encapsulated system. When used in combination, the fat and wax are preferably present in a ratio from about 70:10 to 85:15, respectively.

Typical encapsulated flavoring agent or sweetening agent delivery systems are disclosed in United States patents no. 4,597,970 and 4,722,845, which disclosures are incorporated herein by reference.

The amount of flavoring agent employed herein is normally a matter of preference subject to such factors as the type of final chewing gum composition, the individual flavor, the gum base employed, and the strength of flavor desired. Thus, the amount of flavoring may be varied in order to obtain the result desired in the final product and such variations are within the capabilities of those skilled in the art without the need for undue experimentation. In gum compositions, the flavoring agent is generally present in amounts from about 0.02% to about 5%, and preferably from about 0.1% to about 2%, and more preferably, from about 0.8% to about 1.8%, by weight of the chewing gum composition.

The coloring agents useful in the present invention are used in amounts effective to produce the desired color. These coloring agents include pigments which may be incorporated in amounts up to about 6%, by weight of the gum composition. A preferred pigment, titanium dioxide, may be incorporated in amounts up to about 2%, and preferably less than about 1%, by weight of the gum composition. The colorants may also include natural food colors and dyes suitable for food, drug and cosmetic applications. These colorants are known as F.D.& C. dyes and lakes. The materials acceptable for the foregoing uses are preferably water-soluble. Illustrative nonlimiting examples include the indigoid dye known as F.D.& C. Blue No.2, which is the disodium salt of 5,5-indigotindisulfonic acid. Similarly, the dye known as F.D.& C. Green No.1 comprises a triphenylmethane dye and is the monosodium salt of 4-[4-(N-ethyl-p-sulfoniumbenzylamino) diphenylmethylene]-[1-(N-ethyl -N-p-sulfoniumbenzyl)-delta-2,5-cyclohexadieneimine]. A full recitation of all F.D.& C. colorants and their corresponding chemical structures may be found in the Kirk-Othmer Encyclopedia of Chemical Technology, 3rd

Edition, in volume 5 at pages 857-884, which text is incorporated herein by reference.

Suitable oils and fats usable in gum compositions include partially hydrogenated vegetable or animal fats, such as coconut oil, palm kernel oil, beef tallow, lard, and the like. These ingredients when used are generally present in amounts up to about 7%, and preferably up to about 3.5%, by weight of the gum composition.

In accordance with this invention, effective amounts of the reduced-calorie, low-moisture absorbing bulking agent composition of the present invention may be admixed into the chewing gum composition. The exact amount of bulking agent composition employed is normally a matter of preference subject to the particular type of gum composition being prepared. Thus, the amount of bulking agent composition may be varied in order to obtain the result desired in the final product and such variations are within the capabilities of those skilled in the art without the need for undue experimentation. In general, the amount of reduced-calorie, low-moisture absorbing bulking agent composition normally present in a chewing gum composition will be up to about 70%, preferably from about 20% to about 60%, and more preferably from about 35% to about 55%, by weight of the chewing gum composition.

The present invention also includes a method for preparing the improved chewing gum compositions, including both chewing gum and bubble gum formulations. The chewing gum compositions may be prepared using standard techniques and equipment known to those skilled in the art. The apparatus useful in accordance with the present invention comprises mixing and heating apparatus well known in the chewing gum manufacturing arts, and therefore the selection of the specific apparatus will be apparent to the artisan.

In such a method, a chewing gum composition is made by admixing the gum base with the reduced-calorie, low-moisture absorbing bulking agent composition and the other ingredients of the final desired chewing gum composition. Other ingredients will usually be incorporated into the composition as dictated by the nature of the desired composition as well known by those having ordinary skill in the art. The ultimate chewing gum compositions are readily prepared using methods generally known in the food technology and chewing gum arts.

For example, the gum base is heated to a temperature sufficiently high to soften the base without adversely effecting the physical and chemical make up of the base. The optimal temperatures utilized may vary depending upon the composition of the gum base used, but such temperatures are readily determined by those skilled in the art without undue experimentation.

The gum base is conventionally melted at temperatures that range from about 60° C. to about 120° C. for a period of time sufficient to render the base molten. For example, the gum base may be heated under these conditions for a period of about thirty minutes just prior to being admixed incrementally with the remaining ingredients of the gum composition such as the bulking agent, an intense sweetener, plasticizer, the softener, and/or fillers, coloring agents and flavoring agents to plasticize the blend as well as to modulate the hardness, viscoelasticity and formability of the base. Mixing is continued until a uniform mixture of gum composition is obtained. Thereafter the gum composition mixture may be formed into desirable chewing gum shapes.

Another important aspect of the present invention includes a confectionery composition incorporating the inventive reduced-calorie, low-moisture

absorbing bulking agent composition and a method for preparing the confectionery compositions. The preparation of confectionery formulations is historically well known and has changed little through the years. The reduced-calorie, low-moisture absorbing bulking agent compositions of the present invention can be incorporated into the confections by admixing the inventive composition into the conventional confections.

Soft confectionery may be processed and formulated by conventional means. The preparation of soft confections, such as nougat, involves conventional methods, such as the combination of two primary components, namely (1) a high boiling syrup such as a corn syrup, or the like, and (2) a relatively light textured frappe, generally prepared from egg albumin, gelatin, vegetable proteins, such as soy derived compounds, sugarless milk derived compounds such as milk proteins, and mixtures thereof. The frappe is generally relatively light, and may, for example, range in density from about 0.5 to about 0.7 grams/cc.

The high boiling syrup, or "bob syrup" of the soft confectionery is relatively viscous and has a higher density than the frappe component, and frequently contains a substantial amount of carbohydrate bulking agent such as a Polydextrose. Conventionally, the final nougat composition is prepared by the addition of the "bob syrup" to the frappe under agitation, to form the basic nougat mixture. Further ingredients such as flavoring, additional carbohydrate bulking agent, colorants, preservatives, medicaments, mixtures thereof and the like may be added thereafter also under agitation. A general discussion of the composition and preparation of nougat confections may be found in B.W. Minifie, Chocolate, Cocoa and Confectionery: Science and Technology, 2nd edition, AVI Publishing Co., Inc., Westport, Conn. (1980), at pages 424-425, which disclosure is incorporated herein by reference.

The procedure for preparing the soft confectionery involves known procedures. In general, the frappe component is prepared first and thereafter the syrup component is slowly added under agitation at a temperature of at least about 65° C., and preferably at least about 100° C. The mixture of components is continued to be mixed to form a uniform mixture, after which the mixture is cooled to a temperature below 80° C., at which point, the flavor may be added. The mixture is further mixed for an additional period until it is ready to be removed and formed into suitable confectionery shapes.

In accordance with this invention, effective amounts of the reduced-calorie, low-moisture absorbing bulking agent compositions of the present invention may be admixed into the confections. The exact amount of bulking agent composition may be varied in order to obtain the result desired in the final product and such variations are within the capabilities of those skilled in the art without the need for undue experimentation. The exact amount of bulking agent composition employed is normally a matter of preference subject to the particular type of confection being prepared. Thus, the amount of bulking agent composition may be varied in order to obtain the result desired in the final product and such variations are within the capabilities of those skilled in the art without the need for undue experimentation. In general, the amount of reduced-calorie, low-moisture absorbing bulking agent composition normally present in a confection will be up to about 100%, preferably from about 50% to about 98%, and more preferably from about 60% to about 85%, by weight of the confection.

The present invention extends to methods of making the improved confections. The reduced-calorie, low-moisture absorbing bulking agent compositions may be incorporated into an otherwise conventional confection

composition using standard techniques and equipment known to those skilled in the art. The apparatus useful in accordance with the present invention comprises mixing and heating apparatus well known in the confectionery manufacturing arts, and therefore the selection of the specific apparatus will be apparent to the artisan.

In such a method, a composition is made by admixing the inventive reduced-calorie, low-moisture absorbing bulking agent composition into the confectionery composition along with the other ingredients of the final desired composition. Other ingredients will usually be incorporated into the composition as dictated by the nature of the desired composition as well known by those having ordinary skill in the art. The ultimate confectionery compositions are readily prepared using methods generally known in the food technology and pharmaceutical arts. Thereafter the confectionery mixture may be formed into desirable confectionery shapes.

The reduced-calorie, low-moisture absorbing bulking agent compositions may be formulated with conventional ingredients which offer a variety of textures to suit particular applications. Such ingredients may be in the form of confections, tablets, toffee, nougat, chewy candy, chewing gum and so forth, both sugar and sugarless. The acceptable ingredients may be selected from a wide range of materials. ithout being limited thereto, such materials include diluents, binders and adhesives, lubricants, disintegrants, other bulking agents, humectants and buffers and adsorbents. The preparation of such confections and chewing gum products is well known.

Throughout this application, various publications have been referenced. The disclosures in these publications are incorporated herein by reference in order to more fully describe the state of the art.

The present invention is further illustrated by the following examples which are not intended to limit the effective scope of the claims. All parts and percentages in the examples and throughout the specification and claims are by weight of the final composition unless otherwise specified.

EXAMPLES 1-3

These examples demonstrate the moisture absorption over a five week period of chewing gum compositions containing as the bulking agent, mixtures of Polydextrose and sorbitol, in varying amounts, by weight of the bulking agent.

Polydextrose was incorporated into a conventional sorbitol based chewing gum in varying amounts. In Example 1, the bulking agent comprised 25% Polydextrose and 75% sorbitol. In Example 2, the bulking agent comprised 50% Polydextrose and 50% sorbitol. In Example 3, the bulking agent comprised 75% Polydextrose and 25% sorbitol. The total amount of bulking agent comprised 55% of the chewing gum composition, by weight.

The amount of moisture absorbed by the chewing gums of Examples 1-3 was measured over a period of five weeks at a temperature of 27° C. (80° F.) and a relative humidity (RH) of 80%. The measurements, in percentage moisture absorbed versus weeks of storage, are set out in FIGURE 1.

FIGURE 1 shows that after a period of five weeks, the chewing gums of Examples 1-3 absorbed significant moisture. The chewing gums of Examples 2-3, which contained 50% and 75% of Polydextrose, respectively, initially contained more moisture and, on storage, absorbed more moisture than the chewing gum of Example 1, which contained 25% Polydextrose.

EXAMPLES 4-9

These Examples demonstrate the moisture absorption over a five week period of chewing gum compositions containing as the bulking agent, mixtures of 70% Polydextrose and 30% of a second bulking agent, by weight of the bulking agent.

The bulking agent in the chewing gum of Example 4 was 70% Polydextrose and 30% sorbitol. The bulking agent in the chewing gum of Example 5 was 70% Polydextrose and 30% Palatinit. The bulking agent in the chewing gum of Example 6 was 70% Polydextrose and 30% maltitol. The bulking agent in the chewing gum of Example 7 was 70% Polydextrose and 30% mannitol. The bulking agent in the chewing gum of Example 8 was 70% Polydextrose and 30% fructose. The bulking agent in the chewing gum of Example 9 was 70% Polydextrose and 30% xylitol. The total amount of bulking agent comprised 55% of the chewing gum composition, by weight.

The amount of moisture absorbed by the chewing gums of Examples 4 through 9 was measured over a period of five weeks at a temperature of 27° C. (80° F.) and a relative humidity of 80%. The measurements, in percentage moisture absorbed versus weeks of storage, are set out in FIGURE 2.

FIGURE 2 shows that after a period of five weeks, the chewing gums of Example 5 (70% Polydextrose and 30% Palatinit), Example 6 (70% Polydextrose and 30% maltitol), and Example 7 (70% Polydextrose and 30% mannitol) absorbed less moisture than the chewing gums of Example 4 (70% Polydextrose and 30% sorbitol), Example 8 (70% Polydextrose and 30% fructose), and Example 9 (70% Polydextrose and 30% xylitol). Because of the lower moisture absorption, the chewing gums of Examples 5-7

were less sticky and tacky than the chewing gums of Examples 4, 8 and 9.

EXAMPLES 10-13

These Examples demonstrate the moisture absorption over a five week period of chewing gum compositions containing as the bulking agent, mixtures of Polydextrose and Palatinit, in varying amounts, by weight of the bulking agent.

The bulking agent in the chewing gum of Example 10 was 90% Polydextrose and 10% Palatinit. The bulking agent in the chewing gum of Example 11 was 80% Polydextrose and 20% Palatinit. The bulking agent in the chewing gum of Example 12 was 50% Polydextrose and 50% Palatinit. The bulking agent in the chewing gum of Example 13 was 25% Polydextrose and 75% Palatinit. The total amount of bulking agent comprised 55% of the chewing gum composition, by weight.

The amount of moisture absorbed by the chewing gums of Examples 10 through 13 was measured over a period of five weeks at a temperature of 27° C. (80° F.) and a relative humidity of 80%. The measurements, in percentage moisture absorbed versus weeks of storage, are set out in FIGURE 3.

FIGURE 3 shows that the amount of moisture absorbed by the chewing gums of Example 10-13 decreased with increasing amounts of the Palatinit bulking agent component in the Polydextrose bulking agent composition.

EXAMPLES 14-16

These Examples demonstrate the moisture absorption over a four week period of chewing gum compositions containing as the bulking agent, mixtures of

Polydextrose and maltitol, in varying amounts, by weight of the bulking agent.

The bulking agent in the chewing gum of Example 14 was 75% Polydextrose and 25% maltitol. The bulking agent in the chewing gum of Example 15 was 50% Polydextrose and 50% maltitol. The bulking agent in the chewing gum of Example 16 was 25% Polydextrose and 75% maltitol. The total amount of bulking agent comprised 55% of the chewing gum composition, by weight.

The amount of moisture absorbed by the chewing gums of Examples 14 through 16 was measured over a period of five weeks at a temperature of 27° C. (80° F.) and a relative humidity of 80%. The measurements, in percentage moisture absorbed versus weeks of storage, are set out in FIGURE 4.

FIGURE 4 shows that the amount of moisture absorbed by the chewing gums of Example 14-16 decreased with increasing amounts of the maltitol bulking agent component in the Polydextrose bulking agent composition.

EXAMPLES 17-23

These Examples demonstrate the chewing texture and mouth feel over time of various chewing gum compositions containing as the bulking agent, combinations of 70% Polydextrose and 30% of a second bulking agent, by weight of the bulking agent.

The bulking agent in the chewing gum of Example 17 was sorbitol (control). The bulking agent in the chewing gum of Example 18 was 70% Polydextrose and 30% Palatinit. The bulking agent in the chewing gum of Example 19 was 70% Polydextrose and 30% maltitol. The bulking agent in the chewing gum of Example 20 was 70% Polydextrose and 30% sucrose. The bulking agent in the chewing gum of Example 21 was 70% Polydextrose and 30%

sorbitol. The bulking agent in the chewing gum of Example 22 was 70% Polydextrose and 30% mannitol. Example 23 was 70% Polydextrose and 30% fructose. The total amount of bulking agent comprised 55% of the chewing gum composition, by weight.

A panel expert in evaluating the organoleptic properties and texture of chewing gum compositions judged the relative firmness of Examples 17-23 at 30 second, two minutes and six minutes, on a scale of 0-100, 0 being soft and 100 being hard, in random order, and the findings were pooled and averaged. The results of the expert panel evaluation are shown in FIGURE 5.

FIGURE 5 shows that the chewing gum of Example 18 which contained 70% Polydextrose and 30% Palatinit had the firmest chew initially and during the entire chew-out time period. The chewing gums of Examples 17, 19-21, and 23 containing sorbitol, maltitol, sugar, sorbitol, and fructose, respectively, all had a sticky and tacky texture. The chewing gum of Example 22, containing mannitol, was not as soft as the chewing gums of Examples 17, 19-21, and 23 but was not as firm as the chewing gum of Example 18.

The moisture absorption measurements and firmness evaluation studies show that chewing gum compositions containing a bulking agent comprising Polydextrose and Palatinit have significantly reduced moisture absorption properties and improved firmness resulting in gum compositions having improved organoleptic properties.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention and all such modifications are intended to be included within the scope of the following claims.

We claim:

1. A reduced-calorie, low-moisture absorbing bulking agent composition which comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol.

2. The bulking agent composition according to claim 1, wherein the second bulking agent is present in an amount from about 20% to about 40%, by weight of the bulking agent composition.

3. The bulking agent composition according to claim 2, wherein the second bulking agent is present in an amount of about 30%, by weight of the bulking agent composition.

4. The bulking agent composition according to claim 1, wherein the second bulking agent is isomalt.

5. The bulking agent composition according to claim 1, wherein the Polydextrose is Improved Polydextrose.

6. An edible composition which comprises a pharmaceutically acceptable carrier and an effective amount of a reduced-calorie, low-moisture absorbing bulking agent composition wherein the bulking agent composition comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol.

7. The edible composition according to claim 6, wherein the second bulking agent is present in an amount from about 20% to about 40%, by weight of the bulking agent composition.

8. The edible composition according to claim 6, wherein the second bulking agent is isomalt.

9. The edible composition according to claim 6, wherein the Polydextrose is Improved Polydextrose.

10. The edible composition according to claim 6, wherein the bulking agent composition is present in the edible composition in an amount up to about 70%, by weight of the edible composition.

11. A chewing gum composition which comprises:

(a) a gum base;

(b) an effective amount of a reduced-calorie, low-moisture absorbing bulking agent composition which comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol;

(c) an intense sweetener; and

(d) a flavoring agent.

12. The chewing gum composition according to claim 11, wherein the second bulking agent is present in an amount from about 20% to about 40%, by weight of the bulking agent composition.

13. The chewing gum composition according to claim 11, wherein the second bulking agent is isomalt.

14. The chewing gum composition according to claim 11, wherein the Polydextrose is Improved Polydextrose.

15. The chewing gum composition according to claim 11, wherein the bulking agent composition is present in the chewing gum composition in an amount up to about 70%, by weight of the chewing gum composition.

16. The chewing gum composition according to claim 15, wherein the bulking agent composition is present in the chewing gum composition in an amount from about from about 20% to about 60%, by weight of the chewing gum composition.

17. The chewing gum composition according to claim 11, wherein the gum base is present in an amount up to about 55%, by weight of the chewing gum composition.

18. A confectionery composition which comprises an effective amount of a reduced-calorie, low-moisture absorbing bulking agent composition which comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol.

19. The confectionery composition according to claim 18, wherein the second bulking agent is present in an amount from about 20% to about 40%, by weight of the bulking agent composition.

20. The confectionery composition according to claim 18, wherein the second bulking agent is isomalt.

21. The confectionery composition according to claim 18, wherein the Polydextrose is Improved Polydextrose.

22. The confectionery composition according to claim 18, wherein the bulking agent composition is present in the confectionery composition in an amount up to about 70%, by weight of the confectionery composition.

23. A method for preparing a reduced-calorie, low-moisture absorbing bulking agent composition which comprises admixing Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol.

24. The method according to claim 23, wherein the second bulking agent is isomalt.

25. A method for preparing an edible composition which comprises admixing an effective amount of a reduced-calorie, low-moisture absorbing bulking agent composition with a pharmaceutically acceptable carrier wherein the bulking agent composition comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol.

26. The method according to claim 25, wherein the second bulking agent is isomalt.

27. A method for preparing a chewing gum composition which comprises

(A) providing the following ingredients:

(a) a gum base;

(b) an effective amount of a reduced-calorie, low-moisture absorbing bulking agent composition which comprises Polydextrose and a second bulking agent selected from the group consisting of isomalt and mannitol;

(c) an intense sweetener; and

(d) a flavoring agent;

(B) melting the gum base;

(C) admixing the bulking agent composition, the intense sweetener, and the flavoring agent with the melted gum base; and

(D) forming the mixture from step (C) into suitable gum shapes.

28. The method according to claim 27, wherein the second bulking agent is isomalt.

FIG-1

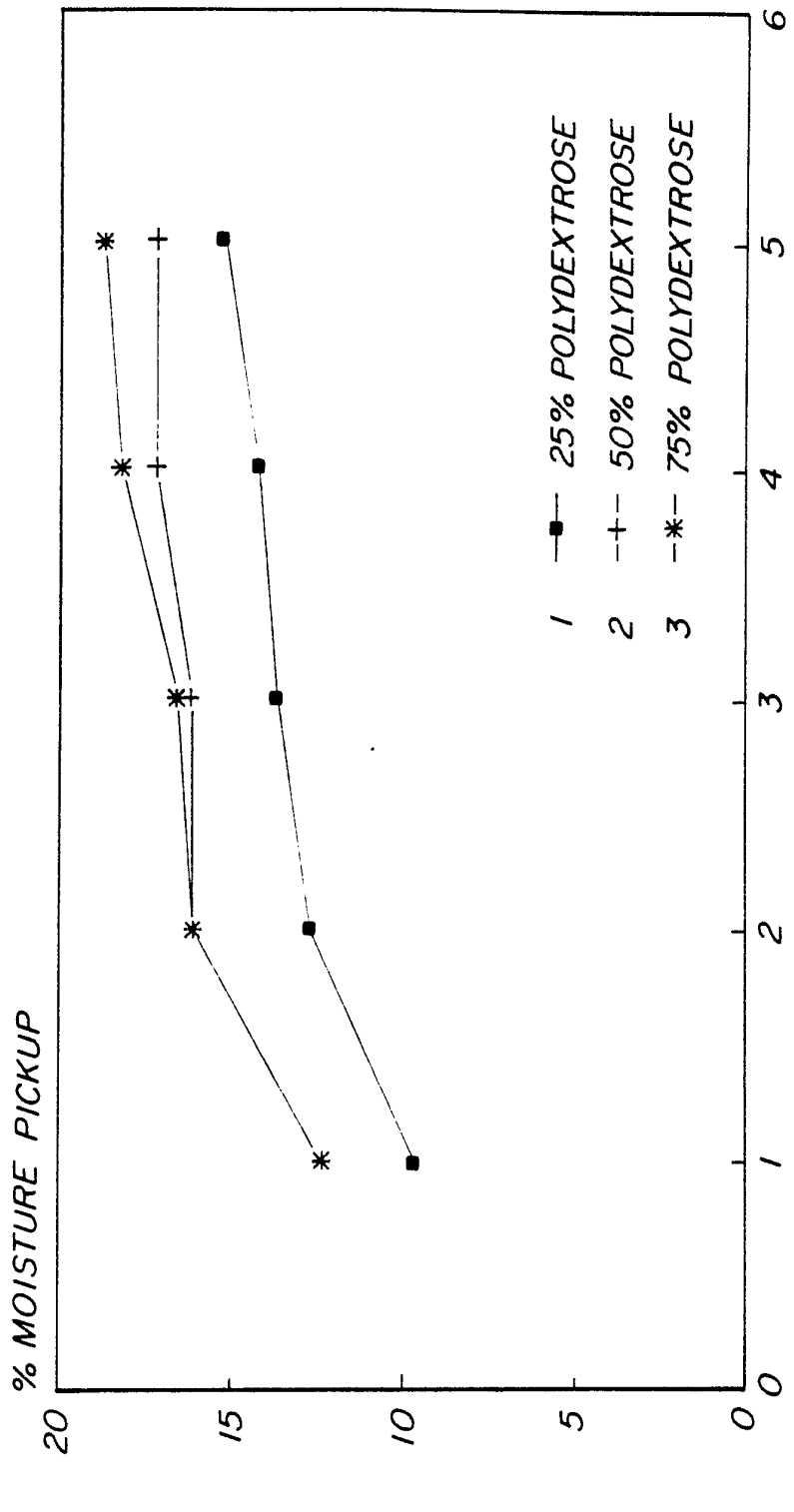

POLYDEXTROSE
MOISTURE PICKUP
% MOISTURE PICKUP
20
15
10
5
0
0
1
2
3
4
5
6
WEEKS
1 25% POLYDEXTROSE
2 50% POLYDEXTROSE
3 75% POLYDEXTROSE
TRIDENT GUM SPEARMINT

FIG-2

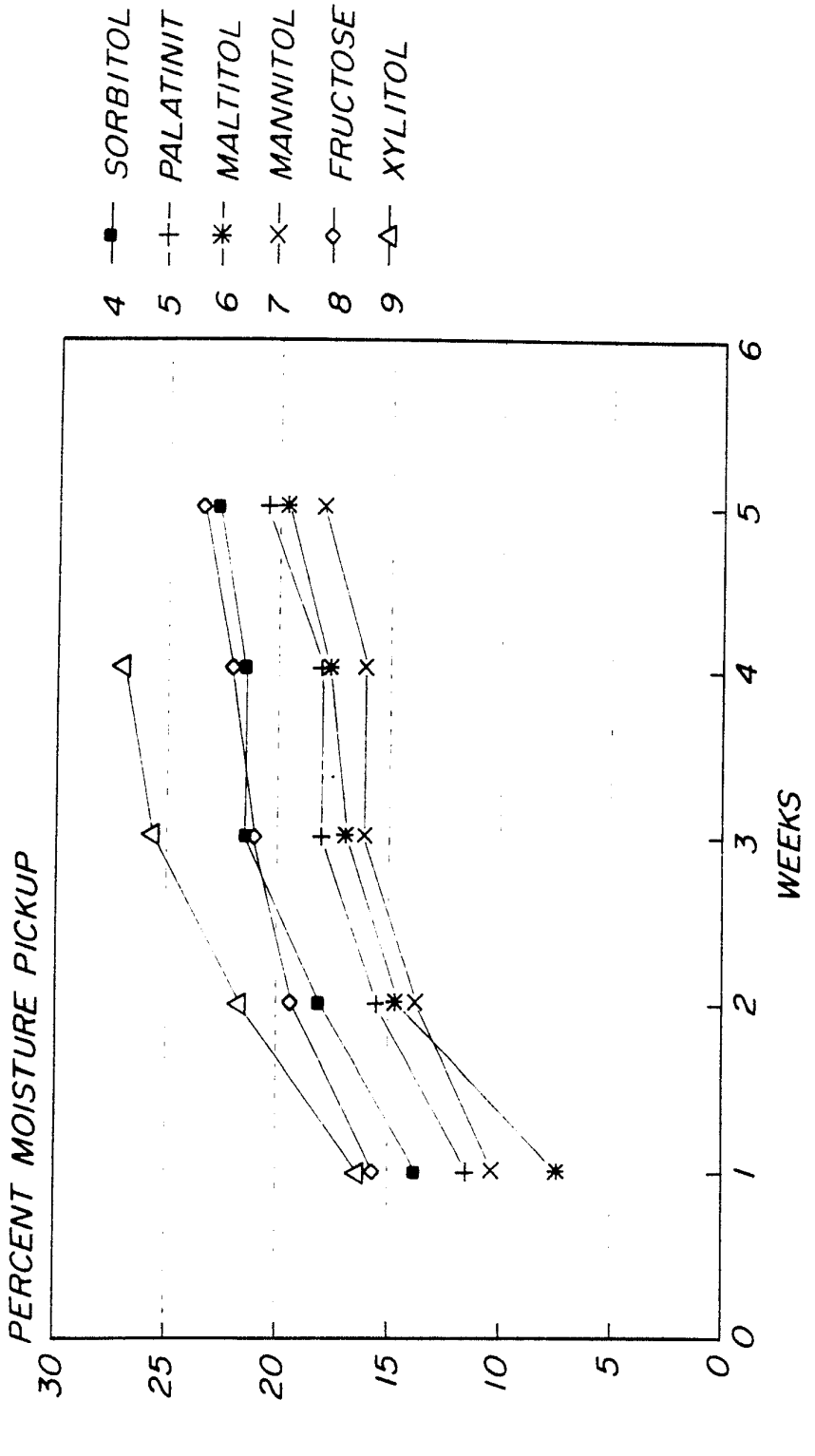
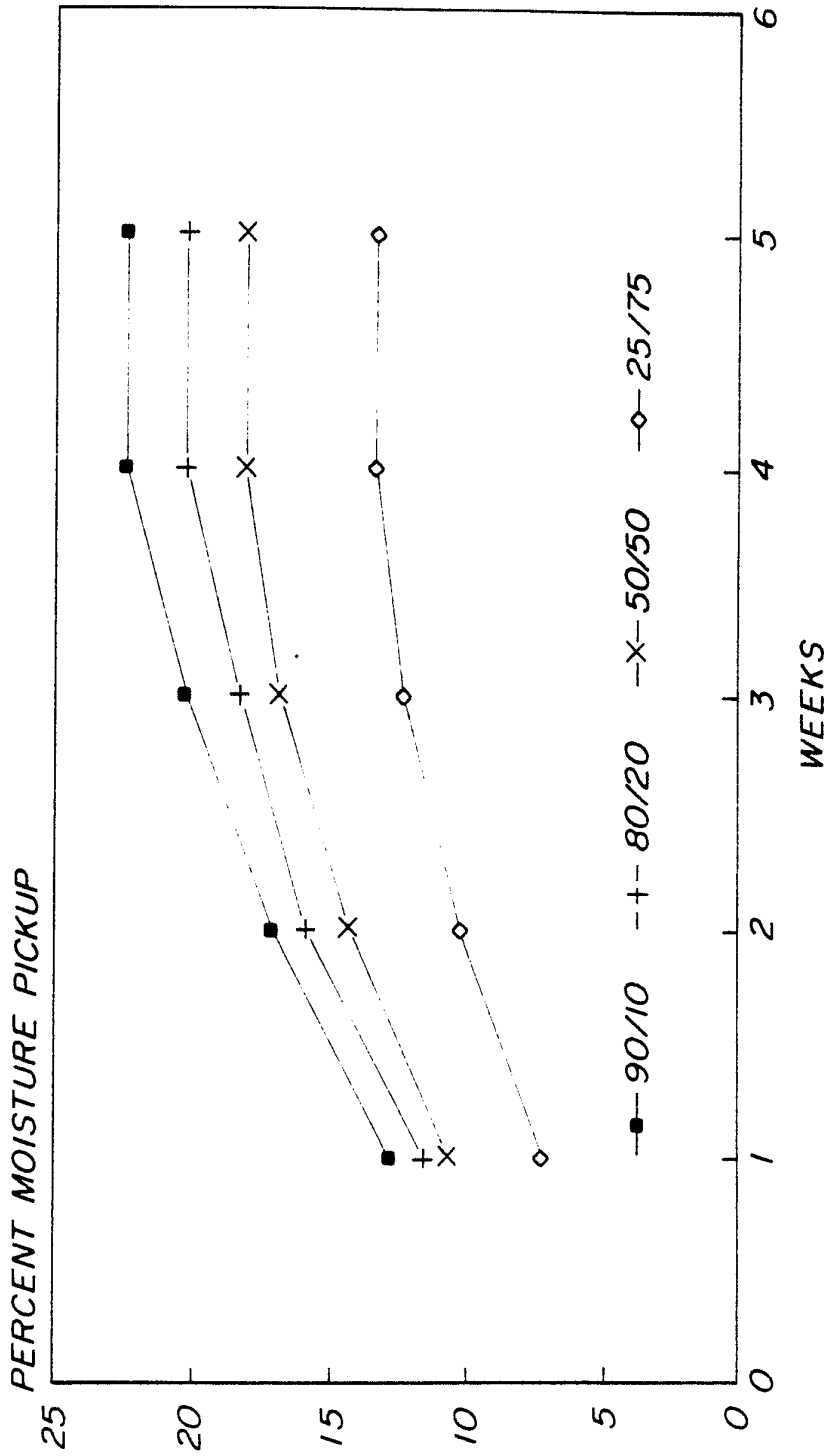

POLYDEXTROSE/BULKING AGENT
MOISTURE PICKUP
PERCENT MOISTURE PICKUP
30
25
20
15
10
5
0
0
1
2
3
4
5
6
WEEKS
4 SORBITOL
5 PALATINIT
6 MALTITOL
7 MANNITOL
8 FRUCTOSE
9 XYLITOL
ALL IN 70:30 RATIO

FIG-3

POLYDEXTROSE/PALATINIT
MOISTURE PICKUP



14 75/25
15 50/50
16 25/75

FIG-4

POLYDEXTROSE/MALTITOL
MOISTURE PICKUP

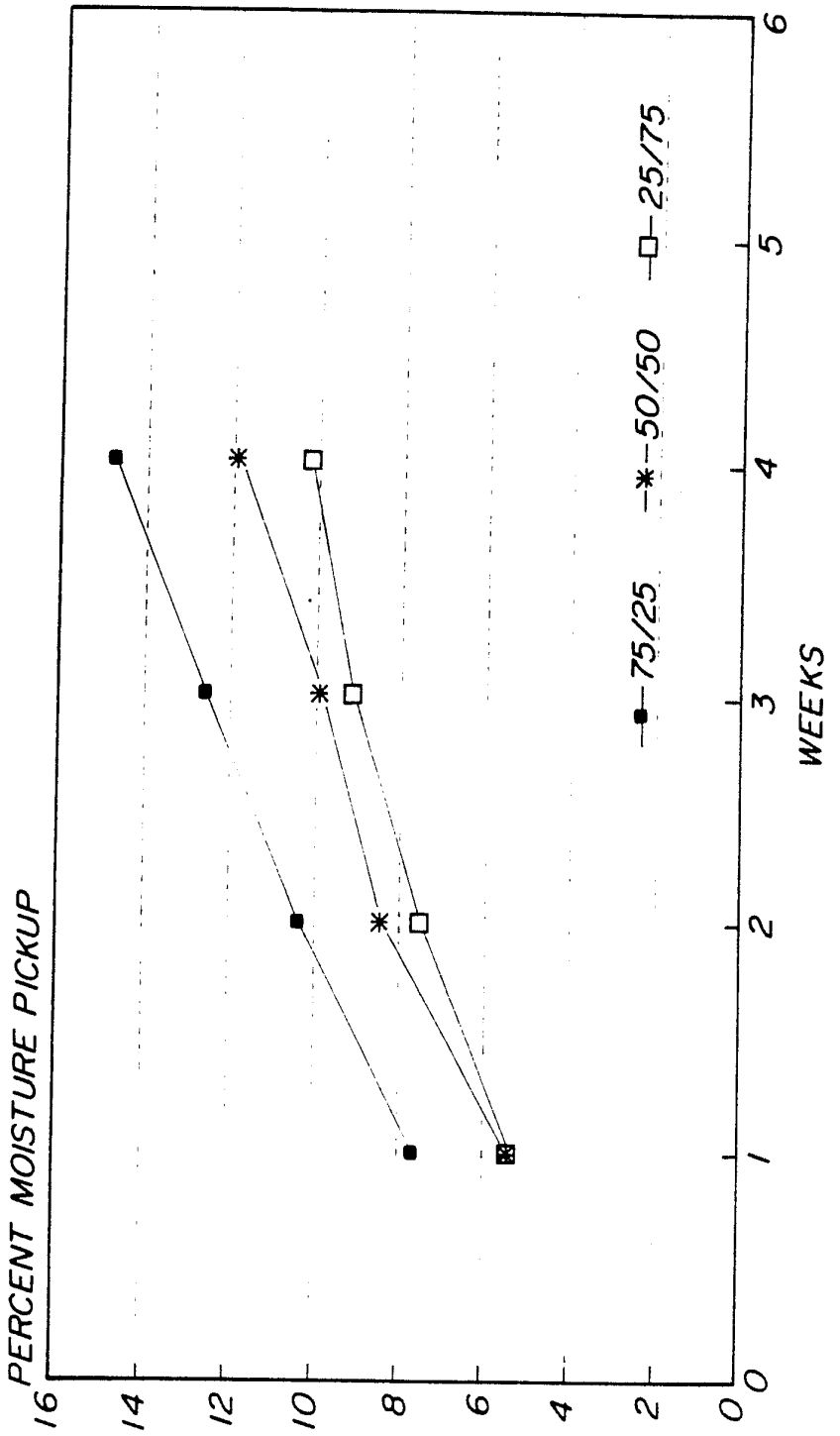
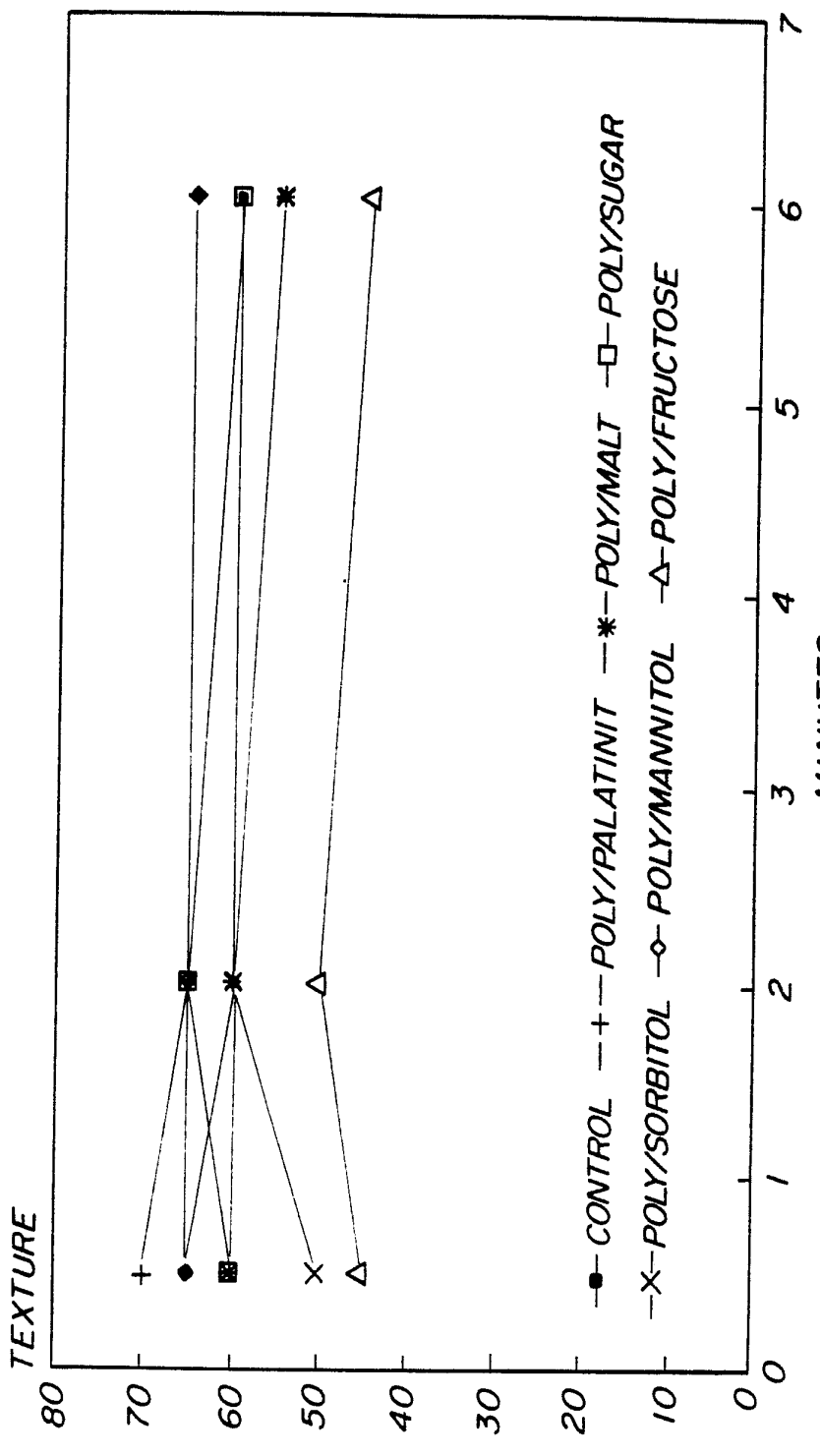


FIG-5


POLYDEXTROSE/BULKING AGENT
CHEW TEXTURE
TEXTURE
MINUTES
0=SOFT 100=HARD
17 CONTROL
18 POLY/PALATINIT
19 POLY/MALTITOL
20 POLY/SUCROSE
21 POLY/SORBITOL
22 POLY/MANNITOL
23 POLY/FRUCTOSE
CONTROL
POLY/PALATINIT
POLY/MALT
POLY/SUGAR
POLY/SORBITOL
POLY/MANNITOL
POLY/FRUCTOSE

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 91/05102

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A23L1/308 ; A23L1/236 ; A23G3/00 ; A23G3/30

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	A23L ; A23G

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	EP,A,0 377 278 (CULTOR) 11 July 1990 see claims	1-4,6-8, 10,11 13,16, 18-20 22-28
A	EP,A,0 254 401 (SUMEN SOKERY OY) 27 January 1988 see claims	1-28
A	EP,A,0 252 874 (WARNER-LAMBERT) 13 January 1988 see claims	1-28
A	US,A,4 382 963 (R.E.KLOSE ET AL.) 10 May 1983 see the whole document	1-28

° Special categories of cited documents :[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
22 OCTOBER 1991	19. 11. 91
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	VAN MOER A.M.J.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. US 9105102 SA 50145

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 22/10/91

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0377278	11-07-90	CA-A-	2002959	14-05-90
		JP-A-	2186959	23-07-90
EP-A-0254401	27-01-88	US-A-	4772482	20-09-88
		AU-B-	597533	31-05-90
		AU-A-	7295587	03-12-87
		JP-A-	63022164	29-01-88
EP-A-0252874	13-01-88	US-A-	4765991	23-08-88
		AU-B-	576447	25-08-88
		AU-A-	7187987	05-11-87
		JP-A-	62289149	16-12-87
US-A-4382963	10-05-83	CA-A-	1177311	06-11-84
		FR-A,B	2515931	13-05-83