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PROCESS FOR AGGLOMERATING BROWN SUGAR

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1 Claim. (Cl. 127—63)

This invention relates to improvements in the treatment of pulverized dry brown sugars to produce porous agglomerated products of improved keeping qualities and with improved dispersibility and solubility in water.

The pulverized dry brown sugars which are used as the starting material of the process are pulverized dry brown sugars such as are described in U.S. Patents Nos. 2,910,386 to 2,910,389. The pulverized dry brown sugars are produced by drying and pulverizing commercial brown sugar.

Commercial brown sugar contains, in addition to sucrose as its principal constituent, a coating of molasses which imparts the distinctive flavor and color to this type of sugar. The molasses, which is composed of sucrose, invert sugar, ash, water and other crystallizable and noncrystallizable compounds, surrounds the sucrose crystals in the form of a thin and sticky film. When commercial brown sugar is dried under suitable conditions, the thin film of molasses surrounding the sugar crystals is converted into a dry, non-sticky, solid film or layer surrounding the relatively large sugar crystals. When the dried granular brown sugar is pulverized, the sugar crystals and the thin dry coating are broken up to form a finely pulverulent product of which most of the fine particles are made up of pulverized fractured sugar crystals admixed with fine particles containing the disintegrated dry coating. In this product the small amount of dried solid molasses coating in fine microscopic pulverulent form is buried in a radically larger amount of microscopic pulverulent sucrose crystal particles.

An illustrative particle size distribution of dried granular brown sugar is as follows: 1.0% on 14 mesh; 10% on 20 mesh; 37.2% on 28 mesh; 33.2% on 35 mesh; 11.85% on 48 mesh; 4.25% on 65 mesh; and 2.50% through 65 mesh.

An illustrative particle size distribution of a sample of the pulverized dry brown sugar is as follows: 0.02% on 65 mesh; .23% on 100 mesh; 1.76% on 150 mesh; 6.36% on 200 mesh; and 91.63% through 200 mesh.

A comparison of the size of the particle of the granular brown sugar and of the pulverized dry brown sugar emphasizes the exent to which the coarse crystals and crystal aggregates of the granular brown sugar are broken up by pulverizing to form small particles, most of which are made up of pulverized sugar crystal particles admixed with fine particles containing the disintegrated dry coating.

According to the process of the present invention, the pulverized dried brown sugar is subjected to agitation while exposed to a humid atmosphere, so that it will take up a controlled and limited amount of moisture, with the resulting production of porous or spongy agglomerates or clusters of greatly improved keeping properties, and improved ease of disintegration and of solubilization in water.

During this agitation of the dry pulverized brown sugar in a humid atmosphere, the molasses, because of its amorphous form and hygroscopic nature, absorbs moisture and becomes sticky, thus allowing the particles to adhere and form clusters or aggregates. A large proportion of the pulverized sugar, as above indicated, is made up of particles which are pulverized or fractured sugar crystals free from molasses, while other particles will have broken up fractured sugar crystals with adhering molasses. As the molasses becomes sticky, it sticks to

adjacent particles and, in the clusters or aggregates which are formed, the molasses is distributed mainly in the interior of the clusters or aggregates, and the outer surfaces and particles of the aggregates or agglomerates are largely or mainly sucrose particles of sucrose surfaces.

Only a small percentage of moisture is required to moisten the dry powdered sugar and cause it to form clusters or aggregates, e.g., between 2% and 5%. Some moisture may be taken up by the surfaces of the broken sugar crystals, to a greater or less extent, and these surfaces may also become sticky as a result of this moistening and aid in forming the clusters or aggregates, particularly if the agitation in the moist atmosphere is prolonged.

After the clusters or aggregates are formed, they are dried, advantageously with hot air and with mild agitation, to produce spongy or porous agglomerates or aggregates or clusters.

Because the molasses is largely buried in the inside of the aggregates or clusters, and the outer surfaces or particles of the aggregates or agglomerates are mainly sugar, there is a minimum tendency for the aggregates to agglomerate together during subsequent storage.

The amount of moisture which is taken up by the powder in forming the spongy agglomerates may vary somewhat with different pulverized brown sugars, but, in general, will be a small percentage of e.g. around 2% to 4%, more or less. The moistening and agitation should be continued until aggregates or agglomerates are formed, but should not be too greatly prolonged.

The subsequent drying of the porous or spongy agglomerates should remove most of the water and advantageously should reduce the water to a fraction of a percent, e.g., around ½% or less. Thus, where the powdered dry brown sugar takes up around 3½% of moisture during the agitation in a moist atmosphere, most of this water will be removed to give a product of e.g. ½% moisture or less after drying. By varying the amount of water taken up, a harder or softer dried porous aggregate can be obtained, an increased amount of water tending to give a somewhat harder dried agglomerate; and less moisture, a softer dried agglomerate.

In the dried porous clusters or agglomerates, the dried molasses, which was moistened during the agitation and agglomeration, and dried during the subsequent drying, is present in a non-uniform manner throughout the fractured sugar crystal particles, aiding in holding them together. The dried molasses throughout the aggregates is, therefore, buried in and protected by a much larger number of fractured crystal particles which form part of the aggregates or clusters.

These porous aggregates or clusters have the advantage of greatly increased stability and improved keeping qualities. They are porous and readily dispersible and readily soluble in water. The porous or spongy nature of the agglomerates or aggregates greatly facilitates their dispersion and dissolving.

The invention will be further illustrated by the following specific example, but it will be understood that the invention is not limited thereto. The parts are by weight.

Two hundred parts of dry, pulverized No. 13 brown sugar, such as described in said prior patents, were subjected to 90% relative humidity air at 25° C. for one hour with continuous mild agitation in a Hobart mixer. This resulted in agglomeration or aggregating of the material to form clusters or aggregates. The wet material was then placed in an oven at 60° C. for one hour and dried with occasional agitation to a moisture content of about ½%. The dry material obtained was in the form of small agglomerates.

A sample of this agglomerated material, after standing in a capped bottle for three years at room temperature,

was still free-flowing for the most part. The one clump which formed disintegrated readily with a few shakes of the bottle.

A further comparative test was made of the product of this example in comparison with a sample of the dried, pulverized No. 13 brown sugar used in producing the aggregated product. Samples of both materials were further dried in an oven at 60° C. for 24 hours to a moisture content of 0.09%. 15 gram samples of each dried product were subjected to ambient air of a relative humidity of 70% at 90° F. In this one-hour exposure, the dry, pulverized No. 13 brown sugar lost its powdery consistency and formed lumps, whereas the agglomerated No. 13 brown sugar sample was still free-flowing. At this stage, the samples were transferred to a desiccator and allowed to stand over calcium chloride at room temperature for 24 hours. At the end of this drying period, the dry, pulverized No. 13 brown sugar had caked, whereas the agglomerated No. 13 brown sugar was still free-flowing.

The pulverized dry brown sugar used in these comparative tests was itself a product of improved stability and resistance to caking, but under the unfavorable accelerated comparative test it lost its free flowing properties after an hour's exposure; whereas the porous agglomerated product showed greatly improved and prolonged stability and caking resistance.

The porous nature of the agglomerated product produced as above described is illustrated by a sample which weighed 23 pounds per cubic foot, but this can be varied somewhat. The product is porous throughout, not only at the surface, but also in the interior of the agglomerates.

An illustration of the mesh size of a sample of the agglomerated product was as follows: 4% on 14 mesh; 5% on 20 mesh; 4.5% on 28 mesh, 6.0% on 35 mesh; 9.5% on 48 mesh; 20% on 65 mesh; 51% through 65 mesh; and less than 5% through 100 mesh.

I claim:

The process of producing agglomerates from a dry brown sugar, wherein said brown sugar consists essentially of sucrose crystals coated with molasses,

comprising the steps of pulverizing the brown sugar to form a flowable pulverized material of which about 90% will pass through a 200-mesh Tyler screen,

exposing said pulverized material to a humid atmosphere at about room temperature without direct liquid addition to said material and for a time sufficient to bring the moisture content of the material up to a predetermined value in the range of about 2 to 5 percent, and during all said exposure, agitating said material so as to retain it in a free flowing condition, and thereby forming it into agglomerates,

and thereafter drying said agglomerates to a total moisture content of not over about ½%, while maintaining them in a flowable condition with some agitation throughout the drying step.

References Cited in the file of this patent

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,098,767 July 23, 1963

Freeman Bush

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 50, for "exent" read -- extent --; column 2, line 5, for "of" read -- or --; column 4, line 30, for "2,954,309" read -- 2,954,306 --.

Signed and sealed this 7th day of April 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents