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NONSTICKY MOLASSES AND SIRUP LIQUID PRODUCTS, AND METHOD FOR MAKING THE SAME

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This invention relates to a process for changing sticky viscous carbohydrate-containing sirups into non-sticky liquids, and to the liquid products resulting from said process.

This application is a continuation-in-part of my co-pending application Serial No. 2,965, filed January 22, 1935, on "Methods for drying hydroscopic materials and the product thereof".

Much difficulty has heretofore been encountered in the mechanical handling through pumps, valves, pipes, nozzles, etc., of the viscous industrial carbohydrate-containing by-products which are known as sirups and molasses, due to the viscosity, gumminess and stickiness of the concentrated solutions. This is particularly true in cool or cold weather because of the increase in viscosity and stickiness with decreasing temperatures. In view of the low unit value of such materials, it is essential that they be handled, stored and transported in as highly concentrated form as possible, and in the liquid state this concentration has been limited by the ability to be pumped and handled by means of liquid handling equipment. In many cases it has been necessary to use heated pipe lines and high pressure special pumps in order to handle these liquids, and the use of this special equipment entails greatly increased cost of handling. Because of the stickiness of these liquids, they may not be "spray dried" except with difficulty and at uneconomical cost, because they cannot, in their concentrated form, be dispersed into the necessary spray either by forcing through a nozzle, or by throwing from a high speed disk. Spray drying may be accomplished, although at prohibitive costs, by diluting the concentrated solution with water, but this water must all be evaporated at great cost per unit of dry powder, and the process cannot be practicably employed. In order to use these sticky industrial sirups and molasses as feed materials, they are sometimes admixed with other dry feed materials, thereby producing a feed which is superficially dry although containing the sirup liquid. For this operation it is customary to spray the sirup into the other dry feed material in order to get proper mixing, but the concentrated sticky sirups and molasses liquids cannot be sprayed without the use of pressure pumps and other expensive equipment. The sirups may, of course, be handled after sufficient dilution with water, but this is undesirable because less of the liquid may be used with the other dry feed materials, or the food value is decreased by the extra water.

All of these difficulties may be overcome by my invention of a process for reducing the gumminess and stickiness of concentrated sirup and molasses liquids, without decreasing the solids content, and without deleteriously affecting the food or fertilizer values. After treatment by my process, these formerly sticky, adhesive liquids may be handled with relative ease through the usual systems of pipes, valves, pumps and sprays.

My process, in general, consists in treating these sticky concentrated carbohydrate-containing liquids with suitable amounts of caustic alkalies, such as caustic lime or caustic soda, by reaction with which they form more fluid, non-sticky liquids which are readily handled by ordinary liquid handling equipment. The amount of alkali is in excess of that required to neutralize the acids which sometimes occur in such liquids. As frequently produced, some of these industrial sirups and molasses compositions contain as low as 25 parts of water per hundred of solution, in which concentration they are handled with great difficulty. My process is applicable to these highly concentrated liquids, as well as to the less concentrated solutions usually encountered, the relative improvement in non-stickiness produced by my process of treatment being comparable. For certain extremely heavy molasses solutions, it is usually desirable to add some additional water to the liquid before treatment, to facilitate the mixing and increase the fluidity, particularly when these treated liquids are later to be sprayed for drying or mixing with other materials.

As an example, I may take ordinary black-strap molasses which contains about 75 parts of solids to 25 parts of water. To this extremely heavy sticky solution I add water to bring the proportion to 50 parts solids to 50 parts water, and then add about 2 parts by weight of quicklime, either in dry form or preferably as a paste moistened with water. The mixture is then agitated by any suitable mechanical or other mixer until the quicklime is thoroughly distributed throughout the liquid, and the reactions are allowed to go to completion. After the reaction, which is evidenced by the production of heat, I find that the molasses solution is lower in viscosity and is much less sticky or tacky or adhesive than before the treatment with lime. The solution may then be pumped through ordinary pumping equipment, or it may be sprayed without excessive pressures. It is in suitable condition to be forced through spray nozzles, or to be thrown out into fine spray from a revolving disk, to produce the finely divided liquid spray which is required for

"spray drying". It is well known that blackstrap molasses solutions, either in the original form having about 25 percent water or in the diluted form having as high as fifty percent water may not, without treatment by my process, be satisfactorily sprayed through a nozzle or dispersed by a high speed disk sprayer. To "atomize" such liquids without my treatment requires further dilution with water which greatly increases the cost of drying, because so much extra water must be evaporated for each unit weight of powdered product produced.

As another example of my process, I may use an evaporated solution of molasses residue or distillery waste containing approximately 50 parts of solids to 50 parts of water. These solids consist of invert sugars and other carbohydrates, gums and proteins. The solution is normally sticky and viscous, and cannot readily be handled by pumps, nor sprayed through nozzles or by high speed disks. By my process, I treat this solution with about 2 parts of caustic soda to 100 parts of solid in the solution. After stirring thoroughly, the solution becomes less viscous and less sticky and tacky, and may be sprayed satisfactorily for drying by the usual methods, and may be pumped and handled by the usual equipment used for handling ordinary non-sticky heavy liquids.

I have found that similar results may be attained by treating such sirupy liquids as water solutions of sugar sirups, malt sirups, molasses, molasses residues, gums, vegetable juices and the like with from one to five parts of caustic alkali to 100 parts of dry solids in solution, and that such treatment greatly reduces the gumminess, stickiness or tackiness of the solutions so that they may be readily handled as are ordinary non-sticky heavy liquids. I have found that the minimum amount of alkali, above that required to neutralize any acid constituents, required to produce these effects and these products varies with the different natures of the liquids; and I find that amounts used above these minimums do not deleteriously affect the results, except that for feed purposes too high free alkali above the minimum would be undesirable because of its physiological effects. The amount of alkali used therefore depends upon the nature of the liquid being treated, and the effect of an excess of alkali is to give free alkali in the final product. Quicklime is the preferred alkali, but other caustic alkalies may be used.

The treated solutions of sirups, molasses, malts, distillery and brewery residues, gums and vegetable juices and the like, in which the stickiness and gumminess have been reduced by the introduction of free alkali, may be handled after the ordinary manner of handling heavy liquids, and may be used for various purposes where the chemical properties of the materials adapt them, such as for mixing with other dried feeds or fertilizer materials, or for drying by any suitable method including "spray drying".

I claim:

1. The process of treating concentrated water solutions of carbohydrate-containing sirup and molasses consisting of adding to the solution an alkaline reagent in quantity sufficient to produce a substantial decrease in the stickiness of the solution but insufficient to produce thickening or solidification.

2. The process of treating concentrated water solutions of carbohydrate-containing sirup and molasses consisting of adding to the solution a caustic alkali in quantity sufficient to produce a substantial decrease in the stickiness of the solution but insufficient to produce thickening or solidification.

3. The process of treating concentrated water solutions of carbohydrate-containing sirup and molasses consisting of adding to the solution caustic lime in quantity sufficient to produce a substantial decrease in the stickiness of the solution but insufficient to produce thickening or solidification.

4. The process of treating concentrated water solutions of carbohydrate-containing sirup and molasses consisting of adding to the solution caustic soda in quantity sufficient to produce a substantial decrease in the stickiness of the solution but insufficient to produce thickening or solidification.

5. The process of treating water solutions of the nature of sirups and molasses, consisting of adding to the solution caustic alkali in quantity in excess of that required to neutralize the acidic materials present, but insufficient to cause thickening or solidification.

6. The process of treating water solutions of the nature of sirups and molasses, consisting of adding to the solutions from 1 to 15 parts of caustic alkali to each 100 parts of solids in the solution, the quantity selected in each case being sufficient to produce a substantial decrease in the stickiness of the solution, but insufficient to cause thickening or solidification.

7. A non-sticky concentrated water solution consisting of carbohydrate-containing sirup and molasses which in water solutions are normally sticky and sirup-like, water, and an amount of alkali in excess of that required to neutralize the acidity but insufficient to cause solidification of the mixture.

8. A non-sticky concentrated water solution consisting of carbohydrate-containing sirup and molasses which in water solutions are normally sticky and sirup-like, water, and an amount of caustic alkali in excess of that required to neutralize the acidity but insufficient to cause solidification of the mixture.

9. A non-sticky concentrated water solution consisting of carbohydrate-containing sirup and molasses which in water solutions are normally sticky and sirup-like, water, and an amount of caustic lime in excess of that required to neutralize the acidity but insufficient to cause solidification of the mixture.

10. A non-sticky concentrated solution consisting of carbohydrate-containing sirup and molasses which in water solutions are normally sticky and sirup-like, water, and an amount of caustic soda in excess of that required to neutralize the acidity but insufficient to cause solidification of the mixture.

11. A non-sticky concentrated solution of molasses containing sufficient caustic alkali to neutralize the acidity but insufficient to produce thickening or solidification.

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