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METHOD OF BLENDING MATERIALS AND
APPLYING BLENDED MATERIALS TO
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Company, St. Joseph, Mo.No Drawing. Application September 13, 1937,
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27 Claims. (Cl. 99-6)

My invention relates to a method of blending materials, and to applying such blended materials to cereals. This application is a continuation in part of my application Serial No. 2,705, filed January 21, 1935.

More particularly my invention relates to a method of blending together materials that are hard to mix, such as heavy viscous liquids, or a heavy viscous liquid and other materials, or a plurality of liquids of different viscosity, and applying these by spraying, to cereal products, such as molasses feeds, corn flakes, bran flakes and other flaked cereals.

In making a cereal product, that is impregnated with a material, such as molasses, certain syrups, or other materials, that are applied by spraying to the cereal product that is to be impregnated therewith, it is frequently very desirable to apply to the cereal or impregnate the cereal with a plurality of different ingredients, and in order to obtain a uniform application of such plurality of ingredients to the cereal product, such as a feed, or flaked cereal, or anything of that character, it is highly important that the material that is applied be of a uniform character throughout. Not only is this desirable in the case of compositions for application to the dry cereals, but also it is frequently found desirable to blend a plurality of different materials together in such a manner that the same will remain intimately mixed and of a uniform character, or homogeneous character, throughout, for other purposes.

It is one of the important purposes of my invention to provide a new and improved method of blending such materials, that are difficult to mix and which are difficult to maintain in a uniformly intimately mixed condition after blending. I have found that by finely dividing the materials that are difficult to mix, by whirling the same in a confined space by the application of centrifugal force thereto, and mixing the materials while so finely divided, an intimate mixture can be obtained that will be of a uniform character throughout its mass and that will remain uniform after mixing so that it will not separate into the different ingredients after treatment by my method. The whirling, or application of centrifugal force to the materials that are to be intimately mixed, may be done in any desired manner, but is, preferably, accomplished by such apparatus as shown in my co-pending application, Serial No. 116,923, filed December 21, 1936. While my improved method is particularly useful for the uniform blending or uniform mixing of heavy

viscous liquids, such as different kinds of molasses, it is also applicable to the blending of other liquids, and to lighter liquids with such heavy viscous liquids, or a liquid with a powdered solid material, or the intimate mixture and blending of any two materials that are difficult to mix and to maintain in such intimately mixed condition to produce a composition that is of a uniform character throughout its mass.

In the making of feed compositions, for example, it is particularly desirable to use a blend of a plurality of different kinds of molasses, instead of just using the ordinary black strap cane sugar molasses. The sugar content and the food value of the product can be increased considerably by utilizing other molasses than cane sugar molasses in combination with such cane sugar molasses, or such other molasses in combination with each other, such as corn sugar molasses and beet sugar molasses. It is accordingly one of the important purposes of my invention to provide a new and improved method of intimately mixing and uniformly blending a plurality of different kinds of molasses, such as cane sugar molasses, beet sugar molasses and corn sugar molasses, or any combination of these that may be desired. There are certain objections to the use of beet sugar molasses alone, and also the corn sugar molasses alone, in molasses feeds, but a mixture of corn sugar and beet sugar molasses produces a highly desirable product, but in order to be desirable it must be a uniform blend with the same proportion of beet sugar molasses and corn sugar molasses existing throughout the blend. The same is true of any two molasses used together.

It has been substantially impossible to use a mixture of different molasses for any purpose, because it has been impossible to mix these in a uniform blend due to the viscosity of the materials. This difficulty is overcome by my new and improved method. Also it is desirable sometimes to add finely divided solid material in the form of a powder, such as some mineral, to certain feed compositions to build up the mineral content, or otherwise supply certain deficiencies that exist in certain grains that are used as a base of the feed material that is to be made. It is also extremely difficult to compound a dry powdered material with a thick viscous material, such as molasses, and get a uniform mixture thereof by previously known methods. By my improved method this difficulty is overcome and such uniform blending or mixing of a finely divided powdered material and a liquid, such as molasses, can

be readily obtained and will be maintained after such blending.

It is accordingly an important purpose of my invention to provide a new and improved method of intimately mixing and uniformly blending finely divided solid materials, such as dry powdered material and a liquid, such as a viscous liquid, as, for example, molasses. This is accomplished in my improved method by whipping or whirling the materials that are to be blended, in a confined space to finely divide the same, and in some cases even vaporize the same, or turn the same into a mist-like form, whereupon the same can be blended into a substantially uniform mixture. This may be accomplished by either vaporizing or finely dividing these materials in separate chambers by the whirling or whipping thereof and passing the same into a single chamber where the same are further whipped or whirled about to further finely divide, vaporize and intimately mix the same, or by passing a plurality of said materials into a single chamber, in which the same are either whipped or whirled about to blend the same into a uniform mist-like form in a finely divided state, or into a uniform vapor, which is then passed out of the chamber and utilized in a feed composition, or other food product.

It is a further purpose of my invention to provide a new and improved method of making a molasses feed composition, comprising the blending of a plurality of different kinds of molasses into a uniform mixture, which is sprayed onto the dry constituents of the molasses feed composition to coat or impregnate the same.

It is another important purpose of my invention to provide a new and improved method of making a flaked cereal that is impregnated, or coated, with a coating composition and afterwards baked or dried. Thus I contemplate as part of my invention the method of making corn flakes, or bran flakes, or other cereal flakes, by coating the same with a coating composition that is of a uniform blend of materials. Such coating compositions may include malt syrup and molasses, and usually also contain water. It is difficult to get a uniform application of such coatings on corn flakes, bran flakes, or other cereal flakes, because the ingredients do not tend to mix readily and do not remain uniformly mixed by the ordinary methods utilized, this being due to the fact that the viscosity of the ingredients varies greatly. The exact proportions of the different ingredients utilized are not particularly important to my method, as these can be varied in accordance with the desires of the manufacturer. The important step in my improved method of making such coated cereal flakes is the provision of a uniform blend of the materials comprising the coating composition therefor, such as water, malt syrup and molasses, and this blending is accomplished by the whirling or whipping of the different materials, separately in separate chambers and then introducing the finely divided, or vaporized, materials into a common chamber where the same are further whirled or whipped about to thoroughly mix and uniformly blend the same to be then discharged in the form of a fine spray, or mist, upon the flaked cereal, or cereal flakes; or by introducing the different ingredients that are to be used in the coating, such as the water, malt syrup and molasses, into a single chamber where the same are whirled or whipped about at high velocity to finely divide the same and thoroughly mix the same so that a

mist-like spray of the components of the composition is discharged from the chamber onto the dry cereal flakes. These coated flakes are then dried, or baked, in the usual manner to produce the desired commercial cereal flake products, such as corn flakes, or bran flakes, or other cereal flakes.

It is a further purpose of my invention to provide a new and improved method of blending a plurality of materials for application to cereal flakes that may include finely divided solid material and a liquid, or liquids, such as a syrup, or a highly viscous liquid, such as molasses, by whirling or whipping the same about within a chamber, or a plurality of chambers, as outlined above, to finely divide or vaporize the same, and apply the same to the flaked cereal, or other cereal product, in the form of a mist-like spray of uniform character throughout.

As to whether the material, in the treatment to blend the same, is vaporized or merely finely divided, to form a mist-like spray thereof, depends upon the rate of rotation of the means for producing the whirl, or whipping action, upon the character of the material treated, and upon the rate at which the material is fed to the chamber in which it is whirled about. Lighter materials will vaporize at a lower velocity of rotation than heavier more viscous materials, and vaporization is more readily accomplished at a given rate of rotation, if the rate at which the material is fed into the chamber is reduced. The blending can be accomplished without vaporizing the materials, but if it is desired to produce a vapor for application of the blended material to another, or for any other step in the process in which the blended material is to be used, such vaporization can be obtained. However, blending will take place even though a true vapor may not be produced, but the material will in any case be so finely divided that the fine particles thereof will be intimately mixed with the fine particles of the other materials that are similarly finely divided, so as to form an absolutely uniform, or homogeneous, material that is a blend of the various materials that are so whipped about, or whirled about, as to produce this mist or vapor.

Other objects and advantages of my invention will appear as the description thereof proceeds. However, I do not intend to limit myself to the particular details described, except as defined in the claims.

In carrying out my improved method, any suitable means may be provided for confining the materials to be blended while a whirl is being set up therein to whip the same about and finely divide the same into a mist-like or vapor form, and any suitable means may be provided for setting up this whirl while so confined, one form of such apparatus being shown in my copending application Serial No. 116,923, filed December 21, 1936. However, other means may be utilized to accomplish the method that forms the subject matter hereof.

It is not necessary that blades, projections or teeth be provided on the rotative means for creating the whipping or whirling action in carrying out the method of blending the materials. The particular shape of the surface of the rotor or impelling member is not important to the process. It is, however, desirable that the edge portion of the rotating member, or impelling member, conform closely to the wall of the chamber in which the same rotates. However, greater clearance can be provided between the rotor and impelling

member to provide a spaced relation between certain portions of this impelling member and the chamber, if this is found desirable. The important thing in getting the whipping or whirling action and the thorough mixing and blending of the materials is that the major portion of the impelling member have only such clearance to prevent engagement of the rotor with the chamber walls, so that a very narrow passage is provided between the impelling member and the chamber walls.

In carrying out the method of blending the materials to produce a material of substantially uniform character throughout, the various materials that are to be utilized in producing the uniform intimate mixture, are whirled or whipped about in a chamber, or other space, to finely divide the same and, if desired, produce a vapor thereof. This may be done by feeding each of the materials into a separate chamber, in which means is provided for centrifugally whipping or whirling the same about, and separately subjecting each of such ingredients to such whirling or whipping action to finely divide the same into the form of a mist, or vapor, and then feeding the finely divided materials from these chambers into a common chamber in which the same are further whirled or whipped about to intimately mix the same and produce a uniform intimate mixture of the various ingredients that have been introduced from the various chambers; or all of the various ingredients can be fed into the same chamber in proper proportion to get the desired proportion of ingredients in the composition that is to result, and whirled or whipped about in said chamber as these are fed into the same to finely divide these materials and intimately mix the same in the one chamber, or various combinations of these methods may be utilized as may be found to be the most desirable for the materials that are to be treated.

In making a blend of molasses, for instance, the cane sugar molasses and beet sugar molasses may be separately whirled about and finely divided in separate chambers and then fed into a third chamber, in which the same are further whipped or whirled about to mix the same in such finely divided or mist-like vaporous state. In a similar manner cane sugar and corn sugar molasses will be separately finely divided and then fed into a common chamber to be intimately mixed, or corn sugar molasses and beet sugar molasses can be similarly processed. Or, if desired, all three kinds of molasses herein mentioned can be separately finely divided by whirling or whipping the same about in a chamber at a high velocity and then all three of these introduced in such finely divided state into a fourth chamber, in which the same are further whipped or whirled about to maintain the same in a finely divided condition and intimately mix the same.

Instead of utilizing a plurality of chambers, the corn sugar molasses and the cane sugar molasses can be continuously fed into a common chamber in the desired proportions to get the blend that is wanted, and whirled or whipped about in said chamber to finely divide the same and intimately mix the same during the same whirling motion. The same method can be utilized in blending any two of the kinds of molasses referred to above, or in blending all three of the same.

Instead of blending two or more viscous liquids, such as two or more different kinds of molasses

in this manner, a dry powdered solid material can be blended with a viscous liquid in a similar manner, that is, the dry powdered material can be whirled or whipped about to finely divide the same and the molasses can be similarly whirled or whipped about, and these ingredients can then be intimately mixed in such finely divided form either in a common chamber into which the powder and the molasses have been fed before being broken up, or after such whipping or whirling and breaking up into a finely divided form, in another chamber by further whirling or whipping.

In making the feed composition, the dry feed material is carried along by any suitable conveyor means in a spread out condition and may also be agitated as it is carried along, if desired, while the blended molasses, or similar blended material, is discharged onto the dry feed material in the form of a fine mist or spray from the chamber, in which the same is being whipped or whirled about to intimately mix the same, to coat and uniformly impregnate said composition with a uniform coating of impregnating material. This spraying of the blended molasses composition on the dry feed material, is usually, and preferably, accomplished without the use of any heat. The whipping or whirling about of the coating or impregnating composition, including one or more kinds of molasses, causes a reduction in the viscosity of the molasses and thus of the blended composition, and thus increases the fluidity so that the blended composition can be readily sprayed on the dry ingredient, or ingredients, of the feed composition. Furthermore, the character of the composition is changed so that the stickiness that would otherwise exist, due to the inclusion of one or more kinds of molasses therein, will be reduced and substantially eliminated. As a result of this change in the characteristics of the molasses in the composition, the blended coating composition will tend to enter more deeply into the dry material than would be the case otherwise, more thoroughly impregnating the same and producing a feed composition that does not have to be dried by heat after the coating composition has been sprayed thereon.

Various other materials can be blended in the manner set forth herein, so as to obtain an intimate mixture and uniform composition throughout the mass of the blended materials. The blending is particularly advantageous when any viscous liquid is included in the product that is to be produced. Materials of relatively low viscosity, or mobile liquids, can also be blended in this manner and more thoroughly blended than would be the case by any other method. This blending is particularly advantageous where it is undesirable to apply heat to any one or more of the materials that are to be blended, such as relatively light liquids of certain characters that might be blended in this manner, as the blending can be accomplished without the use of any heat whatsoever. The blending of different materials by my improved method is particularly desirable where these have a different degree of viscosity. Among such materials that are blended for commercial uses and the blending of which has been difficult, if not entirely impossible, by previously known methods, are those utilized in producing compositions that are sprayed or applied to flaked cereals, such as corn flakes or bran flakes. Usually these compositions include water, malt syrup and molasses, although other ingredients may be added thereto, if desired. The three ingredients mentioned have considerably different viscosities

and one difficulty with the use of coating, or impregnating, compositions for flaked cereals embodying these three components is that a uniform blend of the same is difficult to obtain and apply to the cereal flakes. By my improved method of blending the same, however, this difficulty is entirely overcome. The blending can be accomplished by centrifugally whirling the water, the molasses, the malt syrup, and any other ingredient that may be included in the composition, in separate chambers by the application of centrifugal force at relatively high velocity thereto, whereupon the finely divided materials in a mist-like or vaporous form are discharged from each of these chambers into a common chamber, in which the same are whirled about in such finely divided form in intimate contact with each other to produce an intimate mixture, of a uniform character throughout, of the ingredients mentioned.

Instead of separately finely dividing the materials by whirling thereof, as mentioned above, the malt syrup, the molasses and the water can all be fed into a common chamber in the proper proportions and whirled about therein simultaneously to finely divide and intimately mix the same to produce the blend of the materials desired. In either case the blended materials are discharged from the chamber in which the same are whirled about to produce the final blending thereof. The blended mixture is discharged from the chamber in which the centrifugal force is applied thereto in the form of a mist, or spray, that is applied to the corn, or bran, or other flakes, that have been previously made into a flake form by well known methods. This causes the uniformly blended mixture of the ingredients that are to be applied to the flakes of cereal to uniformly coat and impregnate the same and these cereal flakes are then dried, or baked, to crisp the same and dry the coating thus formed thereon. Due to the changes in the viscosity of certain of the viscous ingredients of the composition, such as the molasses, this drying can usually be considerably shortened over methods previously known.

While these compositions that are applied to cereal flakes may include molasses, it is not absolutely necessary that this be true in order that my improved method may be used to advantage. It is important that a uniform blend of the coating composition be obtained under any circumstances, even though no highly viscous liquid is utilized in the composition, as otherwise a product that is not uniform in character would result. By the use of my method, however, and particularly where the materials are of different viscosity, even though not as highly viscous as black strap molasses, for example, an absolutely uniform coating composition results, where otherwise, by previously known methods, such absolute uniformity was difficult to obtain, if at all obtainable. By my improved method the blending is accomplished entirely mechanically and much more rapidly than would otherwise be possible, and the blending is so thorough that even though the specific gravity and viscosity of the various ingredients of the composition may vary, there would be no tendency whatsoever for the blended material to separate out into different layers or strata. Due to this fact, the blended material can be blended at one place and sprayed or applied to the dry ingredients, or other materials, that are to be sprayed with the coating composition, at a different place, as there will be

no separation of the different materials back into their original form after blending of the same, as frequently occurs with materials of different viscosity, or different specific gravity, when blended by previously known methods. Also no heat is necessary to do the blending and it can be accomplished as a continuous process in a very rapid and efficient manner. Of course, should anyone carrying out the process have some preconceived ideas about the desirability of heating the molasses, or other materials, used in making the blended composition, because of the fact that such molasses, or other highly viscous material, might flow more easily into the chamber, or chambers, in which whirling takes place, there is no great harm done by such heating to obtain such flow into the chamber, although this is not usually necessary at all. If the temperature is not raised to too great an extreme, and the mechanical whipping or whirling action can be carried out on the molasses, or other material, or materials, to mechanically change the same into a mobile condition and mechanically blend the same, there is no great harm in such heating, particularly where extremely low temperatures might interfere with the flow of the molasses, or other viscous material, into a chamber, or to make it flow more slowly than the operator of the method may desire. However, it is preferred that the materials be fed into the chamber in which the whirling or whipping action takes place, in a cold state, or at a temperature that is substantially that of the atmosphere.

Instead of carrying out the methods of blending the materials in the manner set forth above, another method can be used, that of mixing as completely as is possible by ordinary methods, of the ingredients of the composition that is to be blended, before passing the same into the chamber in which the whirling motion takes place, and then applying a whirling or whipping motion to this mixture to thoroughly blend the ingredients thereof. However, this is really more difficult to do to get the proportions uniform throughout, than to introduce each of the ingredients of the composition into the chamber in which the whirling is to take place without first mixing it with other ingredients. This is true because the mixing or blending can be done much more thoroughly in the finely divided condition in which the material is found to exist in the chamber in which the whipping or whirling action takes place, due to centrifugal force being applied thereto in said chamber. Due to the fact that the materials can be blended in such a manner that no separation thereof will occur after blending, the blending can be accomplished in the manner set forth above and the blended materials can then be stored in suitable containers for future use, if this should be found desirable.

While, of course, it has been impossible for me to blend all different materials that can be blended in order to produce a desirable blended uniform compound that is of commercial value, yet I have found that there is an advantage in blending any materials that are desired to be blended into a uniform composition in this manner. This is due to the fact that, because of the materials being broken up into a finely divided condition, the same can be more intimately mixed with each other than is otherwise the case, and can be so thoroughly and completely blended that the same will have no tendency to separate, and the blend will be much more uniform than is possible by any other method. Thus, in any case in which

materials that are difficult to blend are to be blended, or materials are to be blended that are difficult to maintain in a blended condition, or in cases in which it is particularly important that the blend of the materials be uniform, this can be accomplished by my new and improved method by any of the procedures described above. This is due to the fact that the materials can be fed into the chamber, or chambers, in which the whirling takes place in exactly the proportion desired, by suitable controlling of the feed, and if so fed into such chamber, or chambers, the whirling or whipping action that takes place therein will thoroughly and completely blend the same while in a finely divided state, and no matter how difficult the materials are to blend, will much more completely and thoroughly blend the same than is possible by any other method.

While the methods described above are preferred for blending materials that are to be applied to other materials, such as blends, above referred to, for application to flaked cereals to coat or impregnate the same with a coating of uniform character, an approximation of the desirable results above referred to can be obtained as respects a uniform coating on cereal flakes and similar products, by another method. In carrying out this last mentioned method the materials that are to be included in the blended coating applied to the flaked cereals are each fed to a separate chamber and rotatively impelled therein, in the manner above referred to, to finely divide, or vaporize the same, if vaporization is found desirable, and these finely divided materials are discharged onto the material to be coated or impregnated thereby from the chambers, in which the same are whirled or whipped about, in the form of a mist or spray under the influence of the centrifugal force developed in the chambers. The rate of feed of the materials into the various chambers can be controlled to get the blend of the various ingredients desired, and either the materials discharged from the chambers in finely divided form can be simultaneously sprayed on the cereal flakes, or similar product, that is to be coated or impregnated, or the different ingredients of the blended coating can be successively applied to the flaked cereal, or similar product, by means of the centrifugal force developed in the chambers, the materials being, of course, discharged from the chambers onto the flaked cereal, or similar material, in the form of a mist or spray. The materials can be so finely divided by this method that if successively applied to the cereal flakes, the same will be blended substantially uniformly on the surface of the flakes, and while there might be some stratification of the different ingredients on the cereal flakes due to their being successively applied, the major portion of the material that is applied to the flakes will be intimately mixed and blended, due to the force with which the same is applied to the flaked cereal and due to the finely divided condition that this is in when so applied.

In the case where it is desired to spray a finely divided or mist-like spray of a liquid and powdered material on other materials, such as cereal flakes, the liquid and powdered material may be mixed before being submitted to the whirling motion, or may be fed simultaneously, or substantially simultaneously, into the vortex of the whirl. The liquid and powder could be fed into the chamber after being mixed in the proper proportions, or without being previously mixed, at the proper rate and in the right proportions, and in

either case, upon entering the whirl it will immediately be finely divided and thoroughly mixed so that a uniform blend of the powder and liquid will be produced, which can be sprayed evenly over the surface of the material to be sprayed by being discharged from the chamber in which the same was subjected to the whirling or whipping motion. If it is not desired to immediately spray the mixture, it can be thoroughly blended in the above mentioned manner and the blend then collected in a suitable container and subsequently used for any desired purpose.

What I claim is:

1. The method of producing a uniform mixture of a plurality of materials that are difficult to mix, comprising subjecting said materials to a whirling at such a velocity as to finely divide each of the same and mixing the same while each thereof is in such finely divided condition while subjected to such a whirling.
2. The method of producing a uniform mixture of a plurality of materials that are difficult to mix but which have sufficient mobility to be fed into a chamber, comprising subjecting each of said materials to a whirling in a chamber at such a velocity as to nebulize the same and mixing the same in such nebulized condition while subjected to such a whirling.
3. The method of producing a uniform mixture of a plurality of materials that are difficult to mix but which have sufficient mobility to be fed into a chamber, comprising feeding said materials into a common chamber and subjecting the same to a whirling in said chamber at such a velocity as to suspend the same in finely divided condition while whirling in said chamber and intimately mix the same while in such suspended condition.
4. The method of producing an intimate mixture of a plurality of different materials having sufficient mobility to be fed into a chamber, comprising subjecting said materials to a whirling at high velocity in a chamber sufficient to vaporize said materials and intimately mix the same while in a vaporized state.
5. The method of producing an intimate mixture of a plurality of different materials having sufficient mobility to be fed into a chamber, comprising feeding each of said materials into a separate chamber, subjecting each material to a whirling at high velocity in its chamber to vaporize the same, discharging said vaporized materials from said chambers into a common chamber in vaporized condition and subjecting the said vaporized materials to a whirling at high velocity in said common chamber.
6. The method of blending a plurality of different kinds of molasses comprising whirling said plurality of molasses at a velocity while confined in a chamber high enough to nebulize each of said molasses and intimately mix said nebulized molasses while in such nebulized state.
7. The method of producing an intimate mixture of a plurality of different kinds of molasses comprising feeding each thereof into a separate chamber, subjecting each molasses to a whirling at high velocity in its chamber to suspend the same in finely divided condition while whirling therein, discharging said finely divided molasses from said chambers into a common chamber while in suspended condition, and subjecting said finely divided suspensions of molasses to a whirling at high velocity in said common chamber.
8. The method of making a blend of a plu-

ality of different kinds of molasses comprising whirling said plurality of molasses as high velocity to finely divide the same by the centrifugal force created by said whirling and intimately mix the same by whirling the same in a common chamber while in such finely divided condition.

9. The method of producing an intimate mixture of a plurality of different materials having sufficient mobility to be fed into a chamber, comprising feeding each of said materials into a separate chamber, subjecting each material to a whirling at high velocity in its chamber to suspend the same in a finely divided condition while whirling therein, discharging said finely divided materials from said chambers into a common chamber in such suspended condition and subjecting the same to a whirling at high velocity in said common chamber while in such suspended condition.

10. The method of producing a uniform mixture of a plurality of liquids of different viscosity comprising subjecting said liquids to a whirling at such velocity as to nebulize the same and mixing the same in such nebulized condition while subjected to such whirling.

11. The method of producing a uniform mixture of a plurality of liquids of different viscosity comprising feeding said liquids into a common chamber and subjecting the same to a whirling in said chamber at such velocity as to nebulize each thereof and intimately mix the same while in such nebulized condition.

12. The method of producing a uniform mixture of a plurality of liquids of different viscosity comprising subjecting each of said liquids to a whirling in a chamber at such velocity as to nebulize the same, feeding the same into a common chamber in such nebulized condition and subjecting the same to a whirling in said common chamber while nebulized to intimately mix the same.

13. The method of producing a uniformly blended material comprising a powder and a liquid that are difficult to mix, comprising subjecting said powder and said liquid to a whirling at such a velocity as to nebulize the same and mixing the same in such nebulized condition while subjected to such a whirling.

14. The method of making a cereal product comprising producing a substantially uniform mixture of a plurality of liquids of different viscosity by subjecting the same to a whirling at such velocity as to nebulize the same and mixing the same in such nebulized condition while subjected to such a whirling, and spraying such mixture on said cereal in such nebulized condition.

15. The method of making a coated flaked cereal product comprising producing a substantially uniform mixture of a plurality of liquids of different viscosity, including water, malt syrup and molasses, by subjecting the same to a whirling at such velocity as to nebulize said water, malt syrup and molasses and mixing said water, malt syrup and molasses while in such nebulized condition and subjected to such a whirling, and spraying such nebulized mixture on cereal flakes in such finely divided condition.

16. The method of making a coated flaked cereal product comprising producing a substantially uniform mixture of a plurality of liquids of different viscosity including a viscous liquid by subjecting all said liquids to a whirling at such velocity as to nebulize said liquids and mixing

the same in such nebulized condition while subjected to such a whirling, and spraying such mixture on cereal flakes in such nebulized condition.

17. The method of making a cereal product comprising producing a substantially uniform mixture of a plurality of materials including a liquid and a powder by subjecting both the liquid and the powder to a whirling at such velocity as to nebulize the same and mixing the same in such nebulized condition while subjected to such a whirling, and spraying the resultant mixture on said cereal in a nebulized condition.

18. The method of producing an intimate mixture of a plurality of viscous liquids comprising feeding each thereof into a separate chamber, subjecting each of said liquids to a whirling at high velocity in its chamber to nebulize the same, discharging said nebulized liquids from said chambers into a common chamber in the form of a spray, and subjecting said nebulized liquids to a whirling at high velocity in said common chamber.

19. The method of producing an intimate mixture of a plurality of viscous liquids comprising feeding said liquids into a common chamber and subjecting the same to a whirling at high velocity in said chamber to nebulize and intimately mix the same in nebulized condition.

20. The method of producing a uniform mixture of a highly viscous liquid and another liquid comprising feeding said liquids into a common chamber and subjecting both of the same to a whirling in said chamber at such velocity as to nebulize and intimately mix the same while in such nebulized condition.

21. The method of producing a uniform mixture of a highly viscous liquid and another liquid comprising subjecting each of said liquids to a whirling in a chamber at such velocity as to nebulize the same, feeding the same into a common chamber in such nebulized condition and subjecting the same to a whirling in said common chamber while in a nebulized condition to intimately mix the same.

22. The method of making a cereal product including a plurality of liquids and a powder and cereal, which comprises separately whirling a quantity of each of said liquids and powder at a velocity such as to increase the fluidity thereof mechanically by centrifugal atomization and separately spraying each of said atomized materials on said cereal.

23. The method of producing an intimate mixture of a powder and a liquid, comprising mixing said powder and liquid, feeding the mixture of powder and liquid to a chamber, and subjecting said mixture to a whirling in said chamber at such a velocity as to nebulize the same and intimately mix the same while in such nebulized condition.

24. The method of making a treated cereal composition including a plurality of different viscous liquids and dry cereal, which comprises whirling said liquids at high velocity to make a mist thereof and intimately mix the same in said mist-like form and make a mist-like fluid vapor thereof, and spraying said mist-like vapor on the dry cereal.

25. The method of making a treated cereal composition including a plurality of different kinds of molasses and cereal, comprising whirling said plurality of molasses at high velocity to nebulize the same and intimately mix the same in nebulized condition and make a substantially uniform

form mist-like spray thereof and spraying the mist-like blended molasses mixture so produced on said cereal.

5 26. The method of producing an intimate mixture of a plurality of different vaporizable materials having sufficient mobility to be fed into a chamber comprising feeding each of said materials into a separate chamber, subjecting each
10 material to a whirling at high velocity in its chamber to vaporize the same and discharging said vaporized materials from said chambers into a common chamber in a vaporized state and subjecting the same to a whirling at high velocity in

said common chamber in a vaporized state to intimately mix said vapors.

27. The method of producing an intimate mixture of a plurality of different materials, comprising feeding each of said materials into a separate chamber at rates determined by the proportions of said materials to be included in said mixture, subjecting each material to a whirling at high velocity in its chamber to nebulize the same, discharging said nebulized materials from said
10 chambers into a common chamber in a nebulized state and subjecting the same to a whirling at high velocity in said common chamber.

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