

DESCRIPTION

SOLID FAT COMPOSITION AND METHOD FOR MANUFACTURING THE SAME

5 Technical Field

[0001]

The present invention relates to a solid fat composition and a method for producing the same.

10 Background Art

[0002]

Layered puffed food such as a pie, a croissant and a Danish pastry are produced by using dough raw materials including flour and a fat composition, and are mainly divided into two types, i.e. a folded pie and a kneaded pie, according to a
15 difference in production method.

[0003]

A folded pie is obtained by piling a sheet-like fat composition such as butter, margarine and shortening on a dough that is obtained by kneading dough raw materials, and repeating an extension step in which extending and folding are conducted, thereby
20 to allow a thin layer of the dough and the fat to be stacked in plural layers, followed by baking the same. As the sheet-like fat composition, those disclosed in Patent Document 1 can be given, for example.

[0004]

On the other hand, a kneaded pie is obtained by adding small pieces of plastic
25 fat such as butter, margarine and shortening to dough raw materials, kneading the mixture, and only extending or repeatedly folding the mixture, followed by baking the same. In order to allow the plastic fat to be in small pieces, it is known that a fat composition in the form of a lump is processed by means of a special machine in advance to allow them to be in the form of chips (see Patent Document 2, for example).

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Related Art Document

Patent Document

[0005]

Patent Document 1: JP-A-2001-321065

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Patent Document 2: JP-A-2006-204124

Summary of the Invention

[0006]

A folded pie is composed of a plurality of layers obtained by piling alternatively a

pie dough and a sheet-like fat composition and repeating an extension step several times. A fat composition for a folded pie is required to have appropriate extensibility that follows a pie dough. If the fat composition is too hard or has poor extensibility, it may cause problems that a sheet may be cracked at the time of folding or insufficiently
5 extended on a dough. On the other hand, if the fat composition is too soft, it may be kneaded in a dough or may be overflowed from a dough, causing formation of un-uniform layers, insufficient rising, formation of voids and “fish-eyes”, resulting in large variations in product quality.

[0007]

10 As the fat composition for a kneaded pie, normally, those which have been allowed to be in small pieces by cutting in advance or molding into small chips are used. If the fat composition is not allowed to be in small pieces sufficiently, they may not be dispersed in dough raw materials and hence may be distributed unevenly in a dough, resulting in uneven browning after baking or formation of un-uniform layers or
15 un-uniform food texture of a pie.

[0008]

In order to allow the fat composition to be in small pieces, it is required to use equipment for cutting or molding. Therefore, additional production cost is incurred. If a user uses a lump-shaped fat composition, labor and troubles are required when the
20 lump-like fat is cut.

[0009]

The present invention is aimed at providing a solid fat composition that is easily dispersed in dough raw materials and exhibits good extensibility when piled on a dough, and a method for producing the same.

25 [0010]

The inventors of the present invention made extensive studies in order to solve the above-mentioned problem, and found that, by using a solid fat composition composed of an integrated body of a sheet-like and/or a rod-like solid fat composition including a gas phase, when preparing a confectionery dough or a bread dough, the
30 solid fat composition readily collapses in small pieces, whereby the problem mentioned above can be solved. The present invention has been completed based on this finding.

[0011]

Further, the inventors found that, by supplying a gas to the raw materials of a fat
35 composition during the production of a solid fat or oil composition, and at the same time, by passing the raw materials of a fat composition through a mesh during a process of crystallization of the raw materials of a solid fat composition, a solid fat composition that can easily collapse in small pieces can be produced. The present invention has been

completed based on this finding.

[0012]

According to the present invention, the following solid fat composition are provided.

- 5 1. A solid fat composition that readily collapses in small pieces by an external force applied when preparing a confectionery dough or a bread dough.
2. The solid fat composition according to 1 that is composed of an integrated body of a sheet-like solid fat organization and/or a rod-like solid fat organization, wherein the integrated body includes a gas phase.
- 10 3. The solid fat composition according to 1 or 2, that includes 0.1 ml to 20 ml of a gas per 100g of the solid fat composition.
4. The solid fat composition according to any one of claims 1 to 3, that is molded into a sheet-like form, a block-like form, a dice-like form or a cylindrical form.
5. The solid fat composition according to any one of 1 to 4, that has a water
- 15 content of 0 wt% to 17 wt% relative to the total weight of the solid fat composition.
6. The solid fat composition according to any one of 1 to 5, that is produced by dissolving raw materials of a solid fat composition except for a gas, supplying a gas thereto, and passing the raw materials through a mesh when they are crystallized.
7. The solid fat composition according to 6, that is produced by molding the raw
- 20 materials of a solid fat composition after passing the raw materials through a mesh.
8. A method for producing a solid fat composition, comprising the steps of: supplying a gas to raw materials of a fat oil composition; and crystallizing the raw materials of a fat composition, wherein the raw materials of a fat composition are passed through a mesh in the step of crystallizing.
- 25 9. The method for producing a solid fat composition according to 8, further comprising the step of molding the raw materials of a fat composition.
10. A solid fat composition that is produced by the method according to 9 or 10.
11. Layered puffed food that is produced by using the solid fat composition according to any one of 1 to 7 and 10 and dough raw materials.

30 [0013]

According to the present invention, it is possible to provide a novel solid fat composition that exhibits excellent extensibility when piled on a dough and a method for producing the same.

35 Brief Description of the Drawings

[0014]

Fig. 1 is a schematic view showing the inner structure of the solid fat composition of the present invention;

Fig. 2 is a photograph showing one example of the inner structure of the solid
40 fat composition of the present invention;

Fig. 3 is a photograph showing one example of the inner structure of the solid fat composition of the present invention;

Fig. 4 is a photograph showing one example of the inner structure of the solid fat composition of the present invention;

5 Fig. 5 is a photograph showing one example of the inner structure of the solid fat composition of the present invention;

Fig. 6 is a schematic view showing the inner structure of the conventional shortening;

10 Fig. 7 shows one embodiment of the steps of the method for producing the solid fat composition of the present invention; and

Fig. 8 is a photograph showing the manner of the collapsibility test conducted in Example 9 and Comparative Example 6.

Mode for Carrying out the Invention

15 [0015]

[Solid fat composition]

The solid fat composition of the present invention is characterized in that it collapses readily in small pieces by an external force applied when a confectionery dough or a bread dough is prepared.

20 [0016]

In the invention, the “small pieces” literally mean tiny pieces. Further, the “collapses” literally means that the original shape is lost and broken. Therefore, the “collapses in small pieces” means that the solid fat composition loses its original shape and is broken in a plurality of pieces that are smaller than the original size. The small

25 [0017]

In the present invention, the “external force applied when preparing a confectionery dough or a bread dough” means a force applied from the outside to a solid fat composition when it is mixed with other food raw materials such as dough raw materials or the like when preparing a confectionery dough or a bread dough. Specifically, it means a force normally applied to a solid fat composition when a solid fat composition is mixed with other food raw materials by a mechanical means such as a mixer or by hands.

30 [0018]

35 Accordingly, the “collapses in small pieces readily by an external force when preparing a confectionery dough or a bread dough” means that, during the process of production of food in which a solid fat composition is used as a raw material, the solid fat composition collapses in small pieces by applying a force that is normally applied when a solid fat composition is mixed with other food raw materials without applying a

special force such as excessive pressure or shear force.

[0019]

When preparing a confectionery dough or a bread dough, a solid fat composition may be shaved off by a mechanical means such as a mixer blade or a mixer bowl, and then, it is allowed to be in small pieces. However, “collapses in small pieces” in the present invention does not mean being shaved off in small pieces, but means becoming small pieces by losing its original shape or by breaking by application of an external force. Therefore, if a solid fat composition is allowed to be in small pieces only by shaving, such solid fat composition cannot be admitted as the solid fat composition of the present invention. Further, as long as it collapses in small pieces by an external force, even if small pieces are formed as a result of shaving, such a fat composition is not excluded from the scope of the present invention.

[0020]

If the solid fat composition of the present invention is used when preparing food, in particular, layered puffed food, the solid fat composition readily collapses in small pieces by an external force applied when mixed with dough raw materials, and hence, the solid fat composition can be readily dispersed in the dough raw materials. It is not necessary to allow the solid fat composition to be in small pieces by cutting the solid fat composition in advance prior to mixing with the dough raw materials or by molding into small lumps. The solid fat composition of the present invention has excellent extensibility on the dough raw materials. Therefore, the solid fat composition of the present invention can be preferably used when producing layered puffed food, in particular, a kneaded pie or a folded pie.

[0021]

The solid fat composition of the present invention can be shortening, margarine, fat spread, butter or the like, for example.

[0022]

The solid fat composition of the present invention may be in the same shape as that of common business-purpose margarine sold in an amount of several tens kilograms or as that of pound margarine sold in an amount of about 0.5 kilograms. Further, it may be in a molded shape of a sheet, a block, a dice or a cylinder.

[0023]

In the present invention, the “sheet-like shape” means a flat sheet having a thickness of less than 40 mm. The “block-like shape” means a rectangular parallelepiped having a thickness of 40 mm or more. The “dice-like shape” means a rectangular parallelepiped of which the length of one side is about 5 to 30 mm or a shape that can be treated alike. The “cylindrical shape” means the shape of a cylinder having a diameter of about 5 to 30 mm or a shape that can be treated alike.

[0024]

The solid fat composition of the present invention is composed of an integrated body of a sheet-like and/or a rod-like solid fat organization including a gas phase. The integrated body may include the gas phase.

[0025]

That is, in the solid fat composition of the present invention, an integrated body may be formed by combination of either one of the sheet-like solid fat organization or the rod-like solid fat organization or by combination through mixing both of the sheet-like solid fat organization or the rod-like solid fat organization. At this time, an integrated body may include a gas phase.

[0026]

Due to such properties, the solid fat composition of the present invention can collapse in small pieces easily by an external force applied when mixing with dough raw materials, and can be dispersed uniformly in dough raw materials.

[0027]

The dimension of the sheet-like solid fat organization and the dimension of the rod-like solid fat organization are not particularly restricted. The thickness of the sheet-like or rod-like solid fat organization depends on the dimension of an opening of a mesh used in the method for producing a solid fat composition of the present invention, mentioned later, and it may be 250 μm to 5.6 mm, for example.

[0028]

The solid fat composition of the present invention may have a fibrous organization composed of a fat crystal phase and a gas phase. The solid fat composition contains a gas. A gas is present not in the form of dispersed bubbles but is present as a continuous phase. Fat crystals are divided into plural fat crystal phases by this gas phase. Due to entering of the gas phase between the plural fat crystal phases, in the adjacent plural fat crystal phases, the adjacent surfaces are bound not at their entire surfaces but at only part of the surfaces. As a result, the solid fat composition is composed of an integrated body of a sheet-like and/or a rod-like solid fat organization, and the integrated body has an organization including a gas phase. Due to the presence of such organization, the solid fat composition of the present invention collapses readily in small pieces by an external force applied when mixed with dough raw materials, whereby it can be uniformly distributed in the dough raw materials.

[0029]

Fig. 1 is a schematic view showing the inner structure of the solid fat composition of the present invention. A gas is present in the solid fat composition. The gas is not spherical air bubbles and is incorporated between the sheet-like and/or the rod-like solid fat organization.

[0030]

Figs. 2 to 5 are each a photograph showing one example of the inner structure

of the solid fat composition of the present invention. The solid composition of the present invention is an integrated body in which plural sheet-like and/or sheet-like solid fat compositions are bound at part of adjacent surfaces.

[0031]

5 As the solid fat composition including a gas phase, shortening has conventionally been used, which is referred to as the so-called pourable shortening. Fig. 6 schematically shows the inner structure of common shortening (quenched kneaded product). In common shortening, a gas is dispersed as air bubbles in the continuous phase of fat crystals. In the inner structure of the common shortening in
10 which a gas is present in the form of air bubbles, if mixed with dough raw materials, the shortening does not collapse sufficiently in small pieces by an external force applied at this time.

[0032]

Comparison of the collapsibility of the solid fat composition of the present
15 invention and the collapsibility of the conventional pourable shortening can be conducted by a method described in Example 9 and Comparative Example 6, for example.

[0033]

The solid fat composition of the present invention contains 0.1 to 20 ml of a gas
20 relative to 100 g of the solid fat composition. Due to incorporation of an appropriate amount of a gas, the solid fat composition becomes fragile, and tends to collapse easily in small pieces by application of an external force.

[0034]

In the present invention, the “amount of a gas” means the volume (ml) of a gas
25 contained per 100g of the solid fat composition, and is a value measured by the “JAS, the Ministry of Agriculture, Forestry and Fisheries Notification No. 1688 dated July 17, 2014” stipulated by the Ministry of Agriculture, Forestry and Fisheries.

[0035]

The solid fat composition of the present invention contains water in an amount
30 of preferably 0 wt% to 17 wt% relative to the total weight of the solid fat composition in respect of texture of a confectionery or bread produced by using the solid fat composition. The water content is more preferably 0 wt% to 10 wt%, with 0 wt% to 5 wt% being further preferable.

[0036]

35 The solid fat composition of the invention can be produced by the method for producing the solid fat composition of the present invention mentioned later.

[0037]

It is preferred that the solid fat composition of the present invention be one that is produced by dissolving the raw materials of the solid fat composition except for a gas,

supplying a gas thereto, and passing the raw materials through a mesh when they are crystallized.

[0038]

5 It is preferred that the solid fat composition of the present invention be produced by molding the raw materials of the solid fat composition after passing the raw materials through a mesh.

[0039]

[Method for producing solid fat composition]

10 The method for producing the solid fat composition of the present invention comprises the steps of: supplying a gas to raw materials of a fat composition; and crystallizing the raw materials of a fat composition, wherein the raw materials of a fat composition are passed through a mesh in the step of crystallizing.

15 As a result, a solid fat composition that collapses easily in small pieces by an external force can be produced. The solid fat composition produced by the production method of the present invention easily collapses when mixed with dough raw materials and hence can be dispersed uniformly in the dough raw materials. The solid fat composition produced by the production method of the present invention exhibits excellent extensibility on the dough raw materials.

[0040]

20 The step of supplying a gas to the dough raw materials can be conducted prior to the step of crystallizing the raw materials of raw materials of a fat composition or in the midst of the step of crystallizing the raw materials of a fat composition. However, before the raw materials of a fat composition are passed through a mesh in the crystallizing step, a step of supplying a gas to the raw materials of a fat composition is
25 conducted.

[0041]

30 Normally, the solid fat composition is produced by mixing raw materials for constituting the solid fat composition in a liquid state, quenching and kneading the mixed raw materials of the fat composition, and crystallizing by passing the resultant through a resting tube.

[0042]

35 Accordingly, in the production method of the present invention, a gas may be supplied to a mixed liquid of the raw materials when mixing the raw materials of a fat composition, a gas may be supplied to the raw materials of a fat composition when quenching and kneading are conducted, or a gas may be supplied to the raw materials of a fat composition in the resting tube.

[0043]

In the crystallizing step, since resistance at the time of supplying a gas is increased as the crystallization proceeds, there may be a case where a gas is hardly

supplied or cannot be supplied in the later stages of the crystallizing step, depending on the pressure of a gas supplied.

[0044]

No specific restrictions are imposed on the type of a gas used, as long as it can be used in food. For example, nitrogen, helium, carbon dioxide, air, nitrous oxide or the like can be used. Nitrogen, helium, carbon dioxide and nitrous oxide that do not denature the raw materials of a fat composition are preferable.

[0045]

The flow rate of a gas to be supplied can be appropriately determined in accordance with the flow rate of the raw materials of a fat composition and the volume of production equipment. The flow rate of a gas to be supplied is 5 to 25%, preferably 10 to 20%, relative to the flow rate of the raw materials of a fat composition, for example. The flow rate of a gas to be supplied is preferably one such that the amount of a gas per 100g of the solid fat composition to be produced becomes 0.1 ml to 20 ml.

[0046]

The step of crystallizing the raw materials of a fat composition can be conducted by quenching and kneading the raw materials of a fat composition, and passing the resultant through a resting tube, for example. By conducting quenching and kneading, the raw materials of a fat composition are crystallized. Further, by passing through a resting tube, crystallization proceeds and the crystals are aged.

[0047]

The "kneading" in quenching and kneading means mechanical kneading. Quenching and kneading can be conducted by using a suitable apparatus that is known in this technical field. Specifically, quenching is generally conducted in a scraping tubular cooler (also called "A unit") such as a votator, a combinator, an onlator and a perfector, and kneading and plasticization are conducted by passing through a pin machine (also called "B unit") or a resting tube. For example, fat raw materials or an water-in-oil emulsion obtained by adding to fat raw materials water, an emulsifier, a tasting material or the like according to need are heated, molten, and quenched and kneaded. As for the method for quenching and kneading, a method for producing margarine or shortening can be used, normally.

[0048]

In the method for producing a solid fat composition of the present invention, raw materials of a fat composition are passed through a mesh in the crystallizing step. By passing fat composition components including a gas through a mesh in the crystallizing step, a resulting solid fat composition tends to collapse easily by an external force.

[0049]

As for the mesh, an arbitrary number of meshes are arranged at arbitrary positions in the crystallization step. The mesh may be arranged such that it is not in

parallel with the flow direction of the raw materials of a fat composition.

[0050]

It is preferred that the mesh be provided at arbitrary locations from the inlet to the middle part of the resting tube. Further, it is more preferred that the mesh be provided at two locations from the inlet to the middle part of the resting tube. It is further preferred that the mesh be provided at the inlet and the middle part of the length in the flow direction of the resting tube.

[0051]

The materials constituting the mesh are not particularly restricted. Steel wire, thread, piano wire or the like can be used. Normally, metal-made mesh used in a sieve can be used.

[0052]

The dimension of the opening of the mesh is preferably 150 μm to 9.5 mm, more preferably 250 μm to 5.6 mm.

[0053]

Instead of passing through a mesh, the raw materials of the fat composition may be passed through a plurality of steel wire, thread, piano wire or punching metal that are arranged such that they are not in parallel with the flow direction of the raw materials of the fat composition.

[0054]

In one embodiment of the method for producing a solid fat composition of the present invention, after supplying a gas to the raw materials of a fat composition and before passing the raw materials of a fat composition through a mesh, the raw materials of a fat composition may be passed through an inline mixer. As a result, it is possible to finely divide a gas or to sufficiently disperse a gas in the raw materials of a fat composition. Although no specific restrictions are imposed on the inline mixer, a static mixer (manufactured by Noritake Co., Ltd.), a pipeline-homomixer (manufactured by Primix Corporation), a Sulzer mixer (manufactured by Midori Kikai Kogyo) or the like can be given, for example. An inline mixer can be provided before the resting tube, for example.

[0055]

Preferably, the method for producing a solid fat composition of the present invention further includes the step of molding the raw materials of a fat composition. By molding a fat composition that has been crystallized by a crystallizing step by passing through a suitable mouth, a molding machine or the like, it is possible to produce a solid fat composition molded into a sheet-like shape, a block-like shape, a dice-like shape or a cylindrical shape.

[0056]

One embodiment of the method for producing a solid fat composition of the

present invention is characterized in that it comprises: a step of mixing raw materials of a fat composition; and a step of crystallizing the raw materials of a fat composition by quenching and kneading the raw materials of a fat composition and by passing the resultant through a resting tube, wherein the method comprises supplying a gas to the raw materials of a fat composition and passing the raw materials of a fat composition through a mesh in the crystallizing step.

[0057]

Mixing of the raw materials of a fat composition can be conducted by means of a suitable mixing means that is known in this technical field.

[0058]

When the solid fat composition of the present invention is margarine, the raw materials of a fat composition are emulsified in the mixing step of the production method of the present invention. It is preferred that, after the mixing step and before the quenching and mixing step, a sterilizing step for sterilizing the raw materials of a fat composition be conducted.

[0059]

If the solid fat composition of the present invention is shortening, since no water is contained in the raw materials of a fat composition, no emulsification is conducted in the mixing step in the production method of the present invention.

[0060]

Fig. 7 shows one embodiment of the steps of the production method for the present invention.

In Fig. 7, the raw materials for constituting a fat composition are sufficiently mixed in a mixing chamber 1. As the mixing chamber, one that is known in this technical field can be used. Mixing conditions or the like can be appropriately set.

The raw materials of a fat composition after the mixing step are supplied to the subsequent crystallizing step by means of a pump 2. As the pump, one that is known in this technical field can be used.

[0061]

In the crystallizing step, the raw materials of a fat composition are supplied to a quenching and kneading apparatus 3 at first. The raw materials are quenched and kneaded in this apparatus. As the quenching and kneading apparatus, one known in this technical field can be used, and conditions or the like can be appropriately set. By using a quenching and kneading apparatus, crystallization of the raw materials of a fat composition starts, and proceeds.

[0062]

In the quenching and kneading apparatus 3, the raw materials of a fat composition is supplied to a resting tube 4, where the crystals are aged. As the resting tube, one known in this technical field can be used, and conditions or the like can be

appropriately set.

[0063]

In Fig. 7, an arbitrary number of meshes can be provided at arbitrary positions of the quenching and kneading apparatus 3 and the resting tube 4 that constitute the
5 crystallizing step.

[0064]

In the production method of the present invention, a step of supplying a gas to the raw materials of a fat composition can be conducted prior to or during a step of crystallizing the raw materials of a fat composition. Therefore, in Fig. 7, a gas can be
10 supplied to the mixing tank 1 or a gas can be supplied to the quenching or kneading apparatus 3 or the resting tube 4. However, supply of a gas is conducted in the step of crystallization before passing the raw materials of a fat composition through a mesh.

[0065]

Although not shown in Fig. 7, the solid fat composition that is produced by
15 passing the resting tube 4 in Fig. 7 can be molded into a desired shape by further allowing it to pass through an arbitrary mouth, a molding machine or the like.

[0066]

The raw materials of a fat composition that can be used in the present invention are not particularly restricted as long as they are edible fat and oil used in normal
20 processed fat food. For example, vegetable fat and oil such as soybean oil, rapeseed oil, sunflower oil, olive oil, safflower oil, Kabokku oil, palm oil, corn oil, cottonseed oil, coconut oil, palm kernel oil, shea butter, high-oleic rapeseed oil, high-erucic rapeseed oil, high-oleic sunflower oil, and high-oleic safflower oil; animal fat and oil such as beef tallow, lard, fish oil, whale oil, and milk fat, or the like can be given. In addition, those
25 obtained by fractionating or hydrogenating these fat and oil and those obtained by subjecting these fat and oil to interesterification can also be used. These fat and oil can be used singly or in combination of two or more.

[0067]

The fat and oil can be used as an emulsion that has been emulsified with water.

30 Further, if need arises, tasting components, flavoring agents, nutritious components, emulsifiers, colorants, thickening agents, anti-oxidants or the like may be contained.

[0068]

The raw materials of a fat composition that can be used in the present invention
35 can appropriately be selected depending on the type of the solid fat composition of the present invention; i.e. whether it is margarine, shortening, fat spread or butter.

[0069]

[Layered puffed food]

The layered puffed food of the present invention is produced by using the

above-mentioned solid fat composition of the present invention and the dough raw materials. For example, a pie, a Danish pastry, a croissant, a tart or the like can be given.

[0070]

5 No specific restrictions are imposed on the dough raw materials. Flour such as weak flour, all-purpose flour and enriched flour; grain flour such as buckwheat flour, rice flour, barley flour and rye flour; nut flour such as soy flour; starch such as corn starch and tapioca starch; processed starch obtained by processing these starch; salt, water, powder milk or the like can be used, for example.

10 [0071]

The layered puffed food can be produced by a method known in this technical field. For example, a pie may be a kneaded pie or a folded pie, and can be produced by the method described in the Examples given below.

15 Examples

[0072]

The present invention will be described below with reference to the following Examples, which should not be construed as limiting the scope of the invention.

[0073]

20 Example 1

By using an apparatus shown in Fig. 7, a solid fat composition was produced from the raw materials of a fat composition. Specifically, raw materials of a fat composition were prepared and sufficiently mixed. As the raw materials of a fat composition, one obtained by mixing in an amount ratio of 5:5 of interesterified oil of mixed oil comprising 70% of palm oil, 20% of coconut oil and 10% of rapeseed oil and
25 interesterified oil of mixed oil comprising 50% of palm oil, 30% of coconut oil and 20% of rice oil was used.

[0074]

Subsequently, this mixture of the raw materials was passed through the
30 quenching and kneading apparatus and the resting tube in this sequence at a flow rate of 150 L/h, whereby the mixture was crystallized. Then, it was molded into a sheet-like shape to obtain a solid fat composition. At the inlet of the quenching and kneading apparatus, a predetermined amount (shown in Table 2) of a nitrogen gas was blown into the raw materials, and at the two locations, i.e. at the inlet of the resting tube and the
35 middle point in the length of the flow direction of the resting tube, a mesh with a prescribed opening shown in Table 2 was arranged, whereby raw materials were passed therethrough.

[0075]

The amount of a gas was measured for the resulting solid fat composition.

The amount of a gas was the volume (ml) of a gas contained per 100g of the solid fat composition, and measured by the “JAS, the Ministry of Agriculture, Forestry and Fisheries Notification No. 1688 dated July 17, 2012” stipulated by the Ministry of Agriculture, Forestry and Fisheries. The results are shown in Table 2.

[0076]

(Pie production test 1)

(Preparation of pie dough)

By using the thus obtained solid fat composition, a pie (the so-called kneaded pie) was produced. Specifically, prescribed amounts (shown in Table 1) of enriched flour, weak flour, salts and the solid fat or oil composition were put in a mixer bowl and mixed at a low speed (speed select 1, using a hook) for 2 minutes and 50 seconds by means of a 30 quart mixer (Kanto Mixer, manufactured by Kanto Kongoki Industrial Co, Ltd). As for the solid fat composition, one that had been cut in a prescribed amount from a large lump was put in a mixer bowl as a whole. No specific treatment was conducted for allowing the solid fat composition to be in the form of small pieces other than mixing it with other pie dough raw materials without applying an excessive shear force at a low speed by means of a mixer.

[0077]

Table 1

Dough raw materials	Amount [g]
Enriched flour	400
Weak flour	600
Salts	10
Solid fat composition	600
Ice water	400

[0078]

At this time, the dispersibility of the solid fat composition was evaluated as follows. The results are shown in Table 2.

(Dispersibility)

Dispersibility was evaluated by the following method.

First, raw materials other than ice water shown in Table 1, i.e. enriched flour, weak flour, salts and the solid fat composition, were put in a mixer bowl, and mixed at a low speed (speed select 1, using a hook) for 2 minutes and 50 seconds by means of a 30 quart mixer (Kanto Mixer, manufactured by Kanto Kongoki Industrial Co, Ltd). After the lapse of 3 minutes from the start of the mixing, the mixture was collected and passed through a sieve with an opening of 9.5 mm. The weight (A) [g] of the mixture

remained in the sieve was measured. Subsequently, the mixture that had been passed through the sieve was passed through a sieve having an opening of 5.6 mm. The weight (B) [g] of the mixture remained in the sieve was measured, and (A)/(B) [-] was calculated.

5 [0079]

If the fat composition sufficiently collapsed and was uniformly dispersed in the dough raw materials, the value of (A) indicating large fat or oil particles was reduced, and the value of (B) indicating fat or oil particles in a suitable size was increased, and as a result, the value of (A)/(B) became close to zero.

10 [0080]

On the other hand, if the fat composition did not collapse sufficiently and was not uniformly dispersed in the dough raw materials, the value of (A) indicating large fat or oil particles was increased, and the value of (B) indicating fat or oil particles in a suitable size was reduced, and as a result, the value of (A)/(B) became large, i.e.

15 deviating from zero.

[0081]

The dispersibility was evaluated by classifying in accordance with the following criteria based on the value of (A)/(B).

◎ : Very good, with (A)/(B) being less than 1

20 ○ : Good, with (A)/(B) being 1 or more and less than 1.5

△ : Slightly poor, with (A)/(B) being 1.5 or more and less than 2

× : Poor, with (A)/(B) being 2 or more

[0082]

(Baking of pie)

25 Subsequently, ice water was added to the mixture, and mixed for 1 minute at a low speed. Then, the dough was gathered and refrigerated at 5°C for 1 hour. After refrigeration, the dough was folded in three, and then folded in four, and refrigerated at 5°C for 30 minutes. After refrigeration, the dough was further folded in three, and then folded in four, and refrigerated at 5°C for 30 minutes.

30 [0083]

Then, the dough was extended into a 3 mm-thick sheet by means of a reverse sheeter, and cut into a size of 20 cm × 6 cm. The pieces were refrigerated at 5°C for 30 minutes, and baked for 14 minutes in an oven with an upper heat of 220°C and a lower heat of 200°C.

35 After cooling, the baked pie was evaluated for the following items.

[0084]

(Height [mm])

As for each of the Examples and the Comparative Examples, the height of each of 12 pieces of pies (distance between the vertex of the most swollen part in the height

direction and the bottom surface of the pie) was measured by means of vernier calipers, and an average value and a standard deviation were calculated. The average value, the standard deviation, the maximum value and the minimum value of the height are shown in Table 2.

5 [0085]

(Appearance)

The appearance of the pie was evaluated. One in which each layer of the pie was risen uniformly was evaluated as good (○) and one in which each layer of the pie was risen un-uniformly and unevenness was present on the pie surface, the layers of the pie were greatly peeled and turned up, or cracked was evaluated as poor (×).

The number [pieces] of pies with excellent appearance and the efficiency percentage [%] are shown in Table 2.

[0086]

(State of the inner layer)

15 The state of the inner layer of the pie was evaluated by the following criteria. The results are shown in Table 2.

5: The layer was uniform as a whole.

4: Slight amounts of voids are present, but the layer was uniform as a whole.

3: Slight amounts of large voids are present, but the layer was uniform as a whole.

20 2: A large amount of large voids are present, and the layer was not uniform as a whole.

1: In most of the pies, the layer was greatly crushed.

[0087]

(Comprehensive evaluation of confectionery properties)

25 Taking into consideration the height, the appearance and the state of the inner layer of the pie, the confectionery properties were comprehensively evaluated. The confectionery properties were divided based on the criterion of 1 to 5 (1, 2, 3, 4 and 5), and 1 and 2 were taken as poor and 3 to 5 were taken as good. A larger numerical value indicates better confectionery properties.

30 [0088]

Examples 2 to 5

Solid fat compositions were produced and evaluated in the same manner as in Example 1, except that the amount of a nitrogen gas and the opening of the mesh were changed as shown in Table 2. The results are shown in Table 2.

35 [0089]

Comparative Examples 1 to 3

Solid fat compositions were produced and evaluated in the same manner as in Example 1, except that, introduction of a nitrogen gas, the amount of a nitrogen gas, presence or absence of a mesh and the opening of the mesh were changed as shown

in Table 2. The results are shown in Table 2.

[0090]

Examples 6 to 7

- 5 Solid fat compositions were produced and evaluated in the same manner as in Example 1, except that the raw materials of a fat composition were changed and the amount of a nitrogen gas and the opening of the mesh were changed as shown in Table 2. As the raw materials of a fat composition, an oil-in-water emulsion obtained by adding 14% of water and 0.5% of salts to an interesterified oil of mixed oil of 70% of palm oil, 20% of coconut oil and 10% of rapeseed oil.

10 [0091]

Comparative Example 4

A solid fat composition was produced and evaluated in the same manner as in Example 6, except that a nitrogen gas was not introduced. The results are shown in Table 2.

[0092]

Table 2

	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5	Comp. Ex. 1	Comp. Ex. 2	Comp. Ex. 3	Ex. 6	Ex. 7	Comp. Ex. 4
Gas supply amount [L/h]	5	10	28	10	10	0	10	0	10	28	0
Installation of mesh	Conducted	Conducted	Conducted	Conducted	Conducted	Not conducted	Not conducted	Conducted	Conducted	Conducted	Conducted
Opening of mesh [mm]	2.0	2.0	2.0	3.4	5.6	—	—	2.0	5.6	2.0	2.0
Amount of gas [ml/100g]	0.36	2.16	7.30	2.69	2.66	-2.53	-2.20	-2.83	*1	*1	*1
Dispersibility	⊙	⊙	⊙	⊙	⊙	×	×	×	○	○	×
Weight (A) [g] of mixture remained in sieve with opening of 9.5 mm	148	194	117	72	172	366	398	367	280	296	434
Weight (B) [g] of mixture remained in sieve with opening of 5.6 mm	223	207	222	292	401	169	162	134	249	258	125
Weight [g] of mixture with a dimension of less than 5.6 mm	1225	1193	1260	1231	1019	1051	1037	1090	1046	1039	1018
(A)/(B)	0.66	0.94	0.53	0.25	0.43	2.17	2.46	2.74	1.12	1.15	3.47
Comprehensive evaluation of confectionery properties	3	5	4	3	3	2	2	1	5	4	2
Average of height [mm]	35.3	36.8	34.4	32.4	33.9	39.7	34.6	27.1	32.1	33.8	37.9
Standard deviation [mm]	4.4	2.3	1.3	4.7	4.5	5.3	5.0	5.6	2.8	3.7	5.5
Maximum height [mm]	45.0	39.0	37.0	39.0	45.0	48.0	40.0	33.0	35.0	42.0	46.0
Minimum height [mm]	30.0	32.0	32.0	26.0	29.0	29.0	24.0	13.0	27.0	28.0	27.0
Number of pies with excellent appearance [piece]	8	10	11	7	6	5	6	4	10	9	3
Efficiency percentage [%]	66.7	83.3	91.7	58.3	50.0	41.7	50.0	33.3	83.3	75.0	25.0
State of inner layer	3	5	4	4	3	2	2	1	5	4	2

[0093]

In Table 2, “*1” means that, since the boundary between the oil phase and the water phase was not clear when the sample of the solid fat composition was molten, a measurement was impossible.

The amount of a gas of the solid fat compositions in Comparative Examples 1 and 3, which had been produced without supplying a gas, was measured to show a negative value. The reason therefor is assumed that it was due to the effect of a change in volume of the fat composition when heating at the time of measuring the amount of a gas.

[0094]

The amount of a gas of the solid fat composition produced by supplying a gas in Comparative Example 2 was measured to show a negative value as in Comparative Examples 1 and 3. The reason therefor is assumed that, even if a gas is supplied, provision of no mesh results in leakage of a gas as a gas is neither dispersed nor retained in the fat composition.

[0095]

The solid fat composition produced in Examples 1 to 7 collapsed into small pieces easily when mixed with the dough raw materials. On the other hand, the solid fat composition produced in Comparative Examples 1 to 4 did not collapse in small pieces even if they were mixed with the dough raw materials. The lump of the fat was shaved by a stirring blade, and as a result, large lumps of the fat and small-sized fat that had been shaved were present in a mixed state.

[0096]

Example 8

(Pie production test 2)

(Preparation of pie dough)

By using the solid fat composition obtained in Example 5, pie (the so-called folded pie) was produced. Specifically, prescribed amounts (shown in Table 3) of enriched flour, weak flour, salts and shortening to be kneaded were put in a mixer bowl and mixed at a low speed (speed select 1, using a hook) for 1 minute by means of a 30 quart mixer (Kanto Mixer, manufactured by Kanto Kongoki Industrial Co, Ltd).

[0097]

Subsequently, ice water was added to the mixture, and the resultant was kneaded at a low speed for 1 minute and 30 seconds, at a middle speed (speed select 2) for 1 minute and a high speed (speed select 3) for 1 minute. The dough was collected and refrigerated overnight at 5°C.

[0098]

After refrigerating, the solid fat composition that had been extended to have a thickness of 0.5 cm was put on the dough, and wrapped by the dough and folded. As

for the folding, the dough was folded in three, and then folded in four, and refrigerated at 5°C for 1 hour. After refrigeration, the dough was further folded in three, and then folded in four, and refrigerated at 5°C for 1 hour.

[0099]

5 Table 3

Dough raw materials	Amount [g]
Enriched flour	400
Weak flour	600
Salts	10
Shortening to be kneaded	50
Solid fat composition	550
Ice water	500

[0100]

(Baking of pie)

10 Then, the dough was extended into a 3 mm-thick sheet by means of a reverse sheeter, and cut into a size of 20 cm × 6 cm. The piece was refrigerated at 5°C for 30 minutes, and baked for 14 minutes in an oven with an upper heat of 220°C and a lower heat of 200°C.

After cooling, the baked pie was evaluated for the height, appearance and the state of the inner layers in the same manner as in Example 1.

15 Further, the extensibility of the solid fat or oil composition was evaluated as follows. The results are shown in Table 4.

[0101]

(Extensibility)

Extensibility was evaluated by the following method.

20 The solid fat composition of which the temperature had been controlled overnight at 15°C was sandwiched between baking sheets, and extended into a thickness of 5 mm by means of a reverse sheeter. The manner of extension was evaluated in accordance with the following criterion.

- Good extensibility, with no cracking in the fat composition
- 25 △ Slightly poor extensibility, with slight cracking in the fat composition
- × Poor extensibility, with cracking in the fat composition

[0102]

Comparative Example 5

30 A pie (the so-called folded pie) was produced and evaluated in the same manner as in Example 8, except that the solid fat composition obtained in Comparative Example 1 was used. The results are shown in Table 4.

[0103]

Table 4

	Ex. 8	Comp. Ex. 5
Evaluation of confectionary properties		
Average height [mm]	39.6	62.1
Standard deviation [mm]	3.2	6.8
Maximum height [mm]	43.0	74.0
Minimum height [mm]	32.0	51.0
Number of pies with excellent appearance [piece]	12	4
Efficiency percentage [%]	100.0	33.3
Extensibility	○	○

[0104]

- 5 No difference in extensibility was found in the solid fat compositions in the Example and the Comparative Example, the solid fat compositions in the Example and the Comparative Example were both excellent. While the appearance of the pie was good and efficiency percentage was excellent in the Example, the efficiency percentage was low in the Comparative Example.

- 10 The solid fat composition of the Example had excellent extensibility and was preferable for production of a folded pie.

[0105]

(Collapsibility test)

As for the solid fat composition of the present invention and the conventional pourable shortening, collapsibility was evaluated.

15 [0106]

Example 9

The solid fat composition of the present invention that had been prepared in Example 5 was cut to have a prescribed weight at the time of being discharged from a mouth for molding into a 20 mm-thick sheet, and the resultant was refrigerated at -18°C.

- 20 After putting in a 30 quart mixer (Kanto Mixer, manufactured by Kanto Kongoki Industrial Co, Ltd) 60 g of flour (30g of enriched flour and 30g of weak flour), 600g of the sheet-like solid fat composition that had been kept in a freezer was put, and mixed for 30 seconds at a low speed at room temperature of 20°C ± 2°C.

[0107]

- 25 The mixture was collected and passed through a sieve with an opening of 18

mm. The weight (A) [g] of the mixture remained in the sieve was measured. Then, the mixture that had passed through the sieve with an opening of 18 mm was passed through a sieve with an opening of 9.5 mm, and the weight [g] of the mixture remained in the sieve was measured. Next, the mixture that had passed through the sieve with an opening of 9.5 mm was passed through a sieve with an opening of 5.6 mm, and the weight (B) [g] of the mixture remained in the sieve was measured. Subsequently, the mixture that had passed through a sieve with an opening of 5.6 mm was passed through a sieve with an opening of 3.5 mm, and the weight of the mixture remained in the sieve and the weight of the mixture that had passed through the sieve were measured. Taking the total of the weight [g] of the mixture remained in the sieve with an opening of 18 mm and the weight remained in the sieve with an opening of 9.5 mm as (A), (A)/(B) [-] was measured. The results are shown in Table 5.

The state after 30 minutes from the start of mixing is shown in Fig. 8.

[0108]

Comparative Example 6

Conventional pourable shortening (Juan Solare, manufactured by Taiyo Yushi Corp) was cut into a sheet-like shape, and stored in a freezer of -18°C. By using this sheet-like pourable shortening, the operation was conducted with the same procedures as those in Example 9, whereby (A)/(B) [-] was calculated. The results are shown in Table 5. The state after the lapse of 30 seconds from the start of the mixing is shown in Fig. 8.

[0109]

Table 5

	Ex. 9	Comp. Ex. 6
Weight (A) [g] of mixture remained in sieve with opening of 18 mm	122	529
Weight (A) [g] of mixture remained in sieve with opening of 9.5 mm	101	51
Weight (A) [g] of mixture remained in sieve with opening of 5.6 mm	156	12
Weight (A) [g] of mixture remained in sieve with opening of 3.5 mm	155	7
Weight [g] of mixture with dimension of less than 3.5 mm	120	54
(A)/(B)	1.43	48.3

[0110]

In Example 9, the solid fat composition of the present invention collapsed readily in small pieces in a short period of time by mixing with flour. As for the dimension of the small pieces, even in the case of a larger piece, the size thereof was 18 mm or less. In the case of small pieces, in many of them, the size thereof was larger than 3.5 mm and 5.6 mm or less.

In Comparative Example 6, the conventional pourable shortening was broken in large pieces by mixing with the flour, but only a small amount thereof collapsed in small pieces with a dimension of less than 18 mm.

5 Industrial Applicability

[0111]

The solid fat composition of the present invention can be preferably used when producing layered puffed food such as a pie, Danish pastry, a croissant and a tart.

[0112]

10 Although only some exemplary embodiments and/or examples of this invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments and/or examples without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this
15 invention.

The specification of a Japanese application on the basis of which the present application claims Paris Convention priority is incorporated herein by reference in its entirety.

20

CLAIMS

1. A solid fat composition for layered puffed food, that includes 0.1 ml to 20 ml of a gas per 100g of the solid fat composition, wherein in the inner structure of the solid fat composition, plural sheet-like and/or rod-like fat crystal phases are bound at a part of their adjacent surfaces.
2. The solid fat composition according to claim 1, that is molded into a sheet-like form, a block-like form, a dice-like form or a cylindrical form.
3. The solid fat composition according to claim 1 or 2, that has a water content of 0 wt% to 17 wt% relative to the total weight of the solid fat composition.
4. A method for producing a solid fat composition for layered puffed food, comprising the steps of:
 - supplying a gas to mixed raw materials of a solid fat composition; and
 - crystallizing the raw materials of a solid fat composition,
 - wherein in the step of crystallizing,
 - the raw materials of a solid fat composition are quenched and kneaded, and
 - passed through a resting tube, and
 - the raw materials of a solid fat composition including a gas are passed through a mesh having a dimension of the opening of 2.0 mm to 5.6 mm only at a location from an inlet of the resting tube to a middle part of the flow direction of the resting tube.
5. The method for producing a solid fat composition according to claim 4, wherein the mesh is provided at two locations at the inlet of the resting tube and at the middle part of the flow direction of the resting tube.
6. The method for producing a solid fat composition according to claim 4 or 5, further comprising the step of molding the raw materials of a solid fat composition.