

PACKAGED COOKED SEAFOOD PRODUCT AND METHOD FOR PRODUCING SAME

TECHNICAL FIELD

[0001]

The present invention relates to a packaged cooked seafood product and a method for producing the product. In detail, the present invention relates to a packaged cooked seafood product that can be stored at a normal temperature over a long period of time and has a soft texture while retaining an original shape of a whole of the seafood or a part of the seafood such as a fillet of the seafood; and a method for producing the product.

BACKGROUND ART

[0002]

In recent years, populations of advanced nations, in particular, Japan have been aging, and the elderly population is increasing every year. Under such circumstances, various problems have arisen regarding diet of the elderly. For example, some survey findings have shown that more than half of the elderly receiving home care tend to be undernourished, and it has been pointed out that undernutrition leads to increased susceptibility to diseases and delayed recovery from diseases, as well as decreased activity and declined cognitive function. Furthermore, diet is one of the most enjoyable things for the elderly, for example, receiving care. Therefore, for example, care food that can be safely eaten

even by people with a reduced chewing or swallowing function and that retains the original deliciousness, color, shape, and nutrients of food materials is greatly needed and researched from a variety of viewpoints.

[0003]

For example, physical processes such as a tenderization method or a high-pressure retort process is known as methods for softening livestock meat. Although the tenderization is effective to some extent for the livestock meat, it does not provide softness required for the care food. Furthermore, the tenderization may cause seafood meat, which is softer than the livestock meat, to become brittle to the extent that the seafood meat does not retain its original shape. Furthermore, a high temperature and high-pressure treatment such as a retort process may greatly impair a taste of food.

[0004]

Furthermore, enzymes are also known to be used to tenderize the livestock meat and the seafood meat (e.g., Patent Documents 1 to 3). However, when the enzymes are used, the enzymes non-specifically degrade the connective tissues of the seafood meat, the livestock meat, and the like, which may cause enzyme-treated products to have a taste and a texture greatly different from the original and lead to excessive softening of a surface and cracking (disintegration of materials) due to injection of the enzymes into the materials.

[0005]

Moreover, the method of combining tenderization and an

enzyme together (Patent Document 4), the method of combining a decompression treatment and an enzyme together (Patent Document 5), and the method of combining tenderization, a decompression treatment, and an enzyme together (Patent Document 6) have also been proposed. In particular, Patent Document 6 shows that softened fish or livestock meat products with softness that conforms to Category 2 of the Universal Design Food (physical property standard: the upper limit of hardness is 5×10^4 N/m²) as defined by the Japan Care Food Conference can be provided. Furthermore, Patent Document 7 describes the invention relating to a packaged food for normal temperature distribution or for chilled distribution and discloses that a food material is softened so as to give a hardness of 1.0×10^2 N/m² or more and 5.0×10^6 N/m² or less while retaining its original shape by reacting with a degrading enzyme in the presence of a thickening stabilizer in a container and then retort-sterilized to obtain a product for normal temperature distribution. Moreover, Patent Documents 8 and 9 disclose a fish food product produced through vacuum-packing and then retort-sterilizing, and Patent Document 10 discloses that a food material is vacuum-packed together with a degrading enzyme and then heat-treated to inactivate the enzyme.

[0006]

Patent Document 1: Japanese Unexamined Patent Application, Publication No. H07-31421

Patent Document 2: Japanese Unexamined Patent Application,

Publication No. 2007-31966

Patent Document 3: Japanese Unexamined Patent Application,
Publication No. 2008-125437

Patent Document 4: Japanese Unexamined Patent Application,
Publication No. 2004-275083

Patent Document 5: Japanese Unexamined Patent Application,
Publication No. 2009-89668

Patent Document 6: Japanese Unexamined Patent Application,
Publication No. 2011-92216

Patent Document 7: Japanese Unexamined Patent Application,
Publication No. 2017-127222

Patent Document 8: Japanese Unexamined Patent Application,
Publication No. H06-189718

Patent Document 9: Japanese Unexamined Patent Application,
Publication No. 2011-147441

Patent Document 10: Japanese Unexamined Patent Application,
Publication No. 2008-011794

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

[0007]

However, even the methods described in Patent Documents 4 to 6 do not solve any of the problems associated with use itself of the tenderization, the decompression treatment, and the enzyme. Although food with a soft texture can be provided, deterioration in taste, food shape retention, and color, etc. cannot be avoided. Furthermore, although it is disclosed that

the method described in Patent Document 6 can provide livestock or fish meat conforming to Category 2 of the Universal Design Food ($5 \times 10 \text{ N}^4/\text{m}^2$ or less), the only disclosed storage method is to rapidly freeze the softened livestock or fish meat as it is. This method remains inconvenient for storage and serving. Furthermore, the method described in Patent Document 7 uses the enzyme for softening, and the enzyme-treated product has a taste and a texture that greatly differ from the original as mentioned above. Furthermore, in Patent Documents 7 to 9, the softened food is sterilized under common sterilization conditions for a retort pouch, such as at 120°C for 30 minutes. However, the present inventors have conducted researches and studies and found that when a product made of a seafood material according to the present invention is sterilized under such a high-temperature condition, an umami taste inherent in the seafood material, etc. is lost, the predetermined softness cannot be obtained due to deterioration in a part of the seafood meat, or on the contrary, the seafood material becomes embrittled to the extent that the seafood material cannot retain its shape. Moreover, when the food undergoes a heat history at such a high temperature for sterilization, the food is overheated to thereby generate an unpleasant cooking odor peculiar to retort-heated food, a so-called retort odor, which deteriorates flavor of the food. Moreover, in the method described in Patent Document 10, the enzymatic treatment unavoidably deteriorates a taste, food shape retention, and

color, etc., similar to as described above. Note that, since only a short heat treatment at a low temperature is performed for inactivating the enzyme after the enzyme treatment, the problem regarding the retort odor as mentioned above does not occur, but there is no guarantee of sterility which enables long-term storage at a normal temperature.

[0008]

Therefore, an object of the present invention is to solve the above-mentioned problems in the related art and provide a packaged non-molded seafood food product that can be stored at a normal temperature over a long period of time, that has a soft texture while retaining an original shape of a whole of the seafood or a part of the seafood such as a fillet of the seafood, and that also has an excellent taste; and a method for producing the product. An additional object of the present invention is to provide a packaged cooked seafood product that can be eaten without anxiety even by people with a reduced chewing and swallowing function, that bears comparison with ordinary cooked products not only in taste but also in shape and color, and that people can enjoy eating when it is used as care food; and a method for producing the product.

Means for Solving the Problems

[0009]

The present inventors have conducted extensive studies to solve the problems and found that a packaged cooked seafood product that can be stored at a normal temperature over a long period of time, that has a soft texture while retaining an

original shape as a food of seafood, and that also has an excellent taste can be obtained without the use of tenderization, enzymatic treatment, or a softening agent, etc. as in the related art by optimizing a processing process for cooking seafood meat (seafood material) and optimizing sterilization treatment conditions after vacuum packaging. Thus, the present invention has been completed.

[0010]

That is, the present invention, which solves the above problems, is a product including:
a cooked non-molded seafood food; and
a vacuum package,
the cooked non-molded seafood food being contained in the vacuum package,
the non-molded seafood food having a hardness of $6 \times 10^5 \text{ N/m}^2$ or less and $2 \times 10^4 \text{ N/m}^2$ or more, the non-molded seafood food having no retort odor, and
when tested after storage in the vacuum package at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),
the seafood food satisfying aseptic conditions below:
viable bacterial count: less than 300 CFU/g as tested on a standard agar medium;
coliforms: test negative on an XM-G agar medium;
Escherichia coli: test negative on an XM-G agar medium; and
Staphylococcus aureus: test negative on an egg-yolk mannitol

salt agar medium.

[0011]

The present invention, which solves the above problems, is also a product including:
a cooked non-molded seafood food; and
a vacuum package,
the cooked non-molded seafood food being contained in the vacuum package,
the product being obtained by putting a seafood material serving as a raw material into the vacuum package and then subjecting to a heat sterilization treatment at a temperature of less than 105°C,
the non-molded seafood food having a hardness of $6 \times 10^5 \text{ N/m}^2$ or less and $2 \times 10^4 \text{ N/m}^2$ or more, and
when tested after storage in the vacuum package at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),
the non-molded seafood food satisfying aseptic conditions below:
viable bacterial count: less than 300 CFU/g as tested on a standard agar medium;
coliforms: test negative on an XM-G agar medium;
Escherichia coli: test negative on an XM-G agar medium; and
Staphylococcus aureus: test negative on an egg-yolk mannitol salt agar medium,

[0012]

In one embodiment of the product according to the present invention, a salt concentration on a surface of the non-molded seafood food and a salt concentration at a region in a proximity of a center of a meat thickness of the non-molded seafood food are both 0.5% by mass or more and have a difference of less than 20%.

[0013]

The present invention, which solves the above problems, is also a product including:
a cooked non-molded seafood food; and
a vacuum package,
the cooked non-molded seafood food being contained in the vacuum package,
the non-molded seafood food having a hardness of $6 \times 10^5 \text{ N/m}^2$ or less and $2 \times 10^4 \text{ N/m}^2$ or more, and
when tested after storage in the vacuum package at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),
the non-molded seafood food satisfying aseptic conditions below:
viable bacterial count: less than 300 CFU/g as tested on a standard agar medium;
coliforms: test negative on an XM-G agar medium;
Escherichia coli: test negative on an XM-G agar medium; and
Staphylococcus aureus: test negative on an egg-yolk mannitol salt agar medium,

, and

the non-molded seafood food having been stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) or more for 180 days or less after production, and a salt concentration on a surface of the non-molded seafood food and a salt concentration at a region in a proximity of a center of a meat thickness of the non-molded seafood food product being both 0.5% by mass or more and having a difference of less than 20%.

[0014]

In one embodiment of the product according to the present invention, a packaged cooked seafood product for storage at a normal temperature is presented.

[0015]

In one preferred embodiment of the product according to the present invention, the above-mentioned aseptic conditions are satisfied after storage in the vacuum package at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 240 days.

[0016]

In one preferred embodiment of the product according to the present invention, the non-molded seafood food takes a form selected from the group consisting of a grilled form, a simmered form, a deep-fried form, and a steamed form.

[0017]

The present invention, which solves the above problems, is also a method for producing a packaged cooked seafood product characterized in that a seafood material serving as a raw material is pretreated in advance, put into a package, and

vacuum-packed, and then the thus-vacuum-packed seafood material is heat-sterilized at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes.

Effects of the Invention

[0018]

According to the present invention, soft seafood food which does not look different from a cooked product for a general diet and which can also be provided as care food conforming to a predetermined food hardness standard can be provided, and therefore, a diet barrier in the aging society can be eliminated. As a result, for example, the soft seafood food has a high appetite-stimulating effect for people with difficulty in chewing or swallowing, and also has a high social contribution effect. Moreover, unlike conventional softened food materials, the soft seafood food can be stored at a normal temperature over a long period of time, can be eaten immediately after opening a package, and does not require special processing machinery or cooking facilities, etc., which allows care food to be easily provided not only in hospitals or nursing facilities but also in restaurants and homes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is a process chart of one embodiment of the method for producing a packaged cooked seafood product of the present invention;

Fig. 2 is a process chart of another embodiment of the method for producing a packaged cooked seafood product of the present invention;

Fig. 3 is a process chart of still another embodiment of the method for producing a packaged cooked seafood product of the present invention;

Fig. 4 is a process chart of yet another embodiment of the method for producing a packaged cooked seafood product of the present invention;

Fig. 5 is a process chart of yet still another embodiment of the method for producing a packaged cooked seafood product of the present invention; and

Fig. 6 is a process chart of yet still another embodiment of the method for producing a packaged cooked seafood product of the present invention.

PREFERRED MODE FOR CARRYING OUT THE INVENTION

[0020]

The present invention will be described in detail with reference to embodiments.

[0021]

<<Product (packaged cooked seafood product)>>

A product according to the present invention (may also be described as "packaged cooked seafood product") is a product in which a cooked non-molded seafood food is contained in a vacuum package, and one of characteristics of the product is that the non-molded

seafood food has a hardness of 6×10^5 N/m² or less and 2×10^4 N/m² or more and more preferably 5×10^5 N/m² or less and 5×10^4 N/m² or more.

[0022]

Thus, in the present invention, the cooked non-molded seafood food contained in the vacuum package has the hardness of 6×10^5 N/m² or less and 2×10^4 N/m² or more, so that the food has the original shape of a whole of the seafood or a part of the seafood such as a fillet of the seafood, in other words, the food can have a soft texture even though the food is not molded. Note that, in the present invention, the non-molded seafood food preferably has not been enzymatically treated to soften the food so as to fall within the scope of the present invention. Note that, a seasoning including an enzyme in a small amount such as koji or miso may or may not be used.

[0023]

Furthermore, the food has the hardness of 6×10^5 N/m² or less and 2×10^4 N/m² or more and therefore can be provided as a product that conforms to Hardness Category 1 of the Universal Design Food (Easy to chew: hardness of 5×10^5 N/m² or less) as defined by the Japan Care Food Conference (<https://www.udf.jp/outline/udf.html>) and can also be provided as a product that conforms to Hardness Category 2 (Can be broken up using the gums: hardness of 5×10^4 N/m² or less) by slightly adjusting production conditions.

[0024]

Note that, the "hardness" of the cooked non-molded seafood food, as used herein, refers to a value measured according to the test method defined in "the Universal Design Food Self-standard" by the Japan Care Food Conference. Specifically, the hardness is a compressive force (N/m^2) measured using a creep meter (YAMADEN co., ltd., RE2-33005S) when a container having a diameter of 40 mm is filled with a sample to a height of 15 mm in and compressed with a plunger having a diameter of 20 mm or 3 mm at a compression speed of 10 mm/sec and a clearance of 5 mm. The measurement is performed at $20 \pm 2^\circ\text{C}$. Note that, a height and a material of the plunger are not particularly specified. Furthermore, during actual measurement, those samples giving a value exceeding the Hardness Category 2 ($5 \times 10^4 \text{ N/m}^2$ or less) as measured using the plunger having a diameter of 20 mm according to the guidelines in the above-mentioned test method are measured again using the plunger with a diameter of 3 mm and evaluated using this measured value obtained using the plunger with a diameter of 3 mm.

[0025]

Furthermore, another one of the characteristics of the product according to the present invention (packaged cooked seafood product) is that the cooked non-molded seafood food is contained in a vacuum package and sufficiently sterilized by the below-mentioned production process. Specifically, the cooked non-molded seafood food is characterized by being capable of satisfying aseptic conditions below:

viable bacterial count: less than 300 CFU/g as tested on a standard agar medium;
coliforms: test negative on an XM-G agar medium;
Escherichia coli: test negative on an XM-G agar medium; and
Staphylococcus aureus: test negative on an egg-yolk mannitol salt agar medium,
as tested after storage at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018), and
further preferably, satisfying the above aseptic conditions even after storage for 120 days, more preferably after storage for 240 days, or even longer.

[0026]

Moreover, another one of the characteristics of the product according to the present invention (packaged cooked seafood product) is that the non-formed seafood food contained therein has the above-mentioned predetermined soft "hardness", and that the packaged cooked seafood product is sufficiently sterile, but does not have a retort odor.

[0027]

In general, although a causative substance of the "retort odor" has not yet been definitely identified, it is clear that the retort odor is an unpleasant odor or an unusual odor generated as a result of food contained in a package undergoing a retort process for sterilization, representatively a heat history at a high temperature of 120°C

for about 30 minutes. It is said that the "retort odor" representatively includes, but is not limited to, a resin odor and a metallic odor which are unavoidably generated as a result of materials such as a synthetic resin that make up the package being exposed to harsh conditions of the retort process to thereby partially decompose the materials or elute and transfer low-molecular-weight components in the materials to transfer an odor to the food even if the materials have excellent heat resistance and low elution property, etc.; and an odor due to amines and aldehydes generated by decomposition of amino acids as well as a sulfur-containing compound such as hydrogen sulfide generated by decomposition of a sulfur-containing amino acid included in the seafood food as a result that the seafood food is exposed to an overheated condition during the retort process. The former can be reduced to some extent by, for example, appropriately selecting a type of packaging to be used, but the latter is difficult to avoid as long as it undergoes a heat history at a high temperature, that is, the retort process.

[0028]

The seafood food contained in the packaged cooked seafood product according to the present invention does not have at least the odor which is generated as a result of the seafood food being exposed to an overheated condition, and, in particular, have neither the odor generated as a result of the seafood food being exposed to an overheated condition nor the resin odor or the metallic odor which is generated as a result

of materials such as a synthetic resin that make up the package being exposed to the retort process, among such various retort odors.

[0029]

Note that, the reason why the seafood food contained in the packaged cooked seafood product according to the present invention does not have the retort odor is because the seafood food is heat-sterilized in a sufficiently low temperature range compared to the conventionally known retort process as described below, in order to achieve the desired sterile condition.

[0030]

Moreover, when seen from another standpoint, the packaged cooked seafood product according to the present invention is characterized in that the non-formed seafood food contained therein has the above-mentioned predetermined soft "hardness" and that the packaged cooked seafood product is sufficiently sterile even though the seafood food serving as a raw material is put into a vacuum package and then heat-sterilized at a temperature of less than 105°C, preferably 90°C or more but less than 105°C.

[0031]

The packaged cooked seafood product according to the present invention is obtained by a heat sterilization treatment at a temperature of less than 105°C and is not easily distinguishable in terms of sterility and is difficult to adequately differentiate in terms of chemical composition,

structure, or other testable parameters, etc., for example, when compared to a product that has been heat-sterilized, that is, retort-sterilized at a temperature of 120°C or higher. However, the packaged cooked seafood product according to the present invention can at least be easily and clearly distinguished from other packaged cooked seafood products such as retort-sterilized products with a human sense of taste (and sense of smell). At least more than half of those who eat the product, and generally almost all of those who eat the product evaluate the packaged cooked seafood product according to the present invention characterized by being obtained through a heat sterilization treatment at a temperature of less than 105°C as superior to the retort-sterilized products in terms of eating-quality, texture, flavor, taste, etc.

[0032]

Furthermore, in the present invention, it is desired to adjust a predetermined salt concentration that is uniform on a surface and inside of the seafood food in order to achieve a predetermined softness without embrittling the original shape of seafood as described above. Specifically, it is desired that a salt concentration on a surface of the non-molded seafood food and a salt concentration at a region in the proximity of the center of a meat thickness of the non-molded seafood food are both in a range of 0.5% by mass or more and have a difference of less than 20%.

[0033]

The salt concentration on a surface of the non-molded

seafood food and the salt concentration at a region in the proximity of the center of a meat thickness of the non-molded seafood food are more preferably both in a range of 0.8% by mass to 2.5% by mass and have a difference of less than 15%, and further desirably both in a range of 1.0% by mass to 2.0% by mass and have a difference of less than 10%.

[0034]

The "salt concentration on a surface" of the non-molded seafood food, as used herein, refers to an average value of salt concentrations measured at positions located on outer surfaces (both front and back surfaces) and at the center in a width direction of the cooked non-molded seafood food. For example, in the aspect where the non-molded seafood food (cooked non-molded seafood food) has a skin on both or one of surfaces, the surface refers to a surface of the skin; and in the case where both or one of surfaces are meat without a skin, the surface refers to an outer surface of the meat. However, the surface absolutely refers to a surface of a fish body itself. For example, when the non-molded seafood food is a product of which outer surface is covered by a batter coating or a thick starchy sauce, the surface refers to a surface after removing anything other than the fish body (the batter coating and the thick starchy sauce when the outer surface is covered by the batter coating and the thick starchy sauce).

[0035]

Meanwhile, the "salt concentration at a region in the

proximity of the center of a meat thickness" of the non-molded seafood food refers to an average value of salt concentrations measured at positions located at the center in a thickness direction on a cut surface of the non-molded seafood food cut roughly at the center in a width direction.

[0036]

Note that, in the present invention, due to the characteristic that the seafood foods are non-molded products and are not uniform in shape, it is not practical for the positions located "at the center of in width direction" or "at the center in a thickness direction" to be exactly in the center with respect to the positions measured as described above and the measured value does not greatly differ even if the positions deviate to some extent or is not practical. Therefore, the measured value can be accepted as a value at that position as long as it is within a certain degree of allowable error, specifically, for example, within an error range of about 10%.

[0037]

The difference between the salt concentrations (%) is an absolute value of a value determined by $\{(\text{Salt concentration value on surface}) - (\text{Salt concentration value in proximity of center})\} / (\text{Salt concentration value on surface}) \times 100$.

[0038]

Moreover, the salt concentration, as used herein, is sodium chloride (NaCl) concentration measured by an electrical conductivity method. Note that, in this invention,

electrolytes other than NaCl such as potassium and magnesium are included in a negligible amount, even if the electrolytes may be present, so the electrolytes have substantially no effect, but an electrical conductivity value due to them is also converted as a NaCl concentration.

[0039]

Note that, in seafood foods contained in vacuum packages such as the packaged cooked seafood product according to the present invention or conventional retort foods, the difference between the salt concentration on a surface and the salt concentration at a region in the proximity of the center of a meat thickness as described above is less likely to cause a phenomenon in which a salt diffuses and permeates through the foods over time to thereby distribute the salt uniformly throughout the foods even after storage at a normal temperature ($25 \pm 2^{\circ}\text{C}$) or more over a relatively long period of time, for example, 180 days. For example, if there is a difference between the salt concentrations immediately after the foods are produced, the difference hardly changes after the above-mentioned period of time such as 180 days. The period of time for which the foods are stored at a normal temperature or more as mentioned above may be 150 days or less or 120 days or less. The lower limit of this period of time is not particularly limited, but may be, for example, one day or more.

[0040]

Each component of the packaged cooked seafood product

according to the present invention will be described in more detail.

[0041]

<Seafood meat material (seafood material)>

In the packaged cooked seafood product according to the present invention, a seafood material (seafood or seafood meat) serving as the raw material to be processed is not particularly limited as long as it is a seafood material that is generally cooked for eating, and various seafood materials can be used. A shape of the seafood material (raw material to be processed) is also not particularly limited, and, depending on a type of seafood and a cooking method, etc., it can be the whole fish body as it is (round), the whole fish body that has been processed as appropriate (semi-dressed, dressed, pan-dressed, etc.), fillets or blocks obtained from the fish body (fillets, chunks, etc.), and, if necessary, it can also have parts such as a skin, an ovary, or a milt.

[0042]

Furthermore, the seafood material may be raw (fresh fish), frozen, or frozen and thawed, but in order to maintain a certain level of quality in relatively high-volume production, frozen seafood, in particular, frozen seafood that is kept at a temperature of -18°C or lower is desirably used.

[0043]

Examples of a type of a seafood material that can be used include, but not limited to, fish such as mackerel, horse mackerel, sardine, saury, herring, bonito, tuna, yellowtail,

marlin, Pacific Cod, Walleye pollack, Saithe, Blue grenadier, hake, salmon, trout, Sea-cultured rainbow trout, flounder, Yellowfin sole, Greenland halibut, filefish, black scraper, flatfish, chub, Alfonsino, Marbled rockfish, Darkbanded rockfish, Silver warehou, Patagonian toothfish, Gray rockfish, arabesque greenling, Japanese bluefish, Red sea-bream, Golden threadfinbream, blanquillo, hairtail, Spanish mackerel, Striped grunt, conger, eel, Smelt, Pond smelt, Whitespotted char, Common dolphinfish, small-sized Spanish mackerel, White Warehou, catfish, tilapia, Nile perch, Pink cusk eel, pufferfish, Goosefish, Silver croaker, lizard fish, Japanese sardinella, and shark; crustaceans such as various shrimps and crabs; cephalopods such as various squids and octopuses; and shellfish such as short-necked clam, clam, scallop, ark shell, horned turban, and abalone.

[0044]

<Cooking method>

Furthermore, in the packaged cooked seafood products according to the present invention, various cooking forms and recipes can be used as cooking forms of the non-formed seafood food as long as the non-formed seafood food is cooked. A basic cooking method may be any form of cooking, for example, grilling, simmering, deep-frying (frying), or steaming. Specific examples thereof include, but of course not limited to, grilling with salt, grilling with teriyaki sauce, simmering in soy sauce, simmering in miso, simmering with ginger, simmering in ketchup, Japanese-style steaming,

pickling in saikyo-miso, pickling in sake lees, pickling in koji, deep-frying without breading or battering, etc. When cooking, various seasonings and spices, as well as various vegetables, especially condiment vegetables, and other secondary materials such as cheese, edible paste, and a thick starchy sauce can be included together in the product in accordance with cooking recipes.

[0045]

Note that, the above-listed cooking forms are common cooking methods or recipes, and the packaged cooked seafood product according to the present invention does not need to be cooked exactly according to such cooking methods or recipes as long as a final product produced in accordance with the below-mentioned process according to the method of the present invention has a taste and a form that is similar to or imitate a cooked product cooked by such cooking methods or recipes. Note that, of course, one of preferred aspects is for food to be cooked in a similar manner as the above-mentioned cooking methods as much as possible in accordance with the below-mentioned process according to the method of the present invention.

[0046]

<Seasoning>

Other seasonings other than salt can be added to the cooked seafood product according to the present invention. The seasonings play a role in softening the seafood material as well as improving a taste by permeating through the seafood

material during cooking to thereby bring out an umami taste inherent in seafood meat. For example, seasonings for simmering in soy sauce can include high-fructose corn syrup, soy sauce, thick malt syrup, sake, starch, spices, salt, seafood extracts, water, and other minor additive ingredients. Furthermore, seasonings for grilling with teriyaki sauce can include, for example, soy sauce, sugar, rice fermented seasoning, starch, seafood extracts, salt, water, and other minor additive ingredients. Furthermore, seasonings for grilling with salt can include, in addition to salt, the same ingredients as the above-mentioned seasonings for grilling with teriyaki sauce at different ratios, as necessary.

[0047]

Note that, in the present invention, the salt concentration on a surface of the non-molded seafood food and the salt concentration at a region in the proximity of the center of a meat thickness of the non-molded seafood food as defined above are salt concentrations in a final form of the non-molded seafood food, and therefore, are affected by not only simply an amount of salt used for cooking but also a total salt content contained in such seasonings used for cooking.

[0048]

<Vacuum Packaging>

In the packaged cooked seafood product according to the present invention, the non-molded seafood food is externally packaged by a vacuum package. The "vacuum packaging", as used

herein, means packaging with a degree of internal decompression as commonly used in the field of food packaging, not limited to an absolute vacuum state. Specifically, for example, the inside of the package can be decompressed to a pressure below an atmospheric pressure including, but is not limited to, 2×10^2 Pa or less and more preferably 10^1 Pa or less.

[0049]

A package to be used for vacuum packaging is not particularly limited as long as it is a package to be used for vacuum-packaging ordinary seafood meat processed food, but, for example, preferably has oxygen permeability at 23°C (0% relative humidity) of $500 \text{ cm}^3/(\text{m}^2 \cdot 24\text{hr} \cdot \text{atm})$ or less, $50 \text{ cm}^3/(\text{m}^2 \cdot 24\text{hr} \cdot \text{atm})$ or less, and further preferably $10 \text{ cm}^3/(\text{m}^2 \cdot 24\text{hr} \cdot \text{atm})$ or less. The oxygen permeability is measured in accordance with JIS K 7126A, Method B (23°C, 0% RH).

[0050]

Examples of such a low-oxygen-permeable packaging material include appropriately molded single- or multi-layered sheet or film packaging materials with an oxygen barrier layer used for the ordinary seafood meat processed food. As the oxygen barrier layer, a layer including conventionally known materials, for example, a metal foil such as an aluminum foil; an inorganic deposited film such as a silica deposited film and an alumina deposited film; an oriented nylon (ONY) film, a non-oriented nylon film, an oriented polypropylene (OPP) film, a polyethylene terephthalate (PET) film, a polyvinylidene

chloride-coated oriented nylon (KON) film, a polyvinylidene chloride-coated oriented polypropylene film, a polyvinylidene chloride film, and an ethylene-vinyl acetate copolymer saponified film is preferably used.

[0051]

A film with an excellent sealing property can be disposed on an inner layer of the packaging material as a sealant layer. As the film, for example, a film of low-density polyethylene, medium-density polyethylene, high-density polyethylene, non-oriented polypropylene, linear low-density polyethylene (LLDPE), ultra-low-density polyethylene, an ethylene-vinyl acetate copolymer, an ethylene-acrylic acid copolymer, an ethylene-methacrylate copolymer, etc. can be used.

[0052]

Specific examples of a shape of the package include a flat pouch, a standing pouch, a pouch with nozzle, a pillow bag, and a gusset bag. It is possible to provide an easy opening property, an easy tearing property, a shrinking property, a microwave oven suitability, a UV blocking property, a design property, etc. by arbitrarily selecting a material composition in a laminate film which is the packaging material constituting the package. Vacuum-packaging may be performed, for example, using the following method: a three-sided seal bag is made of a film, a content such as a seafood meat material is put into the bag, and then the bag is sealed by decompressing and then sealing at an opening using a vacuum

packaging machine.

[0053]

Note that, the packaging material is not particularly limited, but, for example, those made of a laminated film having three or more layers at least including a deposited polyethylene terephthalate (PET) film layer, an oriented nylon (ONY) film layer, and a non-oriented polypropylene (CPP) film layer from an outer side, specifically, for example, a laminated film of deposited PET12/ONY15/CPP60 (numerals correspond to film thicknesses (μm)) are preferably used from the viewpoints of excellent gas impermeability, stable storage and transportation abilities, compatibility with boiling and electron beam heating such as microwaving, and less odor transferred from plastic constituting the package to the food to the non-molded seafood food therein.

[0054]

Moreover, the packaging material is more preferably transparent or translucent so that the inside of the product can be seen from the outside because the seafood food contained in the packaged cooked seafood product according to the present invention are non-molded and pleasant to the eye.

[0055]

In the packaged cooked seafood product according to the present invention, the non-molded seafood food is vacuum packaged in such a package and sufficiently sterilized by the below-mentioned production process. Therefore, the packaged cooked seafood product can maintain stable quality over a long

period of time not only when refrigerated- or frozen-stored but also when stored at a normal temperature.

[0056]

Therefore, in the packaged cooked seafood product according to the present invention, the non-molded seafood food is characterized by being capable of satisfying aseptic conditions below:

viable bacterial count: less than 300 CFU/g as tested on a standard agar medium;

coliforms: test negative on an XM-G agar medium;

Escherichia coli: test negative on an XM-G agar medium; and

Staphylococcus aureus: test negative on an egg-yolk mannitol salt agar medium,

as tested after storage in the vacuum package at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018), and further preferably, satisfying the above aseptic conditions even after storage for 120 days, more preferably after storage for 240 days, or even longer. Note that, the packaged cooked seafood product according to the present invention may be frozen-stored until shipment immediately after the product is produced in its production process as described below. The number of days specified herein, such as after storage for 90 days, after storage for 120 days, after storage for 240 days, etc. at a normal temperature ($25 \pm 2^{\circ}\text{C}$) does not include a period of frozen storage until shipment but, in the case of

such a frozen-stored product, is the number of days from the time point at which the product begins to be stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) after thawing in the vacuum package.

[0057]

<Production method of packaged cooked seafood product>

A method for producing the packaged cooked seafood product according to the present invention will be described in detail with reference to specific embodiments. Note that, Figs. 1 to 6 are process charts of embodiments of the method for producing a packaged cooked seafood product according to the present invention.

[0058]

In the production of the packaged cooked seafood product according to the present invention with the characteristics described above, pretreatment or pre-cooking before vacuum packaging can take various aspects in accordance with a type of a seafood material to be cooked or a cooking method thereof. The seafood material serving as a raw material is pretreated in advance, put into a package, vacuum-packed, and then, in the case where the thus-vacuum-packed seafood material is heat-sterilized, is desirably heat-sterilized at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes.

[0059]

Generally, a retort pouch is representatively sterilized under conditions at 120°C for 30 minutes. However, when the

product according to the present invention is sterilized under such a high temperature condition, an umami taste inherent in the seafood material, etc. is lost, the predetermined softness cannot be obtained due to deterioration in a part of seafood meat, or on the contrary, the seafood material becomes embrittled to the extent that the seafood material cannot retain its shape. In particular, when the product is provided in a form of cooked seafood food as in the present invention, the seafood food contains a certain level of salt (including salt from seasonings). However, when the seafood food containing the salt is heat-treated at such a high temperature of 120°C or more over a long period of time, properties of the seafood material are highly likely to be impaired.

[0060]

On the other hand, a heat sterilization treatment at a temperature of 90°C or more but less than 105°C is less likely to impair such properties such as the umami taste inherent in the seafood material. Moreover, in the case of heat sterilization at such a relatively low temperature, a relatively long period of time such as 50 minutes or more and more preferably 80 minutes or more is required in order to ensure sterilization, but this heat treatment for heat sterilization also serves as heating for cooking the seafood food contained therein, and heating of the seafood food at such a relatively low appropriate temperature for 50 to 150 minutes can result in the product which has enhanced softness without embrittlement or loss of the umami taste, etc. and

which has the desired hardness as described above.

[0061]

Note that, conditions for the heat sterilization treatment may be more preferably at a temperature of 90°C or more and 100°C or less for 80 and 120 minutes, and further specifically, for example, representatively at 100°C for about 90 minutes.

[0062]

Furthermore, it is enough to perform the heat sterilization treatment once at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes as mentioned above, but more preferably, in order to ensure sterilization, the treatment for a relatively short time within a range of such conditions, such as 50 minutes is preferably performed twice or more, in particular, twice. Note that, when the heat sterilization treatment is performed more than once as described above, the seafood material is desirably temporarily cooled to a normal temperature including, but not particularly limited to, about $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ between the heat sterilization treatments.

[0063]

As shown in process examples in Figs. 1 to 6, when producing the packaged cooked seafood product according to the present invention, pretreatment or pre-cooking before the heat sterilization treatment described above can take various aspects in accordance with a type of a seafood material or a cooking method thereof. However, the following is common to

the various aspects: the seafood material serving as a raw material is brought into contact with a solution containing salt (may be salt in seasonings) at least before vacuum packaging and the above-mentioned heat sterilization treatment; after having been brought into contact with the solution containing salt, the seafood material is not treated at a high temperature, such as 120°C or more for a long time even if heated; and if heated, the seafood material is cooled to 20°C or less at a relatively fast cooling rate after the heat treatment. Through such a processing process, a product that retains the original shape of seafood as food while having the desired softness can be obtained. A method for producing a packaged cooked seafood product according to the present invention will be described in detail with reference to specific examples.

[0064]

A production process shown in Fig. 1 is a process of one example of a method for producing a cooked seafood product packaged in a form of seafood simmered or stewed in soy sauce.

[0065]

In this embodiment, as a pretreatment, basically, a frozen seafood material serving as a raw material is naturally thawed, rinsed under running water to remove drips, and then drained, and additionally, the thus-pretreated seafood material is put into a package together with a seasoning sauce liquid and vacuum-packed. Some examples of cooking methods according to this process chart will be described.

[0066]

Mackerel simmered in miso

The case of producing a cooked fish product packaged in a form of mackerel simmered in miso will be described according to the process chart shown in Fig. 1. First, frozen boneless mackerel fillets serving as a seafood material are received at a raw material receiving step 10, and whether a product name, specifications, an expiration date, a place of origin, or the like is correct is checked. Note that, of course, fresh boneless fish fillets can also be used as the raw material instead of frozen fish, but the frozen fish is easily controlled to maintain uniform and stable product quality without being affected by factors such as seasonal variation and temperature changes in a raw material supply route or factory facilities, etc. In order to prevent product defects due to the raw material itself from occurring, the raw material brought in is checked for an initial temperature of -18°C or less and the presence of a broken packaging box, etc.

[0067]

Then, in an inspection step 20, each raw material is, for example, visually checked for any problem concerning quality, shape, color, smell, and the like. Then, in a raw material unpacking step 30, each raw material is unpacked, and in a thawing step 32, the raw material is put into a special container with drainage holes at the bottom and naturally thawed. Note that, a thawing temperature is not particularly limited, but is desirably a temperature of 15°C or less. This

is because the thus-thawed raw material may be perishable when the temperature is 20°C or more. The period of time for natural thawing may be any as long as the fillets serving as the raw material is sufficiently thawed, but usually about 12 to 24 hours and representatively about one night is enough for natural thawing.

[0068]

The thus-thawed fillets are then thoroughly rinsed clean with tap water in a running water rinsing step 34. This prevents drips from flowing out of the thawed fillets. Note that, the drips that flow out, for example, when the frozen product is thawed also include an umami component of the fish, but the mackerel as in this example has a particularly large amount of the drips, and when the mackerel is cooked as a simmered dish, the drips tend to adhere to a surface of the product as lye to impair its appearance and taste. Therefore, the drips are preferably removed. Note that, when rinsing the fillets, care should be taken not to crack the fillets.

[0069]

After the running water rinsing step 34, the fillets are fully drained in a draining step 36 using a special container with drainage holes at the bottom similar to the one described above. For example, the draining is performed by allowing water to naturally drain for 30 minutes or more in order to prevent the drips from further flowing out of the fillets.

[0070]

Then, in a bagging step 80, each fillet is put into a

package. The package is, for example, a three-sided seal bag made of a film. Before or after the bagging step 80, in a sauce addition step 90, a predetermined amount of miso sauce prepared in advance at a predetermined mix proportion is added to the package. After the fillet and the miso sauce are put into the package, in a vacuum packaging step 100, the package is decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine.

[0071]

After vacuum packaging, in a weight inspection step 110, the package is checked whether a product mass is in accordance with the specification and for the presence or absence of vacuum leakage, and in a metal inspection step 120, the package is checked for the presence or absence of metal such as Fe or SUS mixed into the package from manufacturing equipment, etc.

[0072]

Once contents of the vacuum-packaged product have been confirmed to be safe, in a sterilization step 130, the vacuum-packaged contents, that is, the mackerel fillet and the miso sauce are heat-sterilized at 100°C for 50 minutes, which falls within a range of conditions at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes. Moreover, the contents are heat-sterilized again under the same conditions, that is, at 100°C for 50 minutes. A device for the heat sterilization treatment is not particularly limited, but is,

for example, a retort kettle.

[0073]

In this aspect, the contents, that is, the mackerel fillet and the miso sauce are heat-treated for the first time in this sterilization step 130, and undergo sterilization and cooking at the same time.

[0074]

After the heat treatment in the sterilization step 130 is completed, the thus-vacuum-packed and cooked product is immediately cooled using a refrigerator to a temperature of 20°C or less within one hour in a cooling step 140. Such rapid cooling suppresses further embrittlement of the cooked seafood material (mackerel fillet) than necessary and produces a product of mackerel simmered in miso with a predetermined shape and softness (hardness).

[0075]

The thus-produced product of vacuum-packed mackerel simmered in miso is then boxed 150, frozen-stored 200 until shipment if necessary, and shipped 300. Note that the product can also be shipped immediately after production, of course. In this case, the product according to the present invention can still be shipped at a normal temperature without freezing, since it is for storage at a normal temperature. Note that, it is of course common to all of the below-mentioned embodiments that the product is optionally frozen-stored until shipment and can also still be shipped at a normal temperature.

[0076]

Mackerel simmered in soy sauce

A cooked seafood product packaged in a form of mackerel simmered in soy sauce can also be produced according to the process chart shown in Fig. 1 in almost the same manner as in the mackerel simmered in miso above. In other words, the product is produced in basically the same manner as above, except that a ginger and soy sauce is used instead of the miso sauce in the sauce addition step 90.

[0077]

A production process shown in Fig. 2 is a process of one example of a method for producing a cooked seafood product packaged in a form of seafood stewed in soy sauce. This production process is suitably used when fish with bones is particularly used as the seafood material and softened to a predetermined softness while retaining its original form.

[0078]

In this embodiment, as a pretreatment, basically, a seafood material serving as a pre-treated raw material is heated and pressurized at a temperature of 120°C for a period of time of 20 minutes or more and 30 minutes or less, and then the seafood material is cooled to a temperature of 20°C or less within 30 minutes, and additionally, the thus-pretreated seafood material is put into a package together with a seasoning sauce liquid and vacuum-packed. An example of a cooking method according to this process chart will be described.

[0079]

Sardine simmered with ginger

The case of producing a cooked seafood product packaged in a form of sardine simmered with ginger will be described according to the process chart shown in Fig. 2. It should be understood that steps in Fig. 2 numbered with the same numbers as those shown in Fig. 1 are common to these process charts and therefore may be described in a simplified manner below. First, frozen dressed sardine serving as a seafood material are received from the outside in a raw material receiving step 10, and after undergoing an inspection step 20 and a raw material unpacking step 30, the raw material that is still frozen is placed on, for example, a stainless-steel tray, in an arrangement step 40. Then, in a heating and pressurizing step 50, the dressed sardines that are still frozen are heated and pressurized at 120°C and 0.12 MPa for 20 minutes, for example, in a retort kettle. This softens the dressed sardines and even the bone and removes drips. After the heating and pressurizing step is completed, in a removal step 60, the thus-heated and pressurized dressed sardines are removed from the retort kettle, and immediately thereafter, in a freezing step 70, put into a freezer to be rapidly cooled to a temperature of 20°C or less within 30 minutes for further freezing. Such rapid cooling improves shape retention of the heated and pressurized dressed sardines and suppresses proliferation of microorganisms that adhere thereto in an environment.

[0080]

Then, in a bagging step 80, the frozen dressed sardines are put into a package, for example, two at a time, but the number of fillets is arbitrary. Before or after the bagging step 80, in a sauce addition step 90, a predetermined amount of the ginger and soy sauce prepared in advance at a predetermined mix proportion is added to the package. After the dressed sardines and the ginger and soy sauce are put into the package, in a vacuum packaging step 100, the package is decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine.

[0081]

After vacuum-packaging and then undergoing a weight inspection step 100 and a metal inspection step 120, the thus-vacuum-packaged contents, that is, the dressed sardines and the ginger and soy sauce are heat-sterilized at 100°C for 50 minutes, which falls within a range of conditions at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes, in a sterilization step 130. Moreover, the contents are heat-sterilized again under the same conditions, that is, at 100°C for 50 minutes.

[0082]

In this aspect, the heating in this sterilization step 130 allows the ginger and soy sauce to efficiently and uniformly permeate through the contents, that is, the dressed sardines that have been heated and pressurized in their bare state to thereby give a softer texture to seafood meat.

[0083]

After the heat treatment in the sterilization step 130 is completed, the resultant product is immediately cooled using a refrigerator to a temperature of 20°C or less within one hour in a cooling step 140 in the same manner as mentioned above. The product is then boxed 150, frozen-stored 200 until shipment if necessary, and shipped 300.

[0084]

Next, a production process shown in Fig. 3 is a process of one example of a method for producing a cooked seafood product packaged in a form of seafood stewed in soy sauce. This production process is basically the same as shown in Fig. 2, except that the received seafood material is further processed into fillets. An example of a cooking method according to this process chart will be described.

[0085]

Herring simmered with dried bonito

The case of producing a cooked seafood product packaged in a form of herring simmered with dried bonito will be described according to the process chart shown in Fig. 3. It should be understood that steps in Fig. 3 numbered with the same numbers as those shown in Figs. 1 and 2 are common to these process charts and therefore may be described in a simplified manner below. First, frozen herring fillets that have been filleted into 3 pieces serving as a seafood material are received from the outside in a raw material receiving step 10, and after undergoing an inspection step 20 and a raw

material unpacking step 30, the fillets that are still frozen are cut into halves in a fillet processing step 38, and the thus-cut fillets that are still frozen are placed on, for example, a stainless-steel tray, in an arrangement step 40. Then, in a heating and pressurizing step 50, the herring fillets that are still frozen are heated and pressurized at 120°C and 0.12 MPa for 20 minutes. After the heating and pressurizing step is completed, in a removal step 60, the thus-heated and pressurized herring fillets are removed, and immediately thereafter, in a freezing step 70, put into a freezer to be rapidly cooled to a temperature of 20°C or less within 30 minutes for further freezing.

[0086]

Then, in a bagging step 80, the frozen herring fillets are put into a package, for example, two at a time, but the number of fillets is arbitrary. Before or after the bagging step 80, in a sauce addition step 90, a predetermined amount of the ginger and soy sauce prepared in advance at a predetermined mix proportion is added to the package. After the herring fillet and ginger and soy sauce are put into the package, in a vacuum packaging step 100, the package is decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine.

[0087]

After vacuum-packaging and then undergoing a weight inspection step 100 and a metal inspection step 120, the thus-

vacuum-packaged contents, that is, the herring fillets and the ginger and soy sauce are heat-sterilized at 100°C for 50 minutes, which falls within a range of conditions at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes, in a sterilization step 130. Moreover, the contents are heat-sterilized again under the same conditions, that is, at 100°C for 50 minutes.

[0088]

In this aspect, the heating in this sterilization step 130 allows the ginger and soy sauce to efficiently and uniformly permeate through the contents, that is, the herring fillets that have been heated and pressurized in their bare state to thereby give a softer texture to seafood meat.

[0089]

After the heat treatment in the sterilization step 130 is completed, the resultant product is immediately cooled using a refrigerator to a temperature of 20°C or less within one hour in a cooling step 140 in the same manner as mentioned above. The product is then boxed 150, frozen-stored 200 until shipment if necessary, and shipped 300.

[0090]

A production process shown in Fig. 4 is a process of one example of a method for producing a cooked seafood product packaged in a form of seafood grilled with salt.

[0091]

In this embodiment, as a pretreatment, basically, a seafood material serving as a pre-treated material is immersed

in a processing liquid with a salt concentration of 3 to 6% by volume for about 15 to about 22 hours, and then the seafood material is removed from the processing liquid and grilled such that the center temperature is 75°C or more but less than 90°C. After the grilling, the seafood material is cooled to a temperature of 20°C or less within 30 minutes. Some examples of cooking methods according to this process chart will be described.

[0092]

Salmon grilled with salt

The case of producing a cooked seafood product packaged in a form of salmon grilled with salt will be described according to the process chart shown in Fig. 4. It should be understood that steps in Fig. 4 numbered with the same numbers as those shown in Figs. 1 to 3 are common to these process charts and therefore may be described in a simplified manner below. First, frozen boneless salmon fillets serving as a seafood material are received from the outside in a raw material receiving step 10, and subjected to an inspection step 20. On the other hand, in parallel with this, in a pickling liquid preparation step 22, a pickling liquid with a salt concentration of 3 to 6% by volume, representatively a salt concentration of 5% by volume is prepared for such fillets by adding salt to water. After undergoing a raw material unpacking step 30, the boneless salmon fillets that are still frozen are put 42 into the pickling liquid that has been prepared separately as described above, and in a

seasoning and softening step 44, the fillets are pickled at a normal temperature ($23^{\circ}\text{C} \pm 5^{\circ}\text{C}$) for about 15 to 22 hours, representatively about one night, to thereby thaw as well as season and soften the fillets in the pickling liquid. For the form of grilled with salt, the seafood material is desirably immersed in the pickling liquid with a predetermined salt concentration in advance to thereby transfer salt to seafood meat, because, unlike the simmered form, it is impossible for salt in a seasoning liquid to permeate and soften the seafood meat through heating during heat sterilization of a packaging container to which the seasoning liquid has been added. In an arrangement on a hot plate step 46, the fillets are removed from the pickling liquid and then placed on a hot plate, and in a grilling step 52, the fillets are grilled in an oven at a center temperature of the fillets of 75°C or more but less than 90°C and more preferably at a center temperature of the fillets of 75°C or more but less than 85°C to brown a surface thereof. After the grilling, in a removal step 60, the salmon fillets are removed from the oven, put into a special container for preventing contamination, and immediately thereafter, in a cooling step 72, put into a refrigerator to be rapidly cooled to a temperature of 20°C or less within 30 minutes. Such rapid cooling suppresses proliferation of microorganisms that adhere to the salmon fillets in an environment. Note that, since the salmon fillets have been grilled, they have a relatively good shape at this stage compared to those heated under pressure for stewing as

described above. The fillets are not needed to be frozen to retain their shape, but only have to be refrigerated.

[0093]

After the thus-refrigerated salmon fillets are each put into a package in a bagging step 80, in a vacuum packaging step 100, the package is decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine.

[0094]

After vacuum-packaging and then undergoing a weight inspection step 100 and a metal inspection step 120, the thus-vacuum-packaged contents, that is, the salmon fillets are heat-sterilized at 100°C for 50 minutes, which falls within a range of conditions at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes, in a sterilization step 130. Moreover, the contents are heat-sterilized again under the same conditions, that is, at 100°C for 50 minutes.

[0095]

In this aspect, the heating in this sterilization step 130 gives a softer seafood meat texture to the contents, that is, the salmon fillets that are like grilled with salt.

[0096]

After the heat treatment in the sterilization step 130 is completed, the resultant product is immediately cooled using a refrigerator to a temperature of 20°C or less within one hour in a cooling step 140 in the same manner as mentioned above. The product is then boxed 150, frozen-stored 200 until

shipment if necessary, and shipped 300.

[0097]

Mackerel grilled with salt

Furthermore, the case of producing a cooked seafood product packaged in a form of mackerel grilled with salt will be described according to the process chart shown in Fig. 4. Also, in the case of the mackerel grilled with salt, a cooked seafood product packaged in a form of mackerel grilled with salt can be produced basically in the same manner as in the cooked seafood product packaged in the form of salmon grilled with salt described above, except that the raw material is changed from frozen boneless salmon fillets to frozen boneless mackerel fillets.

[0098]

Atka mackerel grilled with salt

Furthermore, the case of producing a cooked seafood product packaged in a form of Atka mackerel grilled with salt will be described according to the process chart shown in Fig. 4. Also, in the case of the Atka mackerel grilled with salt, a cooked seafood product packaged in a form of Atka mackerel grilled with salt can be produced basically in the same manner as in the cooked seafood product packaged in the form of salmon grilled with salt described above, except that the raw material is changed from frozen boneless salmon fillets to frozen boneless Atka mackerel fillets.

[0099]

Next, a production process shown in Fig. 5 is a process

of one example of a method for producing a cooked seafood product packaged in a form of seafood grilled with teriyaki sauce.

[0100]

In this embodiment, as a pretreatment, a seafood material serving as a raw material is immersed in a processing liquid with a salt concentration of 3 to 6% by volume for about 15 to about 22 hours, and then the seafood material is removed from the processing liquid and grilled at a center temperature of 75°C or more but less than 90°C. After the grilling, the seafood material is cooled to a temperature of 20°C or less within 30 minutes, and additionally, the thus-pretreated seafood material is put into a package together with a seasoning sauce liquid and vacuum-packed.

[0101]

Yellowtail grilled with teriyaki sauce

The case of producing a cooked seafood product packaged in a form of yellowtail grilled with teriyaki sauce will be described according to the process chart shown in Fig. 5. It should be understood that steps in Fig. 5 numbered with the same numbers as those shown in Figs. 1 to 4 are common to these process charts and therefore may be described in a simplified manner below. First, frozen yellowtail fillets that have been filleted into 3 pieces serving as a seafood material is received from the outside in a raw material receiving step 10, and subjected to an inspection step 20. The fillets are then cut into boneless fillets with a predetermined mass in a

filleting step 38. Then, the yellowtail boneless fillets that are still frozen are put 42 into a pickling liquid with a salt concentration of 2 to 6% by volume, representatively a salt concentration of 5% by volume prepared in advance for such fillets, and in a seasoning and softening step 44, the fillets are pickled at a normal temperature ($23^{\circ}\text{C} \pm 5^{\circ}\text{C}$) for about 15 to 22 hours, representatively about one night, to thereby thaw as well as season and soften the fillets in the pickling liquid. For the form of grilled with teriyaki sauce, the seafood material is desirably immersed in the pickling liquid with a predetermined salt concentration in advance to thereby transfer salt to seafood meat in the same manner as in the form of grilled with salt as described above, because, although the seafood material is put into a packaging container together with a seasoning liquid, an amount of the seasoning liquid is smaller than that for the stewed form, so that it is not possible for salt in the seasoning liquid to sufficiently permeate and soften throughout the seafood meat through heating during heat sterilization. Then, in an arrangement on a grid step 48, the fillets are removed from the pickling liquid and placed on a grid, and in a grilling step 52, the fillets are grilled in a gas roaster at a center temperature of the fillets of 75°C or more but less than 90°C and more preferably at a center temperature of the fillets of 75°C or more but less than 85°C to brown a surface thereof. After the grilling, the yellowtail fillets are immediately put into a refrigerator and rapidly cooled to a temperature of

20°C or less within 30 minutes in a cooling step 70. Such rapid cooling suppresses proliferation of microorganisms that adhere to the salmon fillets in an environment. Note that, since the yellowtail fillets have been grilled, they have a relatively good shape at this stage compared to those heated under pressure for stewing as described above. The fillets are not needed to be frozen to retain their shape, but only have to be refrigerated.

[0102]

Then, the yellowtail fillets are carefully separated from the grid so as not to crack meat or be contaminated with foreign materials in a separation from grid step 74 and the refrigerated yellowtail fillets are each put into a package in a bagging step 80. Before or after the bagging step 80, in a sauce addition step 90, a predetermined amount of teriyaki sauce prepared in advance at a predetermined mix proportion is added to the package. After the yellowtail fillets and the teriyaki sauce are put into the package, in a vacuum packaging step 100, the package is decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine.

[0103]

After vacuum-packaging and then undergoing a weight inspection step 100 and a metal inspection step 120, the thus-vacuum-packaged contents, that is, the yellowtail fillets are heat-sterilized at 100°C for 50 minutes, which falls within a range of conditions at a temperature of 90°C or more but less

than 105°C for 50 to 150 minutes, in a sterilization step 130. Moreover, the contents are heat-sterilized again under the same conditions, that is, at 100°C for 50 minutes.

[0104]

In this aspect, the heating in this sterilization step 130 gives a softer seafood meat texture to the contents, that is, the yellowtail fillets that are like grilled with teriyaki sauce.

[0105]

After the heat treatment in the sterilization step 130 is completed, the resultant product is immediately cooled using a refrigerator to a temperature of 20°C or less within one hour in a cooling step 140 in the same manner as mentioned above. The product is then boxed 150, frozen-stored 200 until shipment if necessary, and shipped 300.

[0106]

A production process shown in Fig. 6 is a process of one example of a method for producing a cooked seafood product packaged in a form of deep-fried seafood such as deep-fried seafood dressed with a thick starchy sauce.

[0107]

In this embodiment, as a pretreatment, basically, a seafood material serving as a pre-treated material is deep-fried at a center temperature of 75°C or more but less than 95°C, and then the seafood material is cooled to a temperature of 20°C or less within 30 minutes, and additionally, the thus-pretreated seafood material is put into a package together

with a seasoning sauce liquid and vacuum-packed. An example of a cooking method according to this process chart will be described.

[0108]

Deep-fried flounder dressed with thick starchy sauce

The case of producing a cooked seafood product packaged in a form of deep-fried flounder dressed with a thick starchy sauce will be described according to the process chart shown in Fig. 6. It should be understood that steps in Fig. 6 numbered with the same numbers as those shown in Figs. 1 to 5 are common to these process charts and therefore may be described in a simplified manner below. First, frozen boneless flounder fillets serving as a seafood material are received from the outside in a raw material receiving step 10, and subjected to an inspection step 20. On the other hand, in parallel with this, in a pickling liquid preparation step 22, a pickling liquid with a salt concentration of 3 to 6% by volume, representatively a salt concentration of 5% by volume is prepared for such fillets by adding salt to water. After undergoing a raw material unpacking step 30, the boneless flounder fillets that are still frozen are put 42 into the pickling liquid that has been prepared separately as described above, and in a seasoning and softening step 44, the fillets are pickled at a normal temperature ($23^{\circ}\text{C} \pm 5^{\circ}\text{C}$) for about 15 to 22 hours, representatively about one night, to thereby thaw as well as season and soften the fillets in the pickling liquid. After a predetermined time has elapsed, the fillets

are removed from the pickling liquid and drained thoroughly. Then, in a flouring and battering step 48, the fillets are carefully sprinkled with wheat flour and dipped into a liquid batter with an indicated composition so that an excessive amount of the wheat flour or the batter does not adhere to the fillets. The thus-battered-fillets are put 54 into a fryer and deep-fried in the fryer at a center temperature of the fillets of 75°C or more but less than 90°C and more preferably at a center temperature of the fillets of 75°C or more but less than 85°C in a deep-frying step 56. After the deep-frying, the flounder fillets are removed from the fryer in a removal step 60, put into a special container for preventing contamination, and immediately placed in a refrigerator and cooled to a temperature of 20°C or less within 30 minutes in a cooling step 72. Such rapid cooling suppresses proliferation of microorganisms that adhere to the flounder fillets in an environment. Note that, since the flounder fillets have been deep-fried, they have a relatively good shape at this stage compared to those heated under pressure for stewing as described above. The fillets are not needed to be frozen to retain their shape, but only have to be refrigerated.

[0109]

Then, in a bagging step 80, the thus-cooled deep-fried flounder fillets are put into a package. Before or after the bagging step 80, in a sauce addition step 90, a predetermined amount of a thick starchy sauce prepared in advance at a predetermined mix proportion is added to the package. After

the flounder fillets and the thick starchy sauce are put into the package, in a vacuum packaging step 100, the package is decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine.

[0110]

After vacuum-packaging and then undergoing a weight inspection step 100 and a metal inspection step 120, the thus-vacuum-packaged contents, that is, the flounder fillets and the thick starchy sauce are heat-sterilized at 98°C for 100 minutes, which falls within a range of conditions at a temperature of 90°C or more but less than 105°C for 50 to 150 minutes, in a sterilization step 130.

[0111]

In this aspect, the heating in this sterilization step 130 allows the thick starchy sauce to efficiently and uniformly permeate through the contents, that is, the flounder fillets that have been deep-fried to thereby give a softer texture to seafood meat.

[0112]

After the heat treatment in the sterilization step 130 is completed, the resultant product is immediately cooled using a refrigerator to a temperature of 20°C or less within one hour in a cooling step 140 in the same manner as mentioned above. The product is then boxed 150, frozen-stored 200 until shipment if necessary, and shipped 300.

[0113]

Note that, the present invention has been described based on specific embodiments, but the present invention is not limited to these exemplified embodiments, and various changes or modifications may be made within the scope of the present invention as defined in the claims.

EXAMPLES

[0114]

The present invention will be more specifically described based on the Examples. Note that, methods for evaluating characteristic values evaluated in the Examples below were as follows.

[0115]

Evaluation of food hardness:

Evaluation of a hardness of cooked non-molded seafood food was carried out in accordance with the test method defined in "the Universal Design Food Self-standard" defined by the Japan Care Food Conference. A compressive force (N/m^2) was measured under a temperature condition of $20 \pm 2^\circ\text{C}$ using a creep meter (YAMADEN co., ltd., RE2-33005S) when a container having a diameter of 40 mm was filled with a sample to a height of 15 mm and compressed with a plunger having a diameter of 20 mm or 3 mm at a compression speed of 10 mm/sec and a clearance of 5 mm. Furthermore, during actual measurement, those samples giving the value exceeding the Hardness Category 2 ($5 \times 10^4 \text{ N/m}^2$ or less) in the measurement using the plunger having a diameter of 20 mm according to the

guidelines of the above-mentioned test method are measured again using the plunger with a diameter of 3 mm and evaluated using this measured value obtained using the plunger with a diameter of 3 mm.

[0116]

Salt concentration in food

A salt concentration of the cooked non-molded seafood food was measured using a digital hand-held "Pocket" salt meter PAL-SALT (manufactured by ATAGO CO., LTD., conductivity method). Note that, a salt concentration on a surface portion of the cooked non-molded seafood food was measured on a surface area of the cooked non-molded seafood food removed from a packaging container, and a salt concentration at a region in the proximity of the center of the cooked non-molded seafood food was measured on an area near the center in a thickness direction on a cut surface of the cooked non-molded seafood food removed from the packaging container and cut roughly at the center in a width direction. The measurements were taken five times for each of the surface and the region in the proximity of the center, and the average value was used.

[0117]

Bacteriological examination

The cooked non-molded seafood food was removed from the packaging container after thawing in the packaging container and then stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 90 days, after thawing and then stored at a normal temperature

($25 \pm 2^{\circ}\text{C}$) for 120 days, and after thawing and then stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 240 days, and then tested for viable bacterial count using a standard agar medium; coliforms using an XM-G agar medium; *Escherichia coli* using an XM-G agar medium; and *Staphylococcus aureus* using an egg-yolk mannitol salt agar medium in accordance with the method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018). Note that, this microbiological test was outsourced to Syokuhin Biseibutu Center Co., Ltd. (Odawara City, Kanagawa Prefecture) in order to enhance reliability.

[0118]

Retort odor and taste

After thawing in the packaging container and then stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 120 days, the cooked non-molded seafood food was removed from the packaging container and subjected to a sensory test with the cooperation of 10 male and 10 female panelists. Note that, the age composition of the panelists who participated in the test was 3 in their 30s, 4 in their 40s, and 3 in their 50s, with a gender ratio of 6:4. Note that, the cooked non-molded seafood food was either one that was removed from the packaging container as it is (normal temperature state) or one heated while contained in the packaging container in a microwave oven immediately before being tested (heated state). The panelists were asked to eat these seafood foods and to evaluate the presence or absence of a retort odor and a taste (umami taste

as fish). Note that, evaluation criteria were as described below, and values obtained by averaging scoring results by the panelists and then rounding to the nearest whole number were determined as evaluation results. Note that, the panelists who participated in the sensory test were not previously informed of, for example, a process by which each product was produced and the order of the seafood foods served to each panelist was also randomized so as to be unpredictable.

[0119]

(Evaluation item: Retort odor)

5: There is only a smell inherent in the cooked product and no retort odor at all.

4: An uncomfortable odor may be perceived somehow.

3: A retort odor is slightly perceived.

2: A retort odor is clearly perceived.

1: A retort odor is strongly perceived.

[0120]

(Evaluation item 2: Taste)

5: Very tasty with a taste inherent in fish.

4: Tasty with a taste inherent in fish.

3: Not bad.

2: Edible with less taste of fish.

1: Not tasty without the taste of fish.

[0121]

Moreover, discrimination and preference between Example 1 and Comparative Example 1, Example 3 and Comparative Example 2, and Example 5 and Comparative Example 3 were examined for

retort odor and taste using a pair test.

[0122]

Example 1

A cooked seafood product packaged in a form of mackerel simmered in miso was produced according to the process chart shown in Fig. 1 as described above. Frozen boneless mackerel fillets (70 g) serving as a material were naturally thawed overnight at a temperature of 25°C or less. The thus-thawed fillets were rinsed under running tap water for 15 minutes and drained by allowing water to naturally drain for one hour. Then, the fillets were put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/PP60, manufactured by REPLUS CO., LTD.) together with miso sauce (35 g) prepared in advance at a predetermined mix proportion. The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized twice in a steam kettle at 100°C for 50 minutes. Immediately after the heat sterilization, the products were cooled using a refrigerator to a temperature of 20°C or less within one hour. Thereafter, the products were frozen-stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0123]

Comparative Example 1

Frozen boneless mackerel fillets (70g) serving as a material were naturally thawed overnight at a temperature of 25°C or less. The thus-thawed fillets were put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/PP60, manufactured by REPLUS CO., LTD.) together with miso sauce (35 g) prepared in advance at a predetermined mix proportion. The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized in a steam kettle at 120°C for 30 minutes. The products were cooled to room temperature by natural cooling, frozen-stored at -18°C or less, and then thawed, and the resultant products were evaluated for hardness and subjected to the sensory test. The results obtained are presented in Tables 1 and 3.

[0124]

Example 2

A cooked seafood product packaged in a form of mackerel simmered in soy sauce was produced according to the process chart shown in Fig. 1 as described above. Frozen boneless mackerel fillets (70 g) serving as a material were naturally thawed overnight at a temperature 25°C or less. The thus-thawed fillets were rinsed under running tap water for 15 minutes and drained by allowing water to naturally drain for one hour. Then, the fillets were put into a three-sided seal

bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/CP60, manufactured by REPLUS CO., LTD.) together with ginger and soy sauce (35 g) prepared in advance at a predetermined mix proportion. The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized twice in a retort kettle at 100°C for 50 minutes. Immediately after the heat sterilization, the products were cooled using a refrigerator to a temperature of 20°C or less within one hour. Thereafter, the products were frozen-stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days, 120 days, and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0125]

Example 3

A cooked seafood product packaged in a form of sardine simmered with ginger was produced according to the process chart shown in Fig. 2 as described above. Frozen dressed sardines (2 sardines, 80 g) serving as a material were placed on a stainless-steel tray, etc. without thawing, and heated and pressurized in a retort kettle at 120°C and 0.12 MPa for 20 minutes. The thus-heated and pressurized dressed sardines were removed from the retort kettle, immediately put into a freezer to be rapidly cooled to a temperature of 20°C or less within 30 minutes, and further frozen at a temperature of -

18°C or less. Then, the frozen dressed sardines were put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/CP60, manufactured by REPLUS CO., LTD.) two at a time together with ginger and soy sauce (35 g) prepared in advance at a predetermined mix proportion. The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized twice in a retort kettle at 100°C for 50 minutes. Immediately after the heat sterilization, the products were cooled using a refrigerator to a temperature of 20°C or less within one hour. Thereafter, the products were frozen-stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days, 120 days, and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0126]

Comparative Example 2

Frozen boneless dressed sardines (2 sardines, 80 g) serving as a material were naturally thawed and put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/CP60, manufactured by REPLUS CO., LTD.) together with ginger and soy sauce (35 g) prepared in advance at a predetermined mix proportion. The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating,

etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized in a retort kettle at 120°C for 30 minutes. The products were cooled to room temperature by natural cooling, frozen-stored at -18°C or less, and then thawed, and the resultant products were evaluated for hardness and subjected to the sensory test. The results obtained are presented in Tables 1 and 3.

[0127]

Example 4

A cooked seafood product packaged in a form of herring simmered with dried bonito was produced according to the process chart shown in Fig. 3. Frozen herring fillets that had been filleted into 3 pieces (80 g) serving as a material were cut into halves without thawing, placed on a stainless-steel tray, etc. without thawing, and heated and pressurized in a retort kettle at 120°C and 0.12 MPa for 20 minutes. The thus-heated and pressurized herring fillets were removed from the retort kettle, immediately put into a freezer to be rapidly cooled to a temperature of 20°C or less within 30 minutes, and further frozen at a temperature of -18°C or less. Then, the frozen herring fillets were put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/CPP60, manufactured by REPLUS CO., LTD.) two at a time together with ginger and soy sauce (35 g) prepared in advance at a predetermined mix proportion. The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a

vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized twice in a retort kettle at 100°C for 50 minutes. Immediately after the heat sterilization, the products were cooled using a refrigerator to a temperature of 20°C or less within one hour. Thereafter, the products were frozen-stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days, 120 days, and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0128]

Example 5

A cooked seafood product packaged in a form of salmon grilled with salt was produced according to the process chart shown in Fig. 4. Frozen boneless salmon fillets (70 g) serving as a material were put into a pickling liquid (70 g) prepared by adding salt to water to give a salt concentration of 5% by volume, and pickled at a normal temperature ($23^\circ\text{C} \pm 5^\circ\text{C}$) overnight. The fillets were removed from the pickling liquid, placed on a hot plate, and grilled in an oven for 7 minutes under conditions giving a center temperature of the fillets of about 75°C to brown a surface thereof. After the grilling, the fillets were removed from the oven and put into a refrigerator to be rapidly cooled to a temperature of 20°C or less within 30 minutes. Then, the thus-refrigerated salmon fillets were put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/CP60, manufactured by REPLUS CO., LTD.). The

package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized twice in a retort kettle at 100°C for 50 minutes. Immediately after the heat sterilization, the products were cooled using a refrigerator to a temperature of 20°C or less within one hour. Thereafter, the products were frozen-stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days, 120 days, and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0129]

Comparative Example 3

Frozen boneless salmon fillets (70 g) serving as a material were naturally thawed, sprinkled with an appropriate amount of salt, and grilled in an oven for 5 minutes under conditions giving a center temperature of the fillets of about 120°C. The resultant boneless salmon fillets grilled with salt were put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/PP60, manufactured by REPLUS CO., LTD.). The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were sterilized in a retort kettle at 120°C for 30 minutes. The products were cooled to room temperature by natural cooling, frozen-stored at -18°C or less, and then

thawed, and the resultant products were evaluated for hardness and subjected to the sensory test. The results obtained are presented in Tables 1 and 3.

[0130]

Reference Example 1

A cooked seafood product packaged in a form of salmon grilled with salt was produced in the same manner as in Example 5, except that the salmon fillets were pickled for one hour. The resultant products were evaluated for hardness and subjected to the sensory test. The results obtained are presented in Tables 1 and 3.

[0131]

Reference Example 2

A cooked seafood product packaged in a form of salmon grilled with salt was produced in the same manner as in Example 5, except that the salmon fillets were put into a pickling liquid (70 g) prepared by adding salt to water to give a salt concentration of 20% by volume and pickled for one hour. The resultant products were evaluated for hardness. The results obtained are presented in Tables 1 and 3.

[0132]

Example 6

A cooked seafood product packaged in a form of mackerel grilled with salt was produced in the same manner as in Example 5, except that the frozen boneless salmon fillets serving as a raw material were changed to frozen boneless mackerel fillets (70 g). Thereafter, the products were frozen-

stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 90 days, 120 days, and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0133]

Example 7

A cooked seafood product packaged in a form of mackerel grilled with salt was produced in the same manner as in Example 5, except that the frozen boneless salmon fillets serving as a raw material were changed to frozen boneless Atka mackerel fillets (70 g). Thereafter, the products were frozen-stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 90 days, 120 days, and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0134]

Example 8

A cooked seafood product packaged in a form of yellowtail grilled with teriyaki sauce was produced according to the process chart shown in Fig. 5. Frozen yellowtail fillets that had been filleted into 3 pieces serving as a material were cut into boneless fillets with a predetermined mass (55 g). These fillets were put into a pickling liquid (55 g) prepared by adding salt to water to give a salt concentration of 5% by volume, and pickled at a normal temperature ($23^{\circ}\text{C} \pm 5^{\circ}\text{C}$) overnight. The fillets were removed from the pickling liquid, placed on a grid, and grilled in a gas roaster for 5 minutes

under conditions giving a center temperature of the fillets of about 75°C to brown a surface thereof. After the grilling, the fillets were put into a refrigerator to be rapidly cooled to a temperature of 20°C or less within 30 minutes. Then, the refrigerated yellowtail fillets were put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/CPP60, manufactured by REPLUS CO., LTD.) together with teriyaki sauce (10 g) prepared in advance at a predetermined mix proportion. The package was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant products were heat-sterilized twice in a retort kettle at 100°C for 50 minutes. Immediately after the heat sterilization, the products were cooled using a refrigerator to a temperature of 20°C or less within one hour. Thereafter, the products were frozen-stored at -18°C or less, thawed, and each stored at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days, 120 days, and 240 days before being subjected to evaluation tests. The results obtained are presented in Tables 1 to 3.

[0135]

Reference Example 3

In order to examine a change over time in salt concentration of a cooked non-molded seafood food in a vacuum package, a salt concentration on a surface and a salt concentration at a region in the proximity of the center of a meat thickness of the cooked seafood food (inside) in a cooked

non-molded seafood food of a product produced in a form of mackerel simmered in soy sauce (with ginger) in the same manner as in Example 2 were measured in the same manner as described above immediately after production and after storage at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 150 days in the same lot. As a result, the salt concentrations that were 0.9% on the surface and 1.0% in the inside immediately after production were not substantially changed, in other words, the salt concentrations were 0.9% on the surface and 1.0% in the inside even after 150 days. Therefore, it was found that the salt did not diffuse within the vacuum package and the salt concentration did not become uniform as a whole during such a period extent.

[0136]

[Table 1]

	Hardness ($\times 10^5 \text{N/m}^2$)	Salt (%)		
		Surface	Inside	Reference value (Salt in plain grilled material)
Example 1	3.258	0.9	0.8	0.3
Comparative Example 1	6.453	1.3	0.5	0.3
Example 2	4.032	1.0	1.1	0.3
Example 3	4.473	0.8	0.9	0.3
Comparative Example 2	6.133	1.0	0.6	0.3
Example 4	4.708	1.2	1.6	0.3
Example 5	4.852	1.7	1.5	0.3
Comparative Example 3	9.184	2.3	0.3	0.3
Reference Example 1	5.659	1.8	0.5	0.3
Reference Example 2	7.659	8.7	3.5	0.3
Example 6	4.865	1.9	2.0	0.3
Example 7	3.772	1.4	1.5	0.3
Example 8	3.883	1.4	1.5	0.3

[0137]

[Table 2]

	Bacteriological examination after 90 days				Bacteriological examination after 120 days			
	Viable bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)	Viable bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)
Example 1	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
Example 2	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
Example 3	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
Example 4	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
Example 5	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
Example 6	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
Example 7	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
Example 8	<300	Negative	Negative	Negative	<300	Negative	Negative	Negative
	Bacteriological examination after 240 days							
	Viable bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)				
Example 1	<300	Negative	Negative	Negative				
Example 2	<300	Negative	Negative	Negative				
Example 3	<300	Negative	Negative	Negative				
Example 4	<300	Negative	Negative	Negative				
Example 5	<300	Negative	Negative	Negative				
Example 6	<300	Negative	Negative	Negative				
Example 7	<300	Negative	Negative	Negative				
Example 8	<300	Negative	Negative	Negative				

[Table 3]

	Food in normal temperature state		Food in heated state	
	Retort odor	Taste of fish	Retort odor	Taste of fish
Example 1	5	5	5	5
Comparative Example 1	2	2	2	2
Example 2	5	5	5	5
Example 3	5	5	5	5
Comparative Example 2	2	2	2	2
Example 4	5	5	5	5
Example 5	5	5	5	5
Comparative Example 3	3	3	3	3
Reference Example 1	3	3	3	3
Reference Example 2	3	3	3	3
Example 6	5	5	5	5
Example 7	5	5	5	5
Example 8	5	5	5	5

[0139]

Note that, the results shown in Table 3 were all statistically significant at a 5% risk rate.

[0140]

Furthermore, the results for discrimination and preference between Example 1 and Comparative Example 1, Example 3 and Comparative Example 2, and Example 5 and Comparative Example 3 examined for the retort odor and the taste using a pair test were all statistically significant at a 0.1% risk rate. Therefore, the Examples according to the present invention were evaluated as better than the

Comparative Examples.

EXPLANATION OF REFERENCE NUMERALS

[0141]

- 10: Receiving raw material
- 20: Inspection
- 22: Preparation of pickling liquid
- 30: Unpacking raw material
- 32: Thawing
- 34: Rinsing with running water
- 34: Draining
- 38: Filleting
- 40: Arrangement
- 42: Putting into pickling liquid
- 44: Seasoning and softening
- 46: Arrangement on hot plate
- 48: Arrangement on grid
- 50: Heating and pressurizing
- 52: Grilling
- 56: Deep-frying
- 60: Removal
- 70: Freezing
- 72: Cooling
- 74: Separation from grid
- 80: Bagging
- 90: Sauce addition
- 100: Vacuum packaging

110: Weight inspection

120: Metal inspection

130: Sterilization

140: Cooling

150: Boxing

200: Frozen storage

300: Shipment

CLAIMS

1. A product comprising:

a cooked non-molded seafood food; and
a vacuum package,

the cooked non-molded seafood food being contained in the vacuum package,

the non-molded seafood food having a hardness of 6×10^5 N/m² or less and 2×10^4 N/m² or more, the non-molded seafood food having no retort odor and having been heat-sterilized, and

when tested after storage in the vacuum package at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),

the non-molded seafood food satisfying aseptic conditions including:

a viable bacterial count of less than 300 CFU/g as tested on a standard agar medium;

coliforms tested negative on an XM-G agar medium;

Escherichia coli tested negative on an XM-G agar medium;

and

Staphylococcus aureus tested negative on an egg-yolk mannitol salt agar medium.

2. A product comprising:

a cooked non-molded seafood food; and

a vacuum package,

the cooked non-molded seafood food being contained in the vacuum package,

the product being obtained by putting a seafood material serving as a raw material into the vacuum package and then subjecting to heat sterilization at a temperature of less than 105°C,

the non-molded seafood food having a hardness of 6×10^5 N/m² or less and 2×10^4 N/m² or more, and

when tested after storage in the vacuum package at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),

the non-molded seafood food satisfying aseptic conditions including:

a viable bacterial count of less than 300 CFU/g as tested on a standard agar medium;

coliforms tested negative on an XM-G agar medium;

Escherichia coli tested negative on an XM-G agar medium;

and

Staphylococcus aureus tested negative on an egg-yolk mannitol salt agar medium.

3. The product according to claim 1 or 2 for storage at a normal temperature.

4. The product according to any one of claims 1 to 3,

wherein a salt concentration on a surface of the non-molded seafood food and a salt concentration at a region in a proximity of a center of a meat thickness of the non-molded seafood food are both 0.5% by mass or more and have a difference of less than 20%.

5. A product comprising:

a cooked non-molded seafood food; and

a vacuum package,

the cooked non-molded seafood food being contained in the vacuum package,

the non-molded seafood food having not been enzymatically treated for softening,

the non-molded seafood food having a hardness of 6×10^5 N/m² or less and 2×10^4 N/m² or more, and

when tested after storage in the vacuum package at a normal temperature ($25 \pm 2^\circ\text{C}$) for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),

the non-molded seafood food satisfying aseptic conditions including:

a viable bacterial count of less than 300 CFU/g as tested on a standard agar medium;

coliforms tested negative on an XM-G agar medium;

Escherichia coli tested negative on an XM-G agar medium;

and

Staphylococcus aureus tested negative on an egg-yolk

mannitol salt agar medium,

, and

the non-molded seafood food having been stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) or more for 180 days or less after production, and a salt concentration on a surface of the non-molded seafood food and a salt concentration at a region in a proximity of a center of a meat thickness of the non-molded seafood food product being both 0.5% by mass or more and having a difference of less than 20%.

6. The product according to any of claims 1 to 5, satisfying the aseptic conditions according to claim 1 or 2 after storage at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 240 days.

7. The product according to any of claims 1 to 6, wherein the non-molded seafood food takes a form selected from the group consisting of a grilled form, a simmered form, a deep-fried form, and a steamed form.

8. A method for producing a packaged cooked seafood product, comprising:

pretreating a seafood material serving as a raw material in advance;

putting the seafood material into a package;

vacuum-packing the seafood material; and

heat-sterilizing the thus-vacuum-packed seafood material at a temperature of 90°C or more but less than 105°C for 50 to

150 minutes.