

[Specification]

[Title of Inventive concept]

APPARATUS AND METHOD OF PREPARING INSTANT STEAMED RICE

5

[Field of the Inventive concept]

The inventive concept relates to an apparatus and a method of preparing an instant steamed rice, and more particularly, an apparatus for preparing the instant steamed rice including: a supply module for supplying rice, other ingredients, and
10 containers to the apparatus for preparing the instant steamed rice; a cooking module having a predetermined space therein so that a predetermined palette passes therethrough and maintaining a predetermined pressure and temperature environment to perform cooking of the rice and other ingredients, and a transfer module for transferring the palette in the cooking module,

15 wherein the supply module includes: the palette having a predetermined size to which the container may be inserted; a container supply device for inserting one or more standardized containers to the palette; and a constant amount supply device for supplying rice and ingredients to the container that is inserted in the palette,

20 wherein the cooking module includes: a primary water supply chamber for supplying water to the rice and the ingredients in the container that is inserted in the palette; a compression chamber disposed behind the primary water supply chamber and formed of a sealed steam chamber of high pressure to provide the container with high pressure environment and to perform as a pressure ballast by blocking an external atmospheric environment and post cooking environment from each other; a sterilization
25 chamber disposed behind the compression chamber and spraying steam to the rice and ingredients in the container under high pressure and high temperature environment to cook the rice and the other ingredients and to eliminate bacteria remaining in the rice or the other ingredients; a secondary water supply chamber disposed behind the sterilization chamber and supplying water of high temperature to the rice and the other
30 ingredients in the container so as to prevent propagation of the bacteria, and performing as a pressure ballast by blocking a pressurized environment in the sterilization chamber and the post cooking environment from each other; a rice cooking chamber disposed

behind the secondary water supply chamber and maintaining the high pressure environment to perform cooking of the rice and the other ingredients in the container; and a decompression chamber disposed behind the rice cooking chamber, having a predetermined space therein and maintaining a predetermined decompressurized environment so as to discharge the palette from the pressure environment to an atmospheric environment to perform as the pressure ballast,

wherein the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber are disposed in a main chamber that maintains a predetermined temperature and pressure environment, and each has a chamber structure configuring at least a space in the main chamber.

[Description of the Related Art]

As modern society has become complicated and changed faster, food culture has been changed a lot. Recently, in a field of steamed rice that is traditional food in Korea, an instant steamed rice that is packed independently and cooked instantly has been developed and widely consumed.

Such above instant steamed rice has been released in a cooked state, and thus, there has to be no food health problem during preparing the instant steamed rice and texture of the instant steamed rice has to maintain a certain satisfaction level.

Moreover, instant steamed rices of various kinds have been necessary according to demands of various customers. For example, various kinds of instant steamed rices, for example, low-fat rice for diabetes patients, steamed rice with seasoned thistle, steamed rice with beans, and congees of various types, in addition to conventional instant steamed rices in containers, have been necessary.

However, while preparing the instant steamed rice, various impurities may be mixed during injection of materials, heating, and supplying water, and moreover, texture of the steamed rice may degrade while passing through various preparation processes.

Also, a preliminary process such as soaking rice in water may be necessary before the preparation process due to characteristics of the material, that is, the rice, and then, the preliminary process may become a factor that degrades the texture of the rice and a probability of mixing the impurities in the rice becomes higher in the preliminary process.

Therefore, an apparatus and a method of preparing an instant steamed rice are necessary for resolving the above problem.

[Detailed Description of the Inventive concept]

5 [Technical Problem]

The inventive concept provides an apparatus for preparing an instant steamed rice, the apparatus including: a supply module for supplying rice, other ingredients, and containers to the apparatus for preparing the instant steamed rice; a cooking module having a predetermined space therein so that a predetermined palette passes
10 therethrough and maintaining a predetermined pressure and temperature environment to perform cooking of the rice and other ingredients, and a transfer module for transferring the palette in the cooking module,

wherein the supply module includes: the palette having a predetermined size to which the container may be inserted; a container supply device for inserting one or more
15 standardized containers to the palette; and a constant amount supply device for supplying rice and ingredients to the container that is inserted in the palette,

wherein the cooking module includes: a primary water supply chamber for supplying water to the rice and the ingredients in the container that is inserted in the palette; a compression chamber disposed behind the primary water supply chamber and
20 formed of a sealed steam chamber of high pressure to provide the container with high pressure environment and to perform as a pressure ballast by blocking an external atmospheric environment and post cooking environment from each other; a sterilization chamber disposed behind the compression chamber and spraying steam to the rice and ingredients in the container under high pressure and high temperature environment to
25 cook the rice and the other ingredients and to eliminate bacteria remaining in the rice or the other ingredients; a secondary water supply chamber disposed behind the sterilization chamber and supplying water of high temperature to the rice and the other ingredients in the container so as to prevent propagation of the bacteria, and performing as a pressure ballast by blocking a pressurized environment in the sterilization chamber
30 and the post cooking environment from each other; a rice cooking chamber disposed behind the secondary water supply chamber and maintaining the high pressure environment to perform cooking of the rice and the other ingredients in the container; and

a decompression chamber disposed behind the rice cooking chamber, having a predetermined space therein and maintaining a predetermined decompressurized environment so as to discharge the palette from the pressure environment to an atmospheric environment to perform as the pressure ballast,

5 wherein the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber are disposed in a main chamber that maintains a predetermined temperature and pressure environment, and each has a chamber structure configuring at least a space in the main chamber.

10 [Technical Solution]

According to an aspect of the present inventive concept, there is provided An apparatus for preparing an instant steamed rice, the apparatus comprising: a supply module for supplying rice, other ingredients, and containers to the apparatus for
15 preparing the instant steamed rice; a cooking module having a predetermined space therein so that a predetermined palette passes therethrough and maintaining a predetermined pressure and temperature environment to perform cooking of the rice and other ingredients, and a transfer module for transferring the palette in the cooking module,

20 wherein the supply module comprises: the palette having a predetermined size to which the container may be inserted; a container supply device for inserting one or more standardized containers to the palette; and a constant amount supply device for supplying rice and ingredients to the container that is inserted in the palette,

25 wherein the cooking module comprises: a primary water supply chamber for supplying water to the rice and the ingredients in the container that is inserted in the palette; a compression chamber disposed behind the primary water supply chamber and formed of a sealed steam chamber of high pressure to provide the container with high pressure environment and to perform as a pressure ballast by blocking an external atmospheric environment and post cooking environment from each other; a sterilization
30 chamber disposed behind the compression chamber and spraying steam to the rice and ingredients in the container under high pressure and high temperature environment to cook the rice and the other ingredients and to eliminate bacteria remaining in the rice or

the other ingredients; a secondary water supply chamber disposed behind the sterilization chamber and supplying water of high temperature to the rice and the other ingredients in the container so as to prevent propagation of the bacteria, and performing as a pressure ballast by blocking a pressurized environment in the sterilization chamber and the post cooking environment from each other; a rice cooking chamber disposed behind the secondary water supply chamber and maintaining the high pressure environment to perform cooking of the rice and the other ingredients in the container; and a decompression chamber disposed behind the rice cooking chamber, having a predetermined space therein and maintaining a predetermined decompressurized environment so as to discharge the palette from the pressure environment to an atmospheric environment to perform as the pressure ballast,

wherein the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber are disposed in a main chamber that maintains a predetermined temperature and pressure environment, and each has a chamber structure configuring at least a space in the main chamber.

The main chamber comprises: air-tightening doors disposed on opposite ends of the main chamber, and respectively between the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber to be opened and closed so that the palette moves through the air-tightening doors to introduced or be released; and a double-wall structure comprising an inner wall formed of a heat insulating wall body, and an outer wall surrounding the inner wall and spacing a predetermined distance from the inner wall,

wherein the transfer module is configured to penetrate through inside of the main chamber so that the palette moves in the main chamber.

Each of the air-tightening doors comprises: a gate plate having predetermined thickness and area and having an opening through which the palette passes through to be moved; a slide gate that is displaced to up and down directions to perform opening and closing of the opening; and an opening/closing module for displacing the slide gate,

wherein the opening/closing module comprises a pinion gear and a rack gear for moving the slide gate to the upper and lower directions.

The gate plate comprises an expansion seal, wherein the expansion seal is disposed along with an outer circumference of the opening so as to be located between the slide gate and the gate plate when the slide gate closes the opening, and is expanded by pneumatic pressure to seal a gap between the slide gate and the gate plate when the slide gate closes the opening.

The sterilization chamber comprises a steam spraying device for providing steam to the rice and the ingredients, wherein the steam spraying device comprises: an upper nozzle located above the palette to spray steam to a lower direction from an upper portion; and a lower nozzle located under the palette to spray steam to an upper direction from a lower portion.

According to an aspect of the present inventive concept, the apparatus further comprising a re-heating device, wherein the re-heating device re-heats the steam that is sprayed from the steam spraying device to raise a temperature of the steam.

A temperature in the secondary water supply chamber is maintained to be equal to or lower than a boiling point of water.

The cooking module is configured to repeatedly raise and descend the temperature with respect to the rice and the ingredients.

According to an aspect of the present inventive concept, the apparatus further comprising a sealing module for sealing the container, wherein the sealing module comprises: a condensation elimination device performing supplying and exhausting dry air simultaneously with respect to the container; a vacuum pump for removing air in the sealing module and the container; and a nitrogen supply device for supplying nitrogen.

The cooking module comprises: a steaming chamber providing a predetermined temperature environment to the sealed container for a predetermined time to perform a secondary steaming process; and a cooling device providing cooling water to the sealed container to cool down the sealed container.

According to an aspect of the present inventive concept, there is provided A method of preparing an instant steamed rice, the method comprising: mounting a container in a palette, injecting ingredients of a constant amount into the container; performing a primary water supply to the rice and ingredients; introducing the palette into a compression chamber blocking an external atmospheric environment and post cooking

environment from each other; transferring the palette to a sterilization chamber that is sealed and has high pressure and high temperature to spray steam of high temperature with respect to the container from an upper direction and a lower direction to perform a sterilization process; transferring the palette to a secondary water supply chamber and performing a secondary water supply by supplying hot water to the ingredients and providing a high temperature environment so that the sterilized rice and ingredients absorb moisture, and blocking exchanging between pressures in the sterilization chamber and in a decompression chamber; transferring the palette to a rice cooking chamber that has high pressure to perform a rice cooking process; and transferring the palette, in which the rice cooking has finished, to the decompression chamber and adjusting a pressure of the decompression chamber to the external atmospheric pressure.

According to an aspect of the present inventive concept, the method further comprising transferring the palette to a sealing module so that the container is sealed, wherein the sealing of the container comprises: eliminating condensation of vapour by transferring the container to a condensation elimination device that simultaneously supplies and discharges dry air; and removing internal air of the container and injecting nitrogen.

According to an aspect of the present inventive concept, the method further comprising performing a steaming process by transferring the palette to a steaming chamber of high temperature environment; and cooling down the container.

[Advantageous Effects]

According to an apparatus and method of preparing an instant steamed rice of the inventive concept, rice and ingredients that have received water firstly are provided with high temperature steam that is re-heated in a sterilization chamber having a high temperature and high pressure environment, and then, a secondary water supply using water of a predetermined temperature is performed and a rice cooking process is performed. therefore, the ingredients that have not undergone a pre-cooking process such as soaking, for example, raw rice, may be directly used in the processes. Therefore, a pre-cooking process is not necessary, and thus, costs for manufacturing the instant steamed rice may be reduced. Also, infiltration of impurities and propagation of bacteria

that may occur during the pre-cooking process may be prevented, and thus, reliable products may be manufactured.

In addition, since the water supply processes are performed a plurality of times, that is, the primary water supply and the secondary water supply, moisture in the ingredients may be adjusted easily, and a variation in the absorbent ratio of the ingredients according to the cooking processes may be dealt with sufficiently. Therefore, defects such as defective weight of the product and degradation in texture may be prevented.

Also, a steam spraying device included in the sterilization chamber includes an upper nozzle and a lower nozzle that are located on upper and lower portions, and thus, the steam may be sprayed three-dimensionally to the ingredients so that the steam may be infiltrated easily into the ingredients and the sterilization and cooling processes may be performed effectively.

Moreover, a sealing module maintains a sealed state to prevent infiltration of external impurities, and includes a vacuum pump and a nitrogen supply device to perform a sealing operation of the container under an environment where the infiltration of bacteria into the ingredients and contamination of the rice and ingredients may be prevented.

In addition, during the processes of preparing the instant steamed rice, that is, the primary water supply, the sterilization chamber of high temperature and high pressure, the secondary supply of water having a temperature equal to or lower than a boiling point, and the rice cooking chamber of high temperature and high pressure, the temperature repeatedly rises and descends, elasticity of the product may be improved, and thus, texture of the complete product may be improved.

Also, a main chamber in which the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber are arranged includes a double-wall structure, in which an inner wall formed of a heat insulating wall body and an outer wall surrounding the inner wall are provided, and an air layer is formed between the inner wall and the outer wall so as to perform a heat insulation effectively.

Moreover, the main chamber includes air-tightening doors that are opened and closed by an opening/closing module. The air-tightening door includes a pinion gear and

a rack gear that move a slide gate to upper and lower directions, and an expansion seal is disposed on opposite sides of the slide gate to adhere to the slide gate and the gate plate so as to seal the space between the slide gate and the gate plate. Thus, the main chamber may be reliably sealed, and sealing of the main chamber may be easily performed without using an additional device or manipulating separately.

[Description of the Drawings]

FIG. 1 is a diagram showing a structure of an apparatus for preparing instant steamed rice according to an embodiment of the inventive concept;

FIGS. 2 to 6 are block diagrams showing an internal structure of the apparatus for preparing the instant steamed rice according to an embodiment of the inventive concept;

FIGS. 7 to 10 are diagrams showing a structure of an airtightening door in the apparatus for preparing the instant steamed rice according to an embodiment of the inventive concept;

FIG. 11 is a conceptual diagram of a method of preparing an instant steamed rice according to an embodiment of the inventive concept;

FIG. 12 is a diagram of a structure of an apparatus for preparing an instant steamed rice according to an embodiment of the inventive concept;

FIG. 13 is a diagram showing a structure of a compression chamber in the apparatus for preparing the instant steamed rice according to an embodiment of the inventive concept;

FIG. 14 is a diagram showing a structure of a sterilization chamber of the apparatus for preparing the instant steamed rice according to an embodiment of the inventive concept;

FIG. 15 is a diagram showing a structure of a secondary water supply chamber in the apparatus for preparing the instant steamed rice according to an embodiment of the inventive concept;

FIG. 16 is a diagram showing a structure of a rice cooking chamber in the apparatus for preparing the instant steamed rice according to an embodiment of the inventive concept; and

FIG. 17 is a diagram showing a structure of a decompression chamber in the apparatus for preparing the instant steamed rice according to an embodiment of the inventive concept.

[Mode of the Inventive concept]

5 Provided is an apparatus for preparing an instant steamed rice and an instant steamed rice, the apparatus includes a supply module for supplying rice, other ingredients, and containers to the apparatus for preparing the instant steamed rice; a cooking module having a predetermined space therein so that a predetermined palette passes therethrough and maintaining a predetermined pressure and temperature
10 environment to perform cooking of the rice and other ingredients, and a transfer module for transferring the palette in the cooking module,

 wherein the supply module includes: the palette having a predetermined size to which the container may be inserted; a container supply device for inserting one or more standardized containers to the palette; and a constant amount supply device for
15 supplying rice and ingredients to the container that is inserted in the palette,

 wherein the cooking module includes: a primary water supply chamber for supplying water to the rice and the ingredients in the container that is inserted in the palette; a compression chamber disposed behind the primary water supply chamber and formed of a sealed steam chamber of high pressure to provide the container with high
20 pressure environment and to perform as a pressure ballast by blocking an external atmospheric environment and post cooking environment from each other; a sterilization chamber disposed behind the compression chamber and spraying steam to the rice and ingredients in the container under high pressure and high temperature environment to cook the rice and the other ingredients and to eliminate bacteria remaining in the rice or
25 the other ingredients; a secondary water supply chamber disposed behind the sterilization chamber and supplying water of high temperature to the rice and the other ingredients in the container so as to prevent propagation of the bacteria, and performing as a pressure ballast by blocking a pressurized environment in the sterilization chamber and the post cooking environment from each other; a rice cooking chamber disposed
30 behind the secondary water supply chamber and maintaining the high pressure environment to perform cooking of the rice and the other ingredients in the container; and a decompression chamber disposed behind the rice cooking chamber, having a

predetermined space therein and maintaining a predetermined decompressurized environment so as to discharge the palette from the pressure environment to an atmospheric environment to perform as the pressure ballast,

wherein the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber are disposed in a main chamber that maintains a predetermined temperature and pressure environment, and each has a chamber structure configuring at least a space in the main chamber.

[BEST MODE]

Hereinafter, embodiments of the inventive concept will be described with reference to accompanying drawings. The inventive concept should not be construed as being limited to the exemplary embodiments set forth herein.

The attached drawings for illustrating preferred embodiments are referred to in order to gain a sufficient understanding, the merits thereof, and the objectives accomplished by the implementation. The inventive concept may, however, be embodied in many different forms and should not be construed as being limited to the exemplary embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the concept of the inventive concept to those skilled in the art. The inventive concept is defined by the following claims. Like reference numerals in the drawings denote like elements.

The terms used in the present specification are merely used to describe particular embodiments, and are not intended to limit the inventive concept. An expression used in the singular encompasses the expression of the plural, unless it has a clearly different meaning in the context. In the present specification, it is to be understood that the terms such as "including," "having," and "comprising" are intended to indicate the existence of the features, numbers, steps, actions, components, parts, or combinations thereof disclosed in the specification, and are not intended to preclude the possibility that one or more other features, numbers, steps, actions, components, parts, or combinations thereof may exist or may be added.

Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art

to which this inventive concept belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

5 FIG. 1 is a conceptual diagram of an apparatus 1 for preparing instant steamed rice according to an exemplary embodiment, FIGS. 2 to 6 are block diagrams showing internal structure of the apparatus 1 for preparing the instant steamed rice, FIGS. 7 to 10 are diagrams showing a structure of an air-tightening door 20 provided in a sterilization chamber 230 of the apparatus 1 for preparing the instant steamed rice, FIG. 12 is a
10 diagram showing an entire structure of the apparatus 1 for preparing the instant steamed rice according to an exemplary embodiment, FIG. 13 is a diagram showing a structure of a compressive chamber 220 of the apparatus 1 for preparing the instant steamed rice, FIG. 14 is a diagram showing a structure of the sterilization chamber 230 of the apparatus 1 for preparing the instant steamed rice, FIG. 15 is a diagram showing a structure of a
15 secondary water supply chamber 240 of the apparatus 1 for preparing the instant steamed rice, FIG. 16 is a diagram showing a structure of a rice cooking chamber 250 of the apparatus 1 for preparing the instant steamed rice, and FIG. 17 is a diagram showing a structure of a decompression chamber 260 of the apparatus 1 for preparing the instant steamed rice.

20 The apparatus 1 for preparing the instant steamed rice according to the exemplary embodiment includes a supply module 100 for supplying rice, other ingredients, and containers to the apparatus 1 for preparing the instant steamed rice, a cooking module 200 having a predetermined space therein so that a predetermined palette 10 may pass
25 therethrough and maintaining a predetermined pressure and temperature environment to perform cooking of the rice and other ingredients, and a transfer module 400 for transferring the palette 10 in the cooking module 200.

 The supply module 100 includes the palette 10 having a predetermined size to which the container may be inserted, a container supply device for inserting one or more
30 standardized containers to the palette 10, and a constant amount supply device for supplying rice and ingredients to the container that is inserted in the palette 10.

 The cooking module 200 includes a primary water supply chamber 210 for supplying water to the rice and the ingredients in the container that is inserted in the

palette, a compression chamber 220 disposed behind the primary water supply chamber 210 and formed of a sealed steam chamber of high pressure to provide the container with high pressure environment and to perform as a pressure ballast by blocking an external atmospheric environment and post cooking environment, the sterilization chamber 230
5 disposed behind the compression chamber 220 and spraying steam to the rice and ingredients in the container under high pressure and high temperature environment to cook the rice and the other ingredients and eliminate bacteria remaining in the rice or the other ingredients, the secondary water supply chamber 240 disposed behind the sterilization chamber 230 and supplying water of high temperature to the rice and the other
10 ingredients in the container so as to prevent propagation of the bacteria, and performing as a pressure ballast by blocking the pressurized environment in the sterilization chamber 230 and the post cooking environment from each other, the rice cooking chamber 250 disposed behind the secondary water supply chamber 240 and maintaining the high pressure environment to perform cooking of the rice and the other ingredients in the
15 container, and a decompression chamber 260 disposed behind the rice cooking chamber 250, having a predetermined space therein and maintaining a predetermined depressurized environment so as to discharge the palette 10 from the predetermined pressure environment to the atmospheric environment to perform as the pressure ballast.

The compression chamber 220, the sterilization chamber 230, the secondary
20 water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 are disposed in a predetermined main chamber 2 that may maintain a predetermined temperature and pressure environment, and each has a chamber structure configuring at least a space in the main chamber 2.

The supply module 100 is used to supply the rice, the ingredients, and the
25 containers that are introduced the apparatus 1 for preparing the instant steamed rice according to the exemplary embodiment. The supply module 100 includes the palette 10 in which one or more standardized containers may be inserted, and processes of preparing the instant steamed rice may be performed by providing the palette 10 in which the container is inserted to the cooking module 200 that will be described later.

30 The palette 10 has a predetermined standard and a plurality of mounting regions where the containers, in which the rice and the other ingredients may be placed are injected and mounted. The mounting regions may be predetermined depressed portions

or holes, and may have various shapes such as square shapes and circular shapes according to shape of the container.

The rice placed in the container may be prewashed rice that has not undergone pre-preparing processes such as soaking. That is, raw rice that has not undergone
5 separate preliminary cooking processes may be used as it is. Moreover, various ingredients may be additionally placed in the container according to purposes, for example, various grains except for rice (beans, barley, brown rice, etc.), vegetables (carrots, potatoes, sweet potatoes, etc.), herbs (thistles, spinach, bracken, etc.), seafood (shrimp, squid, crab meat, etc.), and seasonings.

10 As described above, the supply module 100 may include the container supply device 110 for inserting one or more standardized containers into the palette 10 of a predetermined size, and the constant amount supply device 120 for supplying rice or other various ingredients into the container that is injected in the palette 10. The container
15 supply device 110 and the constant amount supply device 120 respectively supply the container and the rice and the ingredients, and the rice and the ingredients in the container may be conveyed to the cooking module 200 by the predetermined transfer module 400 as shown in FIG. 12. In addition, the supply module 100 may include various injection device, a predetermined container test device, and an impurity removing device for injecting, testing, and washing the various ingredients, but is not limited thereto.

20 The palette 10 on which the ingredients and the container supplied by the supply module 100 is guided to the cooking module 200.

In addition, the palette 10 may be conveyed to by a predetermined transfer module 400, and the transfer module 400 may include a predetermined transfer device such as a conveyer belt, a roller, et. al., but is not limited thereto. The transfer module 400 may
25 transfer the palette 10 throughout the entire apparatus 1 for preparing the instant steamed rice 1 according to the exemplary embodiment. Moreover, the transfer module 400 may convey the palette 10 so that the palette 10 may penetrate through the main chamber 2 that will be described later, as shown in FIG. 2.

30 The cooking module 200 may be configured to cook the rice and the other ingredients in the apparatus 1 for preparing the instant steamed rice, and is not limited to any particular device, but is a concept including various devices and regions that take parts in the cooking processes. Also, the cooking processes are not necessarily

continuous, but there may be any intervening process therebetween. That is, the rice and ingredients that have passed through the main chamber are introduced a steaming chamber 270 via a sealing module 300. Thus, a sealing process performed by the sealing module 300 interferes with the cooking processes in the above process, but the cooking processes performed by the cooking module 200 are not classified as processes before and after the sealing process.

As shown in FIG. 1, the cooking module 200 may include the primary water supply chamber 210, the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, the decompression chamber 260, the steaming chamber 270, and a cooling device 280. The above parts are not limited to the successive arrangement or performing of the processes successively.

The palette 10 in which the container is introduced is transferred to the primary water supply chamber 210. The primary water supply chamber is a device for injecting water of a predetermined amount to the container, and may include a water supply device 212.

The palette 10 that has passed through the primary water supply chamber 210 is transferred to the compression chamber 220. The compression chamber 220 blocks post cooking processes from an external atmospheric environment, and may be formed of a high pressure steam chamber that is sealed. The compression chamber 220 provides a high pressure environment of 1.5 to 2.5 kg/cm² in order to maintain the high pressure environment in the post cooking processes. That is, the compression chamber 220 is located between the external cooking environment and the sterilization chamber 230 so as to block switching between the pressures of the sterilization chamber 230 and the external atmosphere.

The structure of the compression chamber 220 is shown in FIG. 13. That is, the compression chamber 220 has a predetermined chamber structure, and air-tightening doors 20 are disposed in front and rear portions thereof in order to introduce and release the palette 10 into/from the compression chamber 220. Here, the palette 10 is introduced through an air-tightening door 20A at the front and is discharged through an air-tightening door 20B at the back. The air-tightening door 20B at the back is located between the compression chamber and the sterilization chamber 230 to act as both an exit of the compression chamber 220 and an entrance of the sterilization chamber 230.

In addition, the palette 10 is transferred to the sterilization chamber 230. The sterilization chamber 230 is a high pressure steam chamber, and provides the palette 10 with high temperature and high pressure environment of 1.5 to 2.5 kg/cm² for a few minutes to eliminate various bacteria in the rice and ingredients placed in the container. Since the palette is introduced after passing through the compression chamber 220 on a front portion, the sterilization chamber 230 may maintain the pressure without leaking the pressure to outside even when the palette 10 is introduced therein.

Here, the sterilization chamber 230 includes a steam spraying device so as to spray steam of high temperature toward the rice and the ingredients. The steam spraying device includes an upper nozzle 16 and a lower nozzle 18. The upper nozzle 16 may spray the steam from above the palette 10 and the lower nozzle 18 may spray the steam from below the palette 10. Accordingly, the steam may be sprayed three-dimensionally with respect to the rice and ingredients placed in the container so that the steam may be infiltrated deep into the rice and ingredients and the sterilization may be performed reliably.

That is, referring to FIG. 14, the sterilization chamber 230 has a predetermined chamber structure and the air-tightening doors 20 in the front and rear portions thereof. The air-tightening door 20B at the front is both the entrance of the sterilization chamber 230 and the exit of the compression chamber 220, and an air-tightening door 20C at the back is both the exit of the sterilization chamber 230 and an entrance of the secondary water supply chamber 240. Moreover, the steam spraying device is provided in the sterilization chamber 230, and the steam spraying device includes the upper nozzle 16 and the lower nozzle 18 so that the steam may be sprayed from the upper and lower directions.

In addition, in order to perform the sterilization more efficiently, the steam may be sprayed while maintaining the high temperature by using various re-heating devices. Here, the re-heating device may be an electric heating device or other thermal media, but may not be limited thereto.

The palette 10 that has passed through the sterilization chamber 230 is transferred to the secondary water supply chamber 240. In the secondary water supply chamber 240, water of a temperature of 60°C to 90°C is supplied again to the palette 10. Moreover, high temperature that is high enough to eliminate bacteria is maintained a few minutes so

that the supplied water may be sufficiently absorbed by the rice and ingredients that have undergone the sterilization process. Here, a predetermined standby time may be provided so that the rice and ingredients may be sufficiently soaked in the water, wherein the standby time may be two to five minutes. Here, since the above temperature environment is maintained, the supplied water may not boil over the palette 10.

Regarding the structure of the secondary water supply chamber 240, as shown in FIG. 15, the secondary water supply chamber 240 has a predetermined chamber structure and air-tightening doors 20 in the front and rear portions thereof. The air-tightening door 20C at the front is both the entrance of the secondary water supply chamber 240 and the exit of the sterilization chamber 230, and an air-tightening door 20D at the back is both the exit of the secondary water supply chamber 240 and an entrance of the rice cooking chamber 250. In addition, a predetermined water supply device 242 is provided to supply water.

The secondary water supply chamber 240 blocks switching between pressures of the sterilization chamber 230 and the rice cooking chamber 250. That is, the secondary water supply chamber 240 is located between the sterilization chamber 230 and the rice cooking chamber 250 that will be described later to block the switching between the pressures of the sterilization chamber 230 and the rice cooking chamber 250 so that the sterilization chamber 230 and the rice cooking chamber 250 may maintain pressure environment independently from each other, like the compression chamber 220 blocks the switching between the pressures between the external atmospheric environment and the sterilization chamber 230 so that the sterilization chamber 230 may maintain the predetermined pressure level.

As described above, since the primary water supply chamber 210 and the secondary water supply chamber 240 are provided separately, the secondary water supply may be performed after the sterilization process that is performed after the primary water supply process. Before introducing the palette into the main chamber 2, the primary water is supplied. And, some of the water is vaporized by the steam of high temperature while the rice absorbs the water through the sterilization chamber 230, and thus, the sterilization is accelerated. After that, insufficient moist may be supplemented while moving toward the secondary water supply chamber 240. Therefore, moisture

adjustment in the rice and ingredients may be performed easily, and the sterilization is accelerated to improve reliability of the products.

The ingredients that have undergone the secondary water supply process are moved to the rice cooking chamber 250.

5 The ingredients moved to the rice cooking chamber 250 undergo the rice cooking process under a temperature of about 100°C to about 120°C and a pressure of 0.5 to 1.2 kg/cm² for 10 to 30 minutes. While undergoing the rice cooking process, the rice and the other ingredients may be cooked. As such, the processes from the sterilization to the rice cooking may be performed while repeatedly rising and descending the temperature so as
10 to improve elasticity of the product, and thereby, texture of the completed product may be improved.

In the structure of the rice cooking chamber 250, referring to FIG. 16, the rice cooking chamber 250 has a predetermined chamber structure and air-tightening doors 20 in front and rear portions thereof. An air-tightening door 20D at the front is configured to
15 act as both the entrance of the rice cooking chamber 250 and the exit of the secondary water supply chamber 240, and an air-tightening door 20E at the back is configured to act as both the exit of the rice cooking chamber 250 and an entrance of the decompression chamber 260.

The rice and ingredients that has been cooked while passing through the rice
20 cooking chamber 250 are transferred to the decompression chamber 260 so as to be discharged to outside. The decompression chamber 260 performs as a buffer that decompresses the internal pressure environment so that the ingredients may be discharged to outside, and blocks exchange of pressure between the elements before the decompression chamber 260 and the atmospheric pressure. That is, the decompression
25 chamber 260 blocks switching between the atmospheric pressure and the pressure of the rice cooking chamber 250.

Referring to FIG. 17 regarding a structure of the decompression chamber 260, the decompression chamber 260 has a predetermined chamber structure and air-tightening doors 20 in front and rear portions thereof. An air-tightening door 20E at the front is
30 configured to act as both the entrance of the decompression chamber 260 and the exit of the rice cooking chamber 250.

The compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 may be arranged in the main chamber 2 that may maintain a predetermined temperature and pressure environment. That is, as described above, since the high pressure and high temperature environment has to be maintained in order to provide the rice and ingredients with appropriate cooking environment, the main chamber 2 having at least a part that is sealed from the external environment is provided. In addition, as shown in FIG. 11, the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 are sequentially arranged at at least one region in the main chamber 2. The compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 respectively have predetermined chamber structures configuring at least a part in the main chamber 2, and are distinguished from each other by the predetermined air-tightening doors 20 and are configured to maintain the pressure and temperature environments of their own. That is, the main chamber 2 may configure a part of the cooking module 200 in the apparatus 1 for preparing the instant steamed rice according to the exemplary embodiment. For example, the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 are sequentially arranged according to the cooking processes. In addition, FIG. 4 shows an example of the internal structure of the main chamber 2, and the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 may each have the structure like the chamber shown in FIG. 4. In addition, the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 each may have a predetermined steam supply and discharge device as a device for providing and discharging a predetermined pressure in order to adjust the internal pressure, but are not limited thereto.

Here, the sterilization chamber 230 and the rice cooking chamber 250 may respectively maintain the above described predetermined pressure environment. That is, even when the palette 10 is introduced and released, the sterilization chamber 230 and

the rice cooking chamber 250 maintain the above pressure environment. To do this, internal pressures in the compression chamber 220, the secondary water supply chamber 240, and the decompression chamber 260 are variable, and moreover, the introducing and releasing of the palette 10 may be connected to operation of the air-tightening doors 20 provided in the main chamber 2. The relationship between the air-tightening doors 20 and the introducing and discharging of the palette 10 will be described later in detail.

Preferably, the main chamber 2 includes an inner wall 12 formed of a heat insulating wall body and an outer wall 14 surrounding the inner wall 12 and spaced a predetermined distance from the inner wall 12 so that a predetermined space is formed between the inner wall 12 and the outer wall 14.

As shown in FIG. 3, the main chamber 2 may include a double-wall structure having the inner wall 12 formed of the heat insulating wall body and the outer wall 14 surrounding the inner wall 12. Here, the inner wall 12 and the outer wall 14 are spaced a predetermined distance from each other, and an air layer is formed in the predetermined distance so as to perform the heat insulation efficiently.

Preferably, the main chamber 2 includes the air-tightening doors 20 at opposite ends thereof and between the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 that are opened/closed so that the palette 10 may move therethrough to be introduced or released.

The air-tightening doors 20 are disposed in the front and rear portions of the main chamber 2, and between the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260. Accordingly, the air-tightening doors 20 are disposed in the front and rear ends of the main chamber 2, and are respectively disposed between the compression chamber 220 and the sterilization chamber 230, between the sterilization chamber 230 and the secondary water supply chamber 240, between the secondary water supply chamber 240 and the rice cooking chamber 250, and between the rice cooking chamber 250 and the decompression chamber 260 to divide the spaces. In addition, each of the air-tightening doors 20 basically has the same structure as those of the others.

In more detail, each of the air-tightening doors 20 includes a gate plate 22 having a predetermined thickness and area and having an opening 30 through which the palette 10 may be passed therethrough, a slide gate 27 displaced in an up and down direction to perform opening/closing of the opening 30, and a predetermined opening/closing module making the slide gate 27 displaced.

The opening/closing module may include a pinion gear 26 and a rack gear 28 for moving the slide gate 27 in the up and down direction as shown in FIGS. 7 and 8. The pinion gear 26 is disposed to a shaft 24 and the rack gear 28 is connected to the slide gate 27 so that the slide gate 27 may slide upward and downward according to operations of the pinion gear 26 and the rack gear 28. Since the slide gate 27 is displaced to up and down directions by the opening/closing module, the opening/closing of the opening 30 may be achieved.

Here, an expansion seal 32 may be provided on the gate plate 22. The expansion seal 32 is disposed along an outer circumference of the opening 30, and may be located between the gate plate 22 and the slide gate 27 when the slide gate 27 closes the opening 30. In addition, the expansion seal 32 is expanded by pneumatic pressure to be adhered to the slide gate 27 and the gate plate 22 so as to seal the space between the slide gate 27 and the gate plate 22.

According to the structure of the air-tightening doors 20, the compression chamber 220, the sterilization chamber 230, the secondary water supply chamber 240, the rice cooking chamber 250, and the decompression chamber 260 in the main chamber 2 may be reliably sealed and the sealing of the each element may be performed without using an additional complicated manipulation or device.

The ingredients and the container containing the ingredients that are discharged outside from the main chamber 2 are transferred to the sealing module 300 to be rapidly sealed. Here, since the rice and ingredients that have been cooked are not sealed, the transfer device for transferring the rice and ingredients may be in a sealed state in order to prevent contamination due to the infiltration of external air.

The sealing module 300 may include a condensation elimination device 310 for eliminating the condensation of the vapour generated from the cooked ingredients. The condensation elimination device 310 has a double-wall 14 structure, and provides dry air

of 60°C or greater that is filtered and at the same time, performs exhaustion to eliminate the condensation of the vapour therein.

Also, the sealing module 300 may include a vacuum pump 320 and a nitrogen supply device 330 for sealing the container in which the cooked rice and ingredients are contained. That is, the cooked rice and ingredients are mounted on a predetermined rail, and after that, internal air is sucked by the vacuum pump 320 and high-purity nitrogen is injected so that the container may be sealed under an environment where the bacteria infiltration and the contamination into the cooked rice and ingredients are prevented. Here, the sealed container may be turned over.

A product that has been sealed and reversed is transferred to the steaming chamber 270. The steaming chamber 270 performs steaming of the cooked product for 10 to 20 minutes under a temperature of 70°C to 90°C. The cooking processes of the rice and ingredients have been finished after passing through the steaming chamber 270, and the product is transferred to the cooling device 280 to be cooled down. The cooling device 280 may cool down the product by using cooling water of 5°C to 20°C, and the sealing portion of the container, which has expanded under the high temperature of the steaming chamber 270, may be contracted.

In addition, a complete product that has finished the cooking and cooling processes may be packaged after passing through a post-process and a test process.

According to the exemplary embodiments of the inventive concept, the steam is sprayed to the rice and ingredients that have been supplied water in the sterilization chamber 230 of the high temperature and high pressure environment, and then, the secondary water supply process is performed and the cooking process is performed. Thus, the rice and ingredients, for example, raw rice, that have not undergone a pre-cooking process such as soaking in the water may be directly used in the processes. Therefore, the pre-cooking process is not necessary in the entire cooking processes, and thus, costs for manufacturing the instant steamed rice may be reduced. In addition, infiltration of impurities or propagation of bacteria that may occur during the pre-cooking process may be prevented, and thus, reliable products may be manufactured.

Also, since the water supply is performed a plurality of times, for example, the primary and secondary water supply processes, the adjustment of the moist in the rice and ingredients may be performed easily. In addition, a variation in the absorbent ratio of

the ingredients according to the cooking processes may be dealt with sufficiently, and thus, defects of the product, for example, weight defect or degradation in the texture, may be prevented.

Also, the steam spray device included in the sterilization chamber 230 includes the upper nozzle 16 and the lower nozzle 18 disposed on the upper and lower portions thereof, and thus, the steam may be sprayed to the rice and ingredients three-dimensionally. Therefore, the steam may be infiltrated easily into the rice and ingredients, and the sterilization and the cooking of the rice and ingredients may be performed efficiently.

In addition, the sealing module 300 maintains the sealing state in order to prevent the infiltration of external impurities, and the sealing module 300 includes the vacuum pump 320 and the nitrogen supply device 330 so as to perform the sealing of the container under the environment where the infiltration of the bacteria and the contamination of the cooked ingredients may be prevented.

Hereinafter, when the palette 10 passes in the main chamber 2, relationship between the movement of the palette 10 and the opening/closing operations of the air-tightening doors 20 will be described according to steps. Each of the steps is classified sequentially according to the movement of the palette 10, and classification is not limited thereto.

1) First step (palette 10 enter the compression chamber 220 from outside : FIG 18)
First, in a state where the air-tightening door 20B between the sterilization chamber 230 and the compression chamber 220 is closed, the air-tightening door 20A in the front portion of the compression chamber 220 is opened so that the palette 10 may enter the compression chamber 220 from the external atmosphere. Here, the pressure in the compression chamber 220 is equal to the atmospheric pressure outside. As described above, since the palette 10 is introduced the compression chamber 220 only by opening the air-tightening door 20A on the front portion of the compression chamber 220 in a state where the air-tightening door 20B between the compression chamber 220 and the sterilization chamber 230 is closed, the pressure in the sterilization chamber 230 is not affected by the entering of the palette 10 in the compression chamber 220.

2) Second step (pressure in the compression chamber 220 is adjusted : FIG 19.) In addition, in a state where the compression chamber 220 is sealed by closing the air-tightening door 20A in the front portion of the compression chamber 220, a pressure that is equal to that of the sterilization chamber 230 is provided to the compression chamber 220. Here, the pressure provided to the compression chamber 220 is 1.5 to 2.5 kg/cm² that is equal to the internal pressure in the sterilization chamber 230, and the sterilization chamber 230 maintains at the same pressure level.

3) Third step (moving the palette 10 from the compression chamber 220 to the sterilization chamber 230 : FIG 20) When the internal pressure of the compression chamber 220 is equal to the internal pressure of the sterilization chamber 230, the air-tightening door 20B between the compression chamber 220 and the sterilization chamber 230 is opened and the palette 10 enters the sterilization chamber 230. Here, since the pressure is applied to the compression chamber 220 in the above second step so that the internal pressure of the compression chamber 220 is equal to the internal pressure of the sterilization chamber 230, even when the air-tightening door 20B is opened and the sterilization chamber 230 and the compression chamber 220 communicate with each other, the internal pressure of the sterilization chamber 230 maintains at 1.5 to 2.5 kg/cm². Here, the air-tightening door 20C between the sterilization chamber 230 and the secondary water supply chamber 240 is in the closed state. As described above, the compression chamber 220 performs as a pressure ballast for blocking the post-cooking environment and the atmospheric pressure environment from each other.

4) Fourth step (adjusting pressure of the secondary water supply chamber 240 : FIG 21) The pressure that is equal to the internal pressure of the sterilization chamber 230 is applied to the secondary water supply chamber 240 that is in a sealed state. Here, the air-tightening door 20B between the sterilization chamber 230 and the secondary water supply chamber 240 and the air-tightening door 20D between the secondary water supply chamber 240 and the rice cooking chamber 250 are closed. The secondary water supply chamber 240 maintains its sealed state independently from the sterilization chamber 230 at the front and the rice cooking chamber 250 at the back, and the pressure

is applied thereto. Here, the pressure applied to the secondary water supply chamber 240 is 1.5 to 2.5 kg/cm² that is equal to the internal pressure of the sterilization chamber 230.

5 5) Fifth step (moving the palette 10 from the sterilization chamber 230 to the secondary water supply chamber : FIG 22) When the internal pressure of the secondary water supply chamber 240 is equal to the internal pressure of the sterilization chamber 230, the air-tightening door 20D between the secondary water supply chamber 240 and the sterilization chamber 230 is opened and the palette 10 is transferred from the
10 sterilization chamber 230 to the secondary water supply chamber 240. Here, since the internal pressures of the sterilization chamber 230 and the secondary water supply chamber 240 are equal to each other, the internal pressure of the sterilization chamber 230 may be maintained at a constant level even when the air-tightening door 20C is opened and the palette 10 is discharged. Here, the air-tightening door 20D between the
15 secondary water supply chamber and the rice cooking chamber 250 and the air-tightening door 20C between the sterilization chamber 230 and the compression chamber 220 are in the closed states.

6) Sixth step (adjusting pressure of the secondary water supply chamber 240 : FIG
20 23) In addition, when the palette 10 enters the secondary water supply chamber 240, the air-tightening door 20C between the sterilization chamber 230 and the secondary water supply chamber 240 is closed. Then, the pressure of the secondary water supply chamber 240 is adjusted according to the pressure of the rice cooking chamber 250 in a state where the secondary water supply chamber 240 is sealed. The above operation is
25 performed in a state where the secondary water supply chamber 240 is sealed after the palette 10 enters the secondary water supply chamber 240, and thus, there is no pressure exchange between the sterilization chamber 230 and the rice cooking chamber 250, and the secondary water supply chamber 240. Here, the internal pressure of the secondary water supply chamber 240 is adjusted to 0.5 to 1.2 kg/cm² that is equal to that
30 of the rice cooking chamber 250, it may be considered that the secondary water supply chamber 240 is decompressed.

7) Seventh step (transferring the palette 10 from the secondary water supply chamber 240 to the rice cooking chamber 250 : FIG 24) When the pressure of the secondary water supply chamber 240 is equal to the pressure of the rice cooking chamber 250, the air-tightening door 20D between the secondary water supply chamber 240 and the rice cooking chamber 250 is opened so that the palette 10 enters the rice cooking chamber 250. Accordingly, the pressure of the rice cooking chamber 250 may be maintained at a constant level even if the air-tightening door 20D is opened and the palette 10 enters. Here, the air-tightening door 20E between the rice cooking chamber 250 and the decompression chamber 260 is in the closed state.

That is, since the secondary water supply chamber 240 is located between the sterilization chamber 230 and the rice cooking chamber 250, the pressures in the sterilization chamber 230 and the rice cooking chamber 250 may be maintained at the constant level even when the air-tightening door 20D is opened to transfer the palette 10. In more detail, the pressure of the sterilization chamber 230 maintains at 1.5 to 2.5 kg/cm², and the pressure of the rice cooking chamber 250 maintains at 0.5 to 1.2 kg/cm².

If there is no secondary water supply chamber 240, the palette 10 is transferred from the sterilization chamber 230 directly to the rice cooking chamber 250. In addition, when the air-tightening door 20 between the sterilization chamber 230 and the rice cooking chamber 250 is opened, the pressure of the sterilization chamber 230 is induced to the rice cooking chamber 250 so that the sterilization chamber 230 and the rice cooking chamber 250 may not maintain their pressure levels constantly.

However, since the secondary water supply chamber 240 is located between the sterilization chamber 230 and the rice cooking chamber 250 according to the inventive concept and the air-tightening doors 20D between the chambers are opened and closed as described above, when the palette 10 is transferred from the sterilization chamber 230 to the rice cooking chamber 250 via the secondary water supply chamber 240, the pressure exchange between the sterilization chamber 230 and the rice cooking chamber 250 is blocked. That is, when the palette 10 is transferred from the sterilization chamber 230 to the secondary water supply chamber 240, the air-tightening door 20C between the sterilization chamber 230 and the secondary water supply chamber 240 is only opened so that the pressure of the secondary water supply chamber 240 is maintained at the level of the pressure of the sterilization chamber 230. In addition, the pressure of the secondary

water supply chamber 240 is adjusted to be the same as the pressure of the rice cooking chamber 250 in a state where the secondary water supply chamber 240 is sealed. After that, the air-tightening door 20D between the secondary water supply chamber 240 and the rice cooking chamber 250 is only opened when the palette 10 is transferred from the secondary water supply chamber 240 to the rice cooking chamber 250, and thus, the pressures of the sterilization chamber 230 and the rice cooking chamber 250 may be maintained at their own levels. Accordingly, the secondary water supply chamber 240 may perform as a predetermined pressure ballast.

8) Eighth step (adjusting the pressure of the decompression chamber 260 FIG 25)
In addition, separately from the cooking operation performed in the rice cooking chamber 250 that is sealed, the internal pressure of the decompression chamber 260 is adjusted. Here, the decompression chamber 260 is sealed, the air-tightening door 20E between the decompression chamber 260 and the rice cooking chamber 250 and the air-tightening chamber 20F at the rear end of the decompression chamber 260 are all closed. In the sealed state, a pressure of 0.5 to 1.2 kg/cm² that is equal to the pressure of the rice cooking chamber 250 is applied into the decompression chamber 260.

9) Ninth step (moving the palette 10 from the rice cooking chamber 250 to the decompression chamber 260 : FIG 26) When the internal pressure of the decompression chamber 260 is in equal to the pressure of the rice cooking chamber 250, the air-tightening door 20E between the decompression chamber 260 and the rice cooking chamber 250 is opened so as to discharge the palette 10 to the decompression chamber 260. Here, as described above, since the pressures of the decompression chamber 260 and the rice cooking chamber 250 are equal to each other, the internal pressure of the rice cooking chamber 250 may be maintained even when the air-tightening door 20E is opened for discharging the palette 10. Here, the air-tightening door 20F at the rear portion of the decompression chamber 260 is in the closed state, and the air-tightening door 20D between the rice cooking chamber 250 and the secondary water supply chamber 240 is also closed. Accordingly, the decompression chamber 260 performs as a pressure buffer for decompressing the internal pressure environment or a pressure

ballast, and may block the pressure exchange between the pressure in the main chamber 2 and the external atmospheric pressure.

10) Tenth step (discharging the palette 10 from the decompression chamber 260) :

5 **FIG. 27** In addition, the air-tightening door 20E between the decompression chamber 260 and the rice cooking chamber 250 is closed to seal the decompression chamber 260. In the above state, the pressure of the decompression chamber 260 is adjusted to the external atmospheric pressure, and after that, the palette 10 is discharged through the air-tightening door 20F in the rear portion of the decompression chamber 260. Here, the
10 air-tightening door 20E between the decompression chamber 260 and the rice cooking chamber 250 is closed, and thus, the internal pressure of the rice cooking chamber 250 may be maintained at a constant level even if the air-tightening door 20F at the rear portion of the compression chamber 220 is opened and the palette 10 is discharged.

15 As described above, the sterilization chamber 230 and the rice cooking chamber 250 may maintain predetermined pressure environments even with the introducing and releasing of the palette 10. Particularly the sterilization chamber 230 and the rice cooking chamber 250 have to maintain the predetermined pressure and temperature environment during preparing the instant steamed rice. For example, if the pressure leaks, the
20 processes of preparing the instant steamed rice are delayed in order to adjust the pressure again, and unnecessary expenses may occur.

However, according to the inventive concept, the compression chamber 220, the secondary water supply chamber 240, and the decompression chamber 260 are respectively disposed, and the compression chamber 220, the secondary water supply
25 chamber 240, and the decompression chamber 260 perform as the pressure buffers so that the sterilization chamber 230 and the rice cooking chamber 250 may maintain their own temperature and pressure environments, and thus, the above problems may be addressed.

FIG. 11 is a conceptual diagram showing a method of preparing the instant
30 steamed rice according to an exemplary embodiment of the inventive concept.

The method of preparing the instant steamed rice includes: mounting the container in the palette 10, injecting rice and ingredients of a constant amount into the container, and performing a primary water supply to the rice and the ingredients;

introducing the palette 10 into a compression chamber 220 blocking an external
5 atmospheric environment and post cooking environment from each other; transferring the palette 10 to the sterilization chamber 230 having high pressure and high temperature and sealed to spray steam of high temperature with respect to the container to perform a sterilization process; transferring the palette to a secondary water supply chamber 240 and performing a secondary water supply by supplying hot water to the rice and the
10 ingredients and providing a high temperature environment so that the sterilized rice and ingredient may absorb the moisture, and blocking exchanging between the pressures in the sterilization chamber 230 and in the decompression chamber 260; transferring the palette 10 to the rice cooking chamber 250 of high pressure to perform a rice cooking process; and transferring the palette 10, in which the rice cooking has finished, to the
15 decompression chamber 260 and adjusting a pressure of the decompression chamber 260 to the external atmospheric pressure.

More preferably, the method of preparing the instant steamed rice according to the exemplary embodiment includes transferring the palette 10 to the sealing module 300 so that the container is sealed, wherein the sealing of the container includes: eliminating
20 condensation of vapour by transferring the container to the condensation elimination device that simultaneously supplies and discharges dry air; and removing internal air of the container and injecting nitrogen.

More preferably, the method of preparing the instant steamed rice according to the exemplary embodiment further includes performing a steaming process by transferring
25 the palette 10 to the steaming chamber 270 of high temperature environment; and cooling down the container.

Preferably, the method of preparing the instant steamed rice according to the exemplary embodiment includes performing rising and descending of the temperature repeatedly in the cooking process.

30 In the above processes, the cooking and sealing processes are the same as those described in the above descriptions about the operations of the devices, and have the same effects. Therefore, detailed descriptions about overlapping parts are omitted here.

While this inventive concept has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope as defined by the following claims. Therefore, the
5 scope of the inventive concept is defined not by the detailed description of the inventive concept but by the appended claims, and all differences within the scope will be construed as being included in the inventive concept.

CLAIMS

1. An apparatus for preparing an instant steamed rice, the apparatus comprising:

5 a supply module for supplying rice, other ingredients, and containers to the apparatus for preparing the instant steamed rice;

a cooking module having a predetermined space therein so that a predetermined palette passes therethrough and maintaining a predetermined pressure and temperature environment to perform cooking of the rice and other ingredients, and

10 a transfer module for transferring the palette in the cooking module, wherein the supply module comprises:

the palette having a predetermined size to which the container may be inserted;

a container supply device for inserting one or more standardized containers to the palette; and

15 a constant amount supply device for supplying rice and ingredients to the container that is inserted in the palette,

wherein the cooking module comprises:

a primary water supply chamber for supplying water to the rice and the ingredients in the container that is inserted in the palette;

20 a compression chamber disposed behind the primary water supply chamber and formed of a sealed steam chamber of high pressure to provide the container with high pressure environment and to perform as a pressure ballast by blocking an external atmospheric environment and post cooking environment from each other;

25 a sterilization chamber disposed behind the compression chamber and spraying steam to the rice and ingredients in the container under high pressure and high temperature environment to cook the rice and the other ingredients and to eliminate bacteria remaining in the rice or the other ingredients;

30 a secondary water supply chamber disposed behind the sterilization chamber and supplying water of high temperature to the rice and the other ingredients in the container so as to prevent propagation of the bacteria, and performing as a pressure ballast by blocking a pressurized environment in the sterilization chamber and the post cooking environment from each other;

a rice cooking chamber disposed behind the secondary water supply chamber and maintaining the high pressure environment to perform cooking of the rice and the other ingredients in the container; and

a decompression chamber disposed behind the rice cooking chamber, having a predetermined space therein and maintaining a predetermined depressurized environment so as to discharge the palette from the pressure environment to an atmospheric environment to perform as the pressure ballast,

wherein the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber are disposed in a main chamber that maintains a predetermined temperature and pressure environment, and each has a chamber structure configuring at least a space in the main chamber.

2. The apparatus of claim 1, wherein the main chamber comprises:

air-tightening doors disposed on opposite ends of the main chamber, and respectively between the compression chamber, the sterilization chamber, the secondary water supply chamber, the rice cooking chamber, and the decompression chamber to be opened and closed so that the palette moves through the air-tightening doors to introduced or be released; and

a double-wall structure comprising an inner wall formed of a heat insulating wall body, and an outer wall surrounding the inner wall and spacing a predetermined distance from the inner wall,

wherein the transfer module is configured to penetrate through inside of the main chamber so that the palette moves in the main chamber.

3. The apparatus of claim 2, wherein each of the air-tightening doors comprises:

a gate plate having predetermined thickness and area and having an opening through which the palette passes through to be moved;

a slide gate that is displaced to up and down directions to perform opening and closing of the opening; and

an opening/closing module for displacing the slide gate,

wherein the opening/closing module comprises a pinion gear and a rack gear for moving the slide gate to the upper and lower directions.

4. The apparatus of claim 3, wherein the gate plate comprises an expansion
5 seal,

wherein the expansion seal is disposed along with an outer circumference of the opening so as to be located between the slide gate and the gate plate when the slide gate closes the opening, and is expanded by pneumatic pressure to seal a gap between the slide gate and the gate plate when the slide gate closes the opening.

10 5. The apparatus of claim 1, wherein the sterilization chamber comprises a steam spraying device for providing steam to the rice and the ingredients,

wherein the steam spraying device comprises:

15 an upper nozzle located above the palette to spray steam to a lower direction from an upper portion; and

a lower nozzle located under the palette to spray steam to an upper direction from a lower portion.

20 6. The apparatus of claim 5, further comprising a re-heating device, wherein the re-heating device re-heats the steam that is sprayed from the steam spraying device to raise a temperature of the steam.

25 7. The apparatus of claim 1, wherein a temperature in the secondary water supply chamber is maintained to be equal to or lower than a boiling point of water.

8. The apparatus of claim 1, wherein the cooking module is configured to repeatedly raise and descend the temperature with respect to the rice and the ingredients.

30 9. The apparatus of claim 1, further comprising a sealing module for sealing the container,

wherein the sealing module comprises:

a condensation elimination device performing supplying and exhausting dry air simultaneously with respect to the container;

a vacuum pump for removing air in the sealing module and the container; and

a nitrogen supply device for supplying nitrogen.

5

10. The apparatus of claim 9, wherein the cooking module comprises:

a steaming chamber providing a predetermined temperature environment to the sealed container for a predetermined time to perform a secondary steaming process; and

10 a cooling device providing cooling water to the sealed container to cool down the sealed container.

11. A method of preparing an instant steamed rice, the method comprising:

mounting a container in a palette, injecting ingredients of a constant amount into the container;

15 performing a primary water supply to the rice and ingredients;

introducing the palette into a compression chamber blocking an external atmospheric environment and post cooking environment from each other;

20 transferring the palette to a sterilization chamber that is sealed and has high pressure and high temperature to spray steam of high temperature with respect to the container from an upper direction and a lower direction to perform a sterilization process;

25 transferring the palette to a secondary water supply chamber and performing a secondary water supply by supplying hot water to the ingredients and providing a high temperature environment so that the sterilized rice and ingredients absorb moisture, and blocking exchanging between pressures in the sterilization chamber and in a decompression chamber;

transferring the palette to a rice cooking chamber that has high pressure to perform a rice cooking process; and

30 transferring the palette, in which the rice cooking has finished, to the decompression chamber and adjusting a pressure of the decompression chamber to the external atmospheric pressure.

12. The method of claim 11, further comprising transferring the palette to a sealing module so that the container is sealed,

wherein the sealing of the container comprises:

eliminating condensation of vapour by transferring the container to a condensation

5 elimination device that simultaneously supplies and discharges dry air; and

removing internal air of the container and injecting nitrogen.

13. The method of claim 12, further comprising:

performing a steaming process by transferring the palette to a steaming chamber

10 of high temperature environment; and

cooling down the container.