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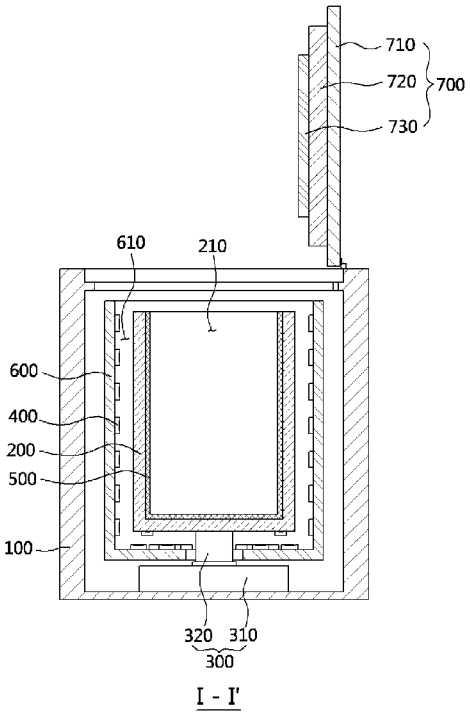
(54) **Title**: APPARATUS FOR STERILIZING FOOD



I - I'

(57) **Abstract**: Provided is an apparatus for sterilizing food, which includes a rotatable reactor, a rotation driving unit configured to rotate the reactor, and a light source unit configured to apply light to an interior of the reactor. The apparatus can use high sterilizing power of ultraviolet rays without generating heat using an ultraviolet light-emitting diode. Further, the apparatus can widen a surface area of each foodstuff exposed to the ultraviolet rays and further improve sterilizing efficiency of the foodstuffs using the rotatable reactor.

WO 2013/180484 A1

Description

Title of Invention: APPARATUS FOR STERILIZING FOOD

Technical Field

[1] The present invention relates to an apparatus for sterilizing food and, more particularly, to an apparatus for sterilizing food using an ultraviolet light-emitting diode.

Background Art

[2] Recently, the number of food service providers handling a large quantity of foodstuffs has increased. In a process in which these providers handle a large quantity of foodstuffs, due to insufficient sterilization or sanitary treatment of foods, accidents such as food poisoning happen now and then. Especially, when such an accident associated with the insanitary treatment of foods happens at the food service provider that offers the foods to a lot of persons, its damage covers a wide range. As such, a social demand for preventing this accident in advance is very high.

[3] In this regard, conventionally, a system that sterilizes foods by spraying foods with a diluted solution of sodium hypochlorite or sodium chlorite or by immersing the foods in the diluted solution, or a sterilization system that removes bacteria by applying microwaves to surfaces of foods has been known.

[4] When the aqueous solution of sodium hypochlorite or sodium chlorite is used, to increase sterilizing power, an acid is added to the aqueous solution, or a concentration of sodium hypochlorite or sodium chlorite is increased. When radicals such as hypochlorite ions are generated by adding specified chemicals as mentioned above, there is a problem that chlorine gas harmful to a human body is generated or that a higher concentration than an appropriate concentration for sterilization occurs, thereby failing to ensure safety of the foods in use. In case of the sterilization system using the microwaves, there is a discomfort that a container capable of transmitting the microwaves should be used, and there is a problem that the overall surface of the food is not exposed to the microwave, and thus sterilization efficiency is reduced.

[5] Moreover, to further improve the sterilization efficiency, an ultraviolet lamp has been used. When the ultraviolet lamp is used, a sterilization effect is improved due to high sterilizing power of ultraviolet rays. However, there is a problem that, due to heat generated from the ultraviolet lamp, nutrients vulnerable to heat including proteins in the food are denatured or destroyed, and thus a degree of freshness or a texture of the food is reduced.

[6] For this reason, there is a need to develop a sterilization system that can uniformly sterilize the overall surface of the food and prevent the denaturation of the food along with high sterilizing power.

Disclosure of Invention

Technical Problem

[7] Accordingly, the present invention has been made keeping in mind the above problems occurring in the related art, and an object of the present invention is to provide an apparatus for sterilizing food, which has high sterilizing power.

[8] Another object of the present invention is to provide an apparatus for sterilizing food, which is capable of uniformly sterilizing an overall surface of each foodstuff.

[9] Still another object of the present invention is to provide an apparatus for sterilizing food, which is free from denaturation of foodstuffs or a decrease in texture of the food.

Solution to Problem

[10] According to an aspect of the present invention, there is provided an apparatus for sterilizing food, which includes a rotatable reactor, a rotation driving unit configured to rotate the reactor, and a light source unit configured to apply light to an interior of the reactor.

[11] The light source unit may include at least one light emitting diode.

[12] The rotation driving unit may include a power supply configured to generate a rotatory force, and a power transmission unit configured to transmit the rotatory force generated from the power supply to the reactor.

[13] The apparatus may further include a cleaning fluid injector that injects cleaning fluid into the reactor.

Advantageous Effects of Invention

[14] The apparatus for sterilizing food according to the present invention can use high sterilizing power of ultraviolet rays without generating heat using an ultraviolet light-emitting diode. Thus, the apparatus can sterilize foodstuffs with high efficiency without denaturing the foodstuffs or reducing textures of the foodstuffs.

[15] Further, the apparatus can rotate the foodstuffs using a rotatable reactor while the foodstuffs are being sterilized. Thus, a surface area of each foodstuff exposed to the ultraviolet rays can be widened, and thus sterilizing efficiency of the foodstuffs can be further improved.

[16] Furthermore, the apparatus is supplied with cleaning fluid via a cleaning fluid injector, and thereby the foodstuffs can be sterilized and cleaned at the same time.

[17] However, the technical effects of the present invention are not limited to the above disclosure; other technical effects may become apparent to those of ordinary skill in the art based on the following descriptions.

Brief Description of Drawings

[18] FIG. 1 is a perspective view showing a first embodiment of an apparatus for sterilizing food according to the present invention.

[19] FIG. 2 is a perspective view showing a second embodiment of the apparatus for sterilizing food according to the present invention.

[20] FIG. 3 is a cross-sectional view taken along line I-I' of FIG. 1 or 2.

[21] FIG. 4 is a cross-sectional view showing a third embodment of the apparatus for sterilizing food according to the present invention.

Mode for the Invention

[22] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments disclosed below, but can be implemented in various forms. The present invention should be understood to include all the changes, equivalents, and substitutions included in the spirit and scope of the present invention.

[23] Herein, when a layer is described to be formed on other layer or on a substrate, this means that the layer can be formed on the other layer or on the substrate, or a third layer can be interposed between the layer and the other layer or the substrate. In addition, directional expressions such as an upper side, an upper (portion), and an upper surface can be understood to be meanings such as a lower side, a lower (portion), and a lower surface according to their criteria. That is, an expression of a spatial direction should be constructed as a relative direction and should not be limitedly construed as meaning an absolute direction.

[24] In the drawings, the thicknesses of layers and regions may be exaggerated or omitted for clarity. Like reference numerals refer to like elements throughout the description of the figures.

[25] FIGS. 1 and 2 are perspective views respectively showing first and second embodiments of an apparatus for sterilizing food according to the present invention, and FIG. 3 is a cross-sectional view taken along line I-I' of FIG. 1 or 2.

[26] Referring to FIGs. 1, 2 and 3, an apparatus for sterilizing food according to the present invention includes a reactor 200, a rotation driving unit 300, and a light source unit 400. The rotation driving unit 300 is connected to the reactor 200 and supplies rotatory power to the reactor 200. The reactor 200 stores foodstuffs and is rotated by the supplied rotatory power, thereby rotating the stored foodstuffs. While the foodstuffs stored in the reactor 200 is being rotated, the light source unit 400 applies or irradiates light to an inside of the reactor 200 and sterilizes the foodstuffs. The overall surface of each foodstuff stored in the reactor 200 is uniformly exposed to the light by the rotation, and thereby is sterilized with high efficiency.

[27] First, the reactor 200 provides a space in which the stored foodstuffs are sterilized, and is provided with an opening in one end thereof and a storeroom 210 inside thereof in which the foodstuffs are stored. The foodstuffs stored in the storeroom 210 are

sterilized by the light applied from the outside of the reactor 200. Accordingly, the reactor 200 may be formed of a translucent or transparent material.

[28] At the same time, the reactor 200 is rotatably configured to rotate the foodstuffs stored in the storeroom 210. The reactor 200 is rotated by rotatory power supplied from the outside. In this way, as the reactor 200 rotates, the foodstuffs stored therein rotate together. A surface area of each foodstuff exposed to the light applied into the storeroom 210 is widened by the rotation of the foodstuff as described above.

[29] The rotatable reactor 200 rotates around a rotational axis C. The rotational axis C extends across the open one end and the closed other end facing the open end (one end in which the opening is formed). FIG. 3 shows only the case in which the rotational axis C extends in a gravitational direction. However, the extending direction of the rotational axis C is not limited to the gravitational direction, but it may extend so as to have an inclined angle of -90 to 90 degrees with respect to the gravitational direction. To be specific, when the rotational axis C extends in the gravitational direction, the apparatus for sterilizing food is realized as shown in FIG. 1. Further, when the rotational axis C extends so as to have the inclined angle of -90 or 90 degrees with respect to the gravitational direction, the apparatus for sterilizing food is realized as shown in FIG. 2. However, the apparatus for sterilizing food according to the present invention may be realized not only as in FIGS. 1 and 2 but also in various forms according to the extending direction of the rotational axis C.

[30] The reactor 200 may further include an impact absorber 500 disposed in the interior thereof. The impact absorber 500 is a means for protecting the foodstuffs from physical impacts generated by friction between the reactor 200 and the foodstuffs while the reactor 200 and the foodstuffs are rotating together. To this end, the impact absorber 500 may be attached to an inner side including an inner circumference of the reactor 200 and be located between the reactor 200 and the storeroom 210.

[31] The impact absorber 500 may be formed of any material as long as it can absorb the physical impacts. Thus, the material of the impact absorber 500 is not particularly limited, and may be formed of an elastic material such as rubber or soft synthetic resin. Further, the impact absorber 500 may be formed of a translucent or transparent material so that the foodstuffs stored in the storeroom 210 can be sterilized by the light applied or irradiated from the outside.

[32] The rotation driving unit 300 is disposed outside the reactor 200 so as to rotate the reactor 200, and includes a power supply 310 and a polwer transmission unit 320.

[33] The power supply 310 is a means for generating a rotatory force for rotating the reactor 200 using power supplied from the outside. The power supply 310 is typically a motor. However, the power supply 310 is not limited to the motor, but it may be any means capable of generating such a rotatory force as to rotate the reactor 200. The

power supply 310 may be appropriately disposed at a position at which the reactor 200 can be rotated around the rotational axis C. For example, the power supply 310 may be disposed under the closed end facing the open end of the reactor 200.

[34] The power transmission unit 320 is a means for transmitting the rotatory force generated from the power supply 310 to the reactor 200, and may be connected to the closed end of the reactor 200. To rotate the reactor 200 around the rotational axis C, the power transmission unit 320 may be connected to the reactor 200 at an extention of the rotational axis C of the reactor 200. The power transmission unit 320 may include a known power transmitting means such as a gear, a friction wheel, a pulley and belt, a chain and sprocket, a cam, or a link rope.

[35] The light source unit 400 is disposed outside the reactor 200 and applies or irradiates light to the inside, i.e. the storeroom 210 of the reactor 200. The light applied or irradiated from the light source unit 400 sterilizes the foodstuffs stored in the storeroom 210 of the reactor 200. The light source unit 400 may include at least one light emitting diode. The light emitting diode generates light having a wavelength of 200 ㎚ to 400 ㎚. For example, the light emitting diode may be a near ultraviolet light emitting diode or a deep ultraviolet light emitting diode.

[36] The light source unit 400 may be a module including at least one light emitting diode and two or more modules. Further, the module constituting the light source unit 400 may include light emitting diodes emitting light having similar wavelengths or light having a single wavelength or different wavelengths. The light emitting diodes or the module including the light emitting diodes is configured so as to be able to apply the light in symmetry or asymmetry, and applies a more quantity of light in a single or multiple directions. Thereby, an applied region of the light within the inside of the reactor 200 can be further expanded.

[37] The apparatus for sterilizing food may further include an inner frame 600 for fixing the light source unit 400 located outside the reactor 200. The inner frame 600 may be provided with an opening in the same end as the reactor 200. The inner frame 600 is supported by an outer frame 100 having an opening formed in the same end as the reactor 200, and is formed along an outer surface including an outer circumference of the reactor 200 at a distance. A space 610 is formed between the outer surface of the reactor 200 and an inner surface of the inner frame 600 by the separation of the inner frame 600 from the reactor 200. The light source unit 400 may be disposed on the inner surface of the inner frame 600 in the space 610. As described above, the light source unit 400 fixed to the inner frame 600 supported by the outer frame 100 is disposed apart from the reactor 200, and does not have an influence on the rotation of the reactor 200.

[38] The apparatus for sterilizing food may include a cover 700. The cover 700 may

include an outer cover 710 and a reactor cover 730. The outer cover 710 is a means for closing the opening of the outer frame 100, and may be opened and closed with one edge coupled to the outer frame 100. The reactor cover 730 may be formed on the one side of the outer cover 710 so as to face the reactor 200. The reactor cover 730 closes the open end of the reactor 200, and may be formed of an elastic material that can absorb physical impacts to protect the foodstuffs from the physical impacts generated by friction between the reactor 200 and the foodstuffs while the reactor 200 and the foodstuffs are rotating together. The cover 700 may be configured such that an inner cover 720 is additionally interposed between the outer cover 710 and the reactor cover 730.

[39] With this configuration, the apparatus for sterilizing food according to the present invention can increase the surface area of each foodstuff exposed to the light by the rotation and apply the light while the foodstuffs are rotating, thereby efficiently sterilizing the foodstuffs.

[40] FIG. 4 is a cross-sectional view showing a third embodment of the apparatus for sterilizing food according to the present invention. In this embodment, a configuration for cleaning foodstuffs is added to the embodment as showen in FIG. 3. The apparatus for sterilizing food as shown in FIG. 4 further includes a configuration capable of injecting cleaning fluid for cleaning the foodstuffs in addition to the apparatus for sterilizing food as shown in FIG. 3, and thereby performing cleaning of the foodstuffs and sterilization of the foodstuffs in the same apparatus.

[41] Referring to FIG. 4, the apparatus for sterilizing food according to the present embodment further includes a cleaning fluid injector 800 in addition to the apparatus for sterilizing food as shown in FIG. 3.

[42] The cleaning fluid injector 800 is a means for injecting cleaning fluid fed from the outside into the storeroom 210. The cleaning fluid injector 800 is not particularly limited as long as it can inject the cleaning fluid into the storeroom 210 under pressure. For example, the cleaning fluid injector 800 may be a nozzle. The cleaning fluid is a fluid for removing contaminants attached to the surface of each foodstuff, and may include water, purified water, a saline solution, or electrolyzed water.

[43] The cleaning fluid injector 800 may be properly disposed at a position at which it can inject the cleaning fluid into the storeroom 210 of the reactor 200. It is shown in FIG. 4 that the cleaning fluid injector 800 is formed so as to protrude from the cover 700 toward the reactor 200, which is merely an example. Thus, the position of the cleaning fluid injector 800 is not particularly limited. In another example, the cleaning fluid injector 800 may inject the cleaning fluid into the storeroom 210 via a cleaning fluid feeding pipe (not shown) separately provided for the reactor 200.

[44] The cleaning fluid injector 800 may inject the cleaning fluid while the reactor 200 is

rotating. In detail, the foodstuffs may be put into the reactor 200 into which no cleaning fluid is injected, and be irradiated with the light to be sterilized while the reactor 200 is rotating. Then, the cleaning fluid may be injected to clean the foodstuffs when or after the foodstuffs are sterilized. Further, the foodstuffs may be put into the reactor 200, and the cleaning fluid injector 800 may inject the cleaning fluid into the reactor 200 into which the foodstuffs are put until the foodstuffs are immersed in the cleaning fluid. Then, the foodstuffs may be irradiated with the light while the reactor 200 is rotating, and thus be sterilized and cleaned at the same time. In this way, the cleaning fluid injector 800 may inject the cleaning fluid before the foodstuffs put into the reactor 200 are sterilized or when or after the foodstuffs put into the reactor 200 are sterilized.

[45] Due to the rotation of the reactor 200, the cleaning fluid injected into the storeroom 210 via the cleaning fluid injector 800 is rotated along with the foodstuffs put into the storeroom 210. In this way, due to friction between the foodstuffs and the cleaning fluid which occurs when the foodstuffs and the cleaning fluid are rotated together, the contaminants existing on the surfaces of the foodstuffs can be removed. Above all, due to the rotation, the surface area of each foodstuff exposed to the cleaning fluid is increased, and the foodstuffs can be efficiently cleaned.

[46] The cleaning fluid injector 800 may be directly connected to an external cleaning fluid source (not shown) such as tap water or drinking water source so as to be supplied with the cleaning fluid. However, when the foodstuffs need to be cleaned using a functional fluid such as a saline solution, ionized water, or electrolyzed water rather than the water supplied from a public water supply source as the cleaning fluid, the cleaning fluid injector 800 may be connected to an internal cleaning fluid source other than the external cleaning fluid source. The apparatus for sterilizing food may further include a cleaning fluid storage 900 and a cleaning fluid pump 1000 as the internal cleaning fluid source. The cleaning fluid storage 900 and the cleaning fluid pump 1000 may be located inside or outside the outer frame 100. Particularly, when the electrolyzed water is used as the cleaning fluid, the cleaning fluid storage 900 is connected to an external power supply (not shown) and is supplied with electric current. However, when fluid other than the electrolyzed water is used as the cleaning fluid, separate electric current may not be applied.

[47] The cleaning fluid storage 900 is a means for storing the functional fluid such as the saline solution, the ionized water, or the electrolyzed water, or water. The cleaning fluid pump 1000 is a means for extracting the cleaning fluid from the cleaning fluid storage 900 and feeding the cleaning fluid to the cleaning fluid injector 800. The cleaning fluid storage 900 and the cleaning fluid pump 1000 are serially and sequentially connected to the cleaning fluid injector 800 via the cleaning fluid flow pipe

1100. That is, the cleaning fluid stored in the cleaning fluid storage 900 is extracted by the cleaning fluid pump 1000, and is fed to the cleaning fluid injector 800 via the cleaning fluid flow pipe 1100.

[48] The cleaning fluid storage 900 may further include an ultraviolet light-emitting diode 1200 in order to sterilize the cleaning fluid. The ultraviolet light-emitting diode 1200 may emit light having a wavelength band of 200 ㎚ to 400 ㎚. Particularly, the ultraviolet light-emitting diode 1200 may emit light which has a wavelength band of 200 ㎚ to 300 ㎚ which has excellent sterilizing power. When the ultraviolet light-emitting diode 1200 is disposed inside the cleaning fluid storage 900 so as to be in direct contact with the cleaning fluid, the ultraviolet light-emitting diode 1200 itself may be waterproofed.

[49] When the apparatus for sterilizing food according to the present embodiment further includes the configuration for cleaning the foodstuffs as described above, the apparatus for sterilizing food may further include at least one fluid outlet 1300. The fluid outlets 1300 are to discharge the cleaning fluid to the outside while or after the foodstuffs are cleaned with cleaning fluid, and may be formed within surfaces of the reactor 200 which is parallel with the rotational axis C. When the fluid outlets 1300 are formed in the surfaces parallel with the rotational axis C, the cleaning fluid can be discharged while sterilizing and cleaning the foodstuffs. When the reactor is rotated to sterilize and clean the foodstuffs, the cleaning fluid is discharged to the fluid outlets by a centrifugal force caused by the rotation. However, positions of the fluid outlets are merely illustrative and are not particularly limited. In another example, the fluid outlets 1300 may be formed in other surface(s) of reactor 200 which is not parallel with the rotational axis C, and the cleaning fluid may be discharged after the foodstuffs are sterilized and cleaned.

[50] With the configuration as described above, the apparatus for sterilizing food according to the present embodiment can sterilize and clean the foodstuffs, and increase the surface area of each foodstuff exposed to the light and cleaning fluid by the rotation, so that it can efficiently sterilize and clean the foodstuffs.

[51] The apparatus for sterilizing food may further include an operation control unit. The operation control unit is a means capable of selectively controlling sterilization and cleaning function of the apparatus for sterilizing food, and independently controls on/off of electric current applied to the light source unit 400 and the cleaning fluid injector 800. Thus, the operation control unit controls the apparatus for sterilizing food so as to perform one or both of the sterilization and cleaning. In detail, when only the sterilization is performed, the operation control unit applies electric current only to the light source unit 400. When only the cleaning is performed, the operation control unit applies electric current only to the cleaning fluid injector 800. Further, when both the

sterilization and cleaning are performed, the operation control unit applies electric current to the light source unit 400 and the cleaning fluid injector 800.

[52] The apparatus for sterilizing food may further include an operation display unit displaying information about functions controlled by the operation control unit. The operation display unit is a means for displaying the function, sterilization or cleaning, controlled by the operation control unit. The operation display unit may include a liquid crystal display (LCD), a plasma display panel (PDP), a light emitting diode (LED), a laser diode, or a touch screen. The operation display unit may be omitted depending on a mode of the present embodiment.

[53] With the configuration as described above, the apparatus for sterilizing food according to the present embodiment can selectively sterilize and clean the foodstuffs, and thus an applied range of the apparatus for sterilizing food can be widened.

[54] While the present invention has been shown and described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims

Claims

[Claim 1] An apparatus for sterilizing food, comprising:
a rotatable reactor;
a rotation driving unit configured to rotate the reactor; and
a light source unit configured to apply light to an interior of the reactor.

[Claim 2] The apparatus according to claim 1, wherein the light source unit includes at least one light emitting diode.

[Claim 3] The apparatus according to claim 2, wherein the light emitting diode emits light having a wavelength of 200 nm to 400 nm.

[Claim 4] The apparatus according to claim 1, wherein the reactor is formed of a translucent or transparent material.

[Claim 5] The apparatus according to claim 1, further comprising an impact absorber that is attached to an inner surface of the reactor, and is formed of an elastic material.

[Claim 6] The apparatus according to claim 5, wherein the impact absorber is formed of a translucent or transparent material.

[Claim 7] The apparatus according to claim 1, further comprising an inner frame formed along an outer surface of the reactor at a distance.

[Claim 8] The apparatus according to claim 7, wherein the light source unit is disposed on an inner surface of the inner frame in a space between the inner frame and the reactor.

[Claim 9] The apparatus according to claim 1, wherein the rotation driving unit includes:
a power supply configured to generate a rotatory force; and
a power transmission unit configured to transmit the rotatory force generated from the power supply to the reactor.

[Claim 10] The apparatus according to claim 1, further comprising a cleaning fluid injector configured to inject cleaning fluid into the reactor.

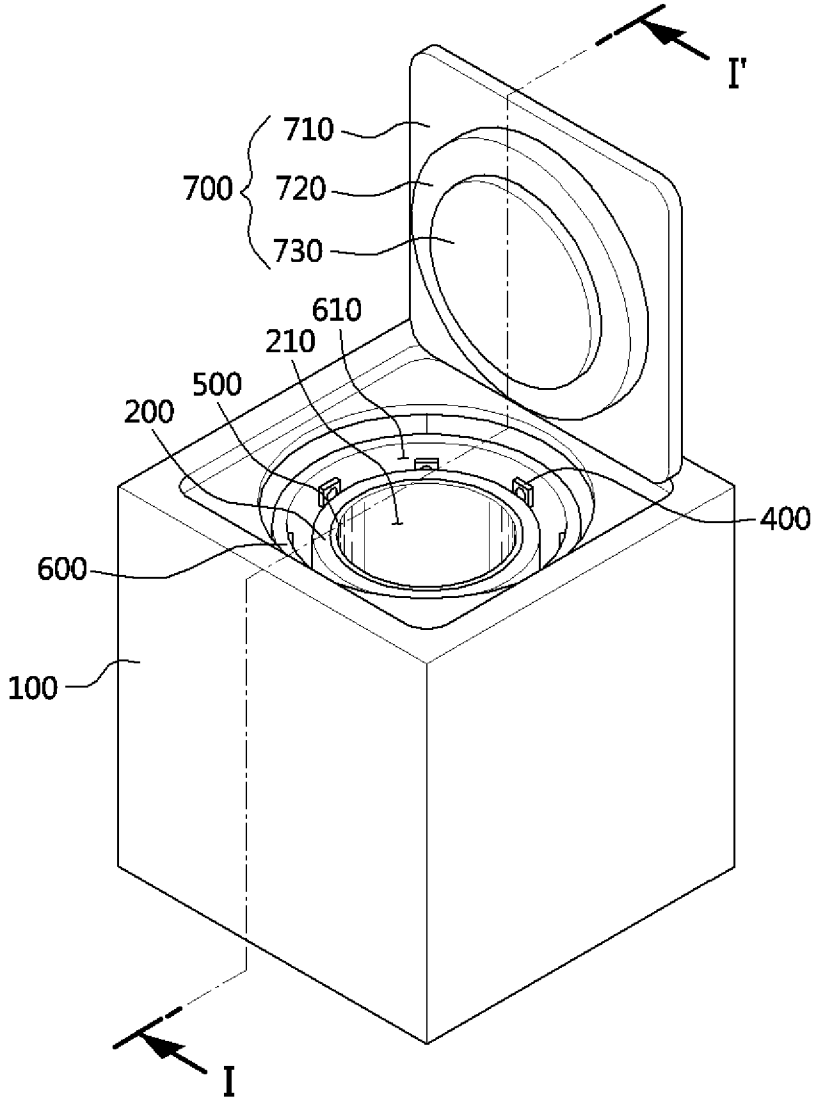
[Claim 11] The apparatus according to claim 10, further comprising:
a cleaning fluid storage configured to store the cleaning fluid; and
a cleaning fluid pump configured to extract the cleaning fluid from the cleaning fluid storage to the cleaning fluid injector.

[Claim 12] The apparatus according to claim 11, wherein the cleaning fluid storage further includes an ultraviolet light-emitting diode that emits ultraviolet rays having a wavelength band of 200 nm to 400 nm.

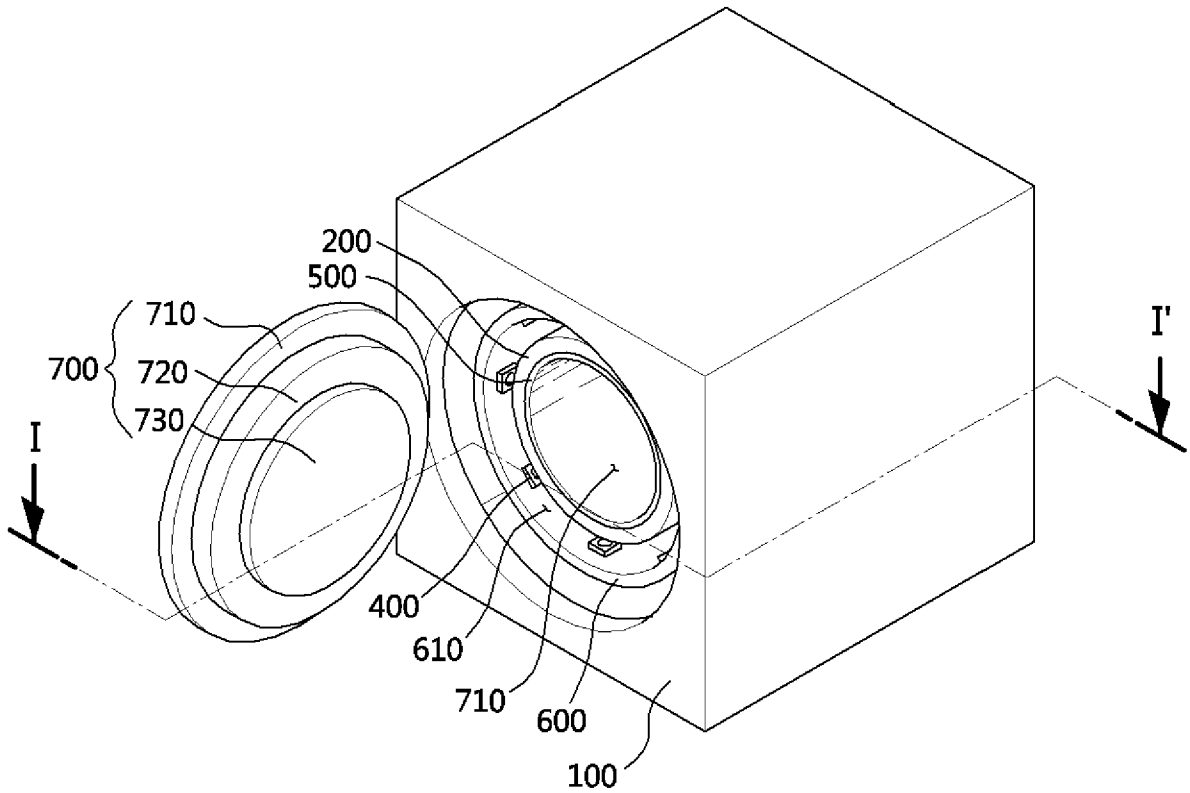
[Claim 13] The apparatus according to claim 10, wherein the reactor further includes at least one fluid outlet that discharges the cleaning fluid.

[Claim 14] The apparatus according to claim 10, wherein the cleaning fluid includes at least one fluid selected from the group consisting of water, purified water, a saline solution, and electrolyzed water.

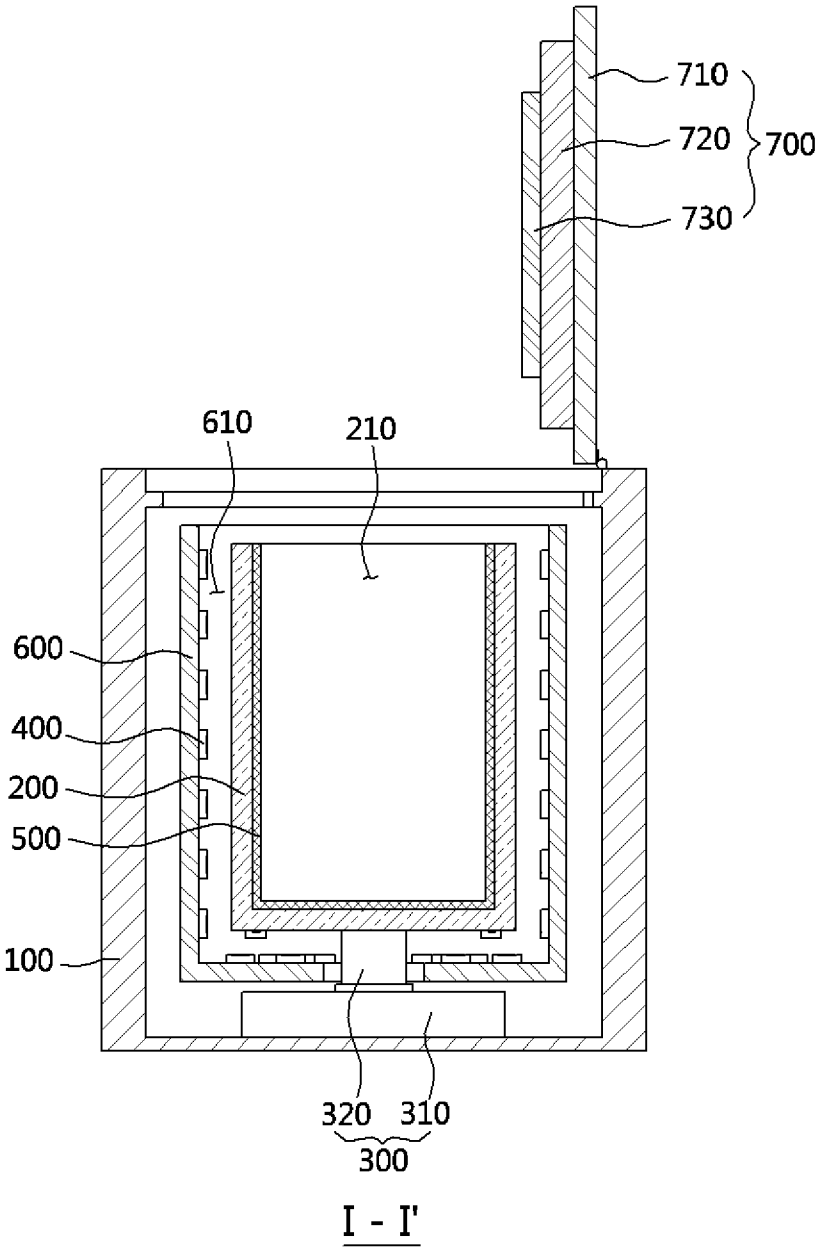
[Fig. 1]



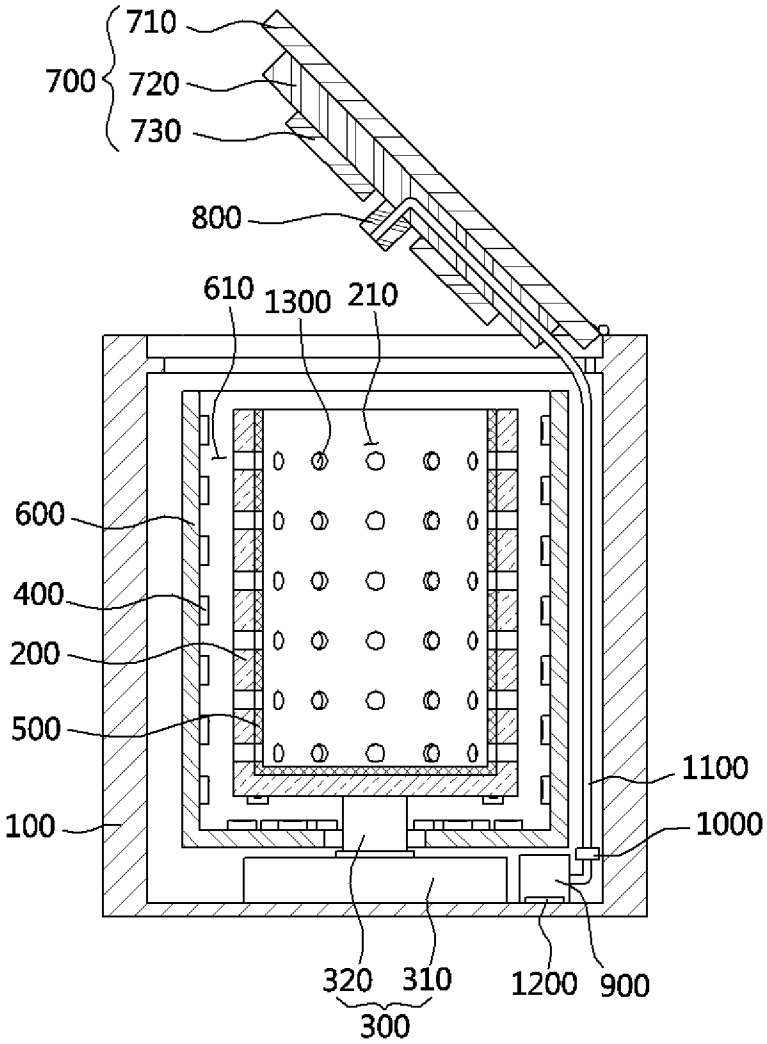
[Fig. 2]



[Fig. 3]



[Fig. 4]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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2013/004756

A. CLASSIFICATION OF SUBJECT MATTER

A23L 3/26(2006.01)i, A23L 3/28(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23L 3/26; A47J 43/24; A61L 2/10; A23B 7/158; A23L 3/28; A61L 2/00; A23L 3/32; B08B 3/02; A23L 3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: sterilizing, food, rotatable reactor, driving unit, light source, light emitting diode, cleaning fluid injector

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0098259 A1 (MCELLEN, JOHN J.) 16 April 2009 See abstract; paragraphs [0012]-[0013], [0015], [0019]-[0020]; and figures 1-2, 4.	1-4,7-9
Y		5-6,10-14
Y	US 2002-0168287 A1 (ECKHARDT, RICHARD et al.) 14 November 2002 See abstract; paragraphs [0017]-[0020], [0022]-[0024]; and figures 1A-1B.	5-6
A		1-4,7-14
Y	US 6006659 A (ROSENTHAL, RICHARD A.) 28 December 1999 See abstract; column 3, line 52 - column 4, line 26; column 4, lines 38-46; column 5, lines 13-24; and figure 2.	10-14
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A	EP 1943932 B1 (GIORGIA S.R.L) 15 September 2010 See claims 1-3, 14-16; and figures 1-4.	1-14
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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29 August 2013 (29.08.2013)	**02 September 2013 (02.09.2013)**

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