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(54) A refrigeration device

(57) The refrigeration device (S) according to the present invention comprises at least one inner volume (S1) in which products to be cooled are placed; at least one ozone source (1) supplying ozone to the inner volume (S1) and having at least a first operating mode wherein an amount of ozone gas within the limits determined by the health institutions is supplied into the inner volume (S1) instantaneously or at certain intervals, and at least a second operation mode wherein an amount of ozone gas above the limits determined by the health institutions is supplied into the inner volume (S1) of the refrigeration device (S) for certain period of time; a switch (2) permitting the user to adjust the amount of ozone received from the ozone source (1) and to arrange the said operating modes under the control of the user; at least one transfer line (1b) transferring the ozone from the ozone source (1) into the said inner volume (S1); at least one ozone outlet (1c) through which ozone received from the transfer line (1b) is introduced into the inner volume (S1) and which is positioned in the inner volume (S1); and at least one control unit adjusting the amount of ozone received from the ozone source (1) in line with the commands from the said switch (2).

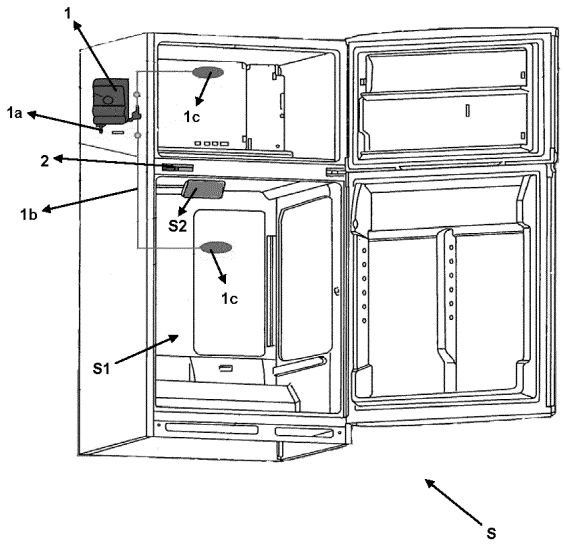

Figure 1

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Description

Field of the Invention

[0001] The present invention relates to refrigeration devices with self-cleaning feature.

Prior Art

[0002] Ozone is a gas with a very high oxidation power, which is one of the most powerful disinfectants known. High oxidation power results in a completely effective role of ozone in destroying bacteria. Furthermore, the fact that ozone is the only disinfectant that leaves no waste and residue after the disinfection makes it more advantageous than others, especially its use in food industry. Therefore storage, transportation and cleaning of vegetables and fruits, upon treatment with ozone, prevent contamination of vegetables and fruits by microorganisms in water and any other cross-contamination, so their shelf life is increased. Therefore, it is a preferred and increasingly widespread application to use ozone gas as a cleaner/disinfectant especially in refrigeration devices.

[0003] The refrigeration device disclosed in the state-of-art document WO2006131374A2, as an example using ozone gas in refrigeration devices, comprises an ozone generator supplying ozone to the air inside an interior chamber thereof. Here the amount of ozone produced and transferred to the interior chamber by the ozone generator is changed in each operation phase of the refrigerating device, thereby maintaining a constant ozone concentration. In another embodiment disclosed in the said document, the ozone concentration is not maintained constant in the interior chamber, but ozone is supplied to the interior chamber according to the decay rate of the ozone. However, in the embodiments disclosed in the said document, ozone supply into the refrigeration device is performed independent from the user. Still in the embodiment disclosed in the said document, the amount of ozone supplied into the interior part of the device should be between specified limits in order for the ozone supplied into the device not to negatively affect the food products in the refrigeration device and health of the user. This, however, may not be sufficient in proper disinfection of the refrigeration device in cases where the refrigeration device is highly contaminated, which may sometimes require a maintenance to be made by a technical service and a cleaning procedure for the refrigeration device with ozone in higher amount than the said limits, for example. This results in extra maintenance cost for the user.

Brief Description of the Invention

[0004] The refrigeration device according to the present invention comprises at least one inner volume in which products to be cooled are placed; at least one ozone source supplying ozone to the said inner volume and having at least a first operation mode wherein an amount of ozone gas within the limits determined by the health institutions is supplied into the said inner volume instantaneously or at certain intervals, and at least a second operation mode wherein an amount of ozone gas above the limits determined by the health institutions is supplied into the inner volume of the refrigeration device for certain period of time; at least one switch permitting the user to adjust the amount of ozone received from the ozone source and to arrange the said operation modes under the control of the user; at least one transfer line transferring the ozone from the ozone source into the said inner volume; at least one ozone outlet through which ozone received from the transfer line is introduced into the inner volume and which is positioned in the said inner volume; and at least one control unit adjusting the amount of ozone received from the ozone source in line with the commands from the said switch.

[0005] With the refrigeration device according to the present invention, in addition to the prevention of unwanted biological materials and unwanted odors - known in the prior art - resulting from ozone gas supply into the inner volume within the limits determined by the health institutions instantaneously or at certain intervals, and thereby disinfection thereof, provision is made for supply into the inner volume an amount of ozone gas above the limits determined by the health institutions, which is activated under the control of the user. Thus, in cases where the refrigeration device is highly contaminated, the user can perform a disinfection process according to their own needs and at their discretion, without the need for a technical service to perform such disinfection. In addition, since the need for a technical service to perform this procedure is eliminated, maintenance cost is also reduced.

Object of the Invention

[0006] It is an object of the present invention to provide a refrigeration device wherein the amount of ozone provided by the ozone source therein may be controlled by the user as well.

[0007] Another object of the present invention is to provide a refrigeration device wherein ozone provided by the ozone source therein is, during normal use, supplied thereto within the limits determined by the heath institutions so that disinfection is instantaneously made therein.

[0008] Another object of the present invention is to provide a refrigeration device wherein ozone provided by the ozone source therein is, upon activated by the user, supplied thereto above the limits determined by the heath institutions and accordingly maintenance and service cost is reduced.

[0009] Still another object of the present invention is to provide a refrigeration device which is easy to manufacture and use, and which is practical and reliable.

Description of the Drawings

[0010] An embodiment of the refrigeration device according to the present invention is illustrated in the annexed drawing, wherein;

Figure 1 is a perspective view of the inventive refrigeration device.

[0011] All the parts illustrated in the drawing are individually assigned a reference numeral and the corresponding terms of these numbers are listed as follows.

Refrigeration device	(S)
Inner volume	(S1)
Guiding member	(S2)
Ozone source	(1)
Aperture	(1a)
Transfer line	(1b)
Ozone outlet	(1c)
Switch	(2)

Description of the Invention

[0012] In refrigeration devices, unwanted biological materials such as bacteria, fungus etc. may be generated due to such reasons as decomposition of food products stored therein over a certain period of time, food waste remaining in the device etc. This may often result in bad odors and may sometimes negatively affect human health. These unfavorable conditions are mainly eliminated through cleaning of the refrigeration device by the user with the aid of various cleaning agents. However, said cleaning procedure is often troublesome for the user. Therefore, an ozone source may be utilized in refrigeration devices and ozone received from this source is, instantaneously and at certain intervals, introduced into the compartments of the refrigeration devices in which products are stored and onto the products within the limits determined by the health institutions so as not to damage human health and the products. Thus, formation of unwanted biological materials may be prevented for a certain period of time. However, this application is often not sufficient and the user may, from time to time, need to have the refrigeration device cleaned by a technical service. Therefore with the present invention, there is provided a refrigeration device wherein the amount of ozone provided by the ozone source therein may be controlled by the user as well.

[0013] The refrigeration device (S) according to the present invention, as illustrated in Figure 1, comprises at least one inner volume (S1) in which products to be cooled are placed; at least one ozone source (1) supplying ozone gas to the said inner volume (S1); at least one transfer line (1b) transferring the ozone received from the ozone source (1) into the said inner volume (S1); at least one ozone outlet (1c) through which ozone received from the transfer line (1b) is introduced into the inner volume (S1) and which is positioned in the said inner volume (S1); at least one switch (2) permitting the user to adjust the amount of ozone received from the ozone source (1); and at least control unit (not shown) adjusting the amount of ozone received from the ozone source (1) in line with the commands from the said switch (2). The said ozone source (1) has at least two operation modes regulated by the switch (2) of the refrigeration device (S); a first operation mode and a second operation mode. In the first operation mode, the ozone source (1) supplies into the said inner volume (S1) an amount of ozone gas within the limits (i.e. 2 ppm) determined by the health institutions instantaneously or at certain intervals. Thus the refrigeration device (S) is regularly disinfected so that the shelf life of the products in the device is increased. In the second operation mode, the ozone source (1) supplies into the inner volume (S1) of the refrigeration device (S) an amount of ozone gas above the limits (i.e. 10 ppm) determined by the health institutions for certain period of time (i.e. 5-15 minutes). Before the second operation mode, the products inside the refrigeration device (S) are emptied and the door of the refrigeration device (S) is kept closed. In this way the need for a technical service is eliminated, and cleaning and disinfection procedure provided by the technical service is performed by the user at any time desired. After the end of the second operation mode, the door of the refrigeration device (S) is opened so as to aerate the said inner volume (S1), and it is made ready for re-use. The said switch (2) may either be mechanical switch (2) such as a dial-up knob or an electronic switch (2) such as a button.

[0014] In a preferred embodiment of the invention, the surfaces forming the ozone source (1) of the refrigeration device (S) are made of an anti-bacterial material. Thus, the number of bacteria in the air introduced into the ozone source (1) is also reduced, which results in a more sterile refrigeration device (S). Similarly, those parts where ozone outlet (1c) is located are also made of an anti-bacterial material.

[0015] In another preferred embodiment of the invention, the switch (2) of the refrigeration device (S) has a graded structure. Thus, in the second operation mode of the ozone source (1), the amount of ozone to be supplied into the inner volume (S1) and/or duration of the second operation mode may be adjusted by the user according to their needs. For example, based on the contamination level of the refrigeration device (S), the user may select the first grade of the switch (2) and determine the amount of the ozone gas to be supplied into the refrigeration device (S) as 5 ppm or may select a second grade in order to adjust it as 7 ppm or may select a third grade in order to adjust it as 10 ppm. In addition, for example, in a first position of the switch (2), the ozone source (1) provides 10 ppm ozone for 5 minutes whereas in a second grade of the switch (2) it provides 10 ppm for 10 minutes and in a third grade of the switch (2) it provides 10 ppm ozone

for 15 minutes. These periods and amounts may vary in various combinations. In this manner, the needs of the user may be satisfied at top level with a single application.

[0016] In another alternative embodiment of the invention, the refrigeration device (S) comprises at least one controlled valve (not shown) preferably positioned at the ozone outlet (1c). With this controlled valve, the amount of ozone introduced into the said inner volume (S1) may be adjusted. The said controlled valve may either be controlled manually or may be electronically controlled in connection with the control unit contained in the refrigeration device (S). In the embodiment where the said valve is electronically controlled, controlling of the ozone supplied from the ozone outlet (1c) may be adjusted according to the opening and closing of the door, in addition to the user preferences. Thus, for example in case the door is opened, ozone transfer into the inner volume (S1) is interrupted so as to prevent direct exposure of the user to the ozone gas or the amount of ozone supplied into the inner volume (S1) and/or the duration thereof may be adjusted based on the frequency of the opening/closing of the door. Therefore a more reliable refrigeration device (S) is developed.

[0017] In an alternative embodiment of the invention, the refrigeration device (S) comprises at least one timer (not shown) for periodic ozone transfer into the inner volume therein. This timer may either be associated with the said control unit or may be associated with the controlled valve. Thus, the refrigeration device (S) is used in a more efficient way.

[0018] In another preferred embodiment of the invention, the refrigeration device (S) comprises at least one ozone sensor (not shown) which measures the amount of ozone inside the inner volume (S1) in order to control the amount of ozone supplied into the inner volume (S1) and which is preferably positioned in the inner volume (S1). Thus, according to the ozone amount sensed and based on the user requirements, the refrigeration device (S) is operated in a controlled and reliable manner.

[0019] In another alternative embodiment of the invention, the refrigeration device (S) comprises at least one guiding member (S2) for conveying the ozone received from the ozone source (1) into different compartments inside the refrigeration device (S). The said guiding member (S2) may be in the form of a damper, flap or may have an air channel form. With the said guiding member (S2), ozone gas-air mixture reaches to all compartments, which are accordingly are sterilized.

[0020] In an illustrative embodiment of the invention, the ozone source (1) in the refrigeration device (S) is in the form of a system comprising compressed ozone gas (i.e. inside a tube). In another preferred embodiment of the invention, the said ozone source (1) is in the form of an ozone generator. In this embodiment, the ozone source (1) comprises at least one aperture (1a) and ambient air is inputted from this aperture (1a) so as to generate ozone gas which is in turn sent to the said inner volume (S1). In this embodiment, the ozone source (1) preferably comprises at least one filter (not shown). Thus, air received into the ozone source (1) is sterilized. In another embodiment, the ozone source (1) alternatively comprises at least one anti-bacterial cleaning system for same purposes. With the said cleaning system, ozone is rendered more sterilized.

[0021] With the refrigeration device (S) according to the present invention, in addition to the prevention of unwanted biological structures and unwanted odors - known in the prior art - resulting from ozone supply into the inner volume (S1) within the limits determined by the health institutions instantaneously or at certain intervals, and thereby disinfection thereof, provision is made for supply into the inner volume (S1) an amount of ozone gas above the limits determined by the health institutions, which is activated under the control of the user. Thus, in cases where the refrigeration device (S) is highly contaminated, the user can perform disinfection according to their own needs and at their discretion, without the need for a technical service to perform such disinfection. In addition, since the need for a technical service to perform this procedure is eliminated, maintenance cost is also reduced.

Claims

1. A refrigeration device (S) comprising at least one inner volume (S1) in which products to be cooled are placed, **characterized by** comprising;

   - at least one ozone source (1) supplying ozone gas into the said inner volume (S1) and having at least a first operation mode wherein an amount of ozone gas within the limits determined by the health institutions is supplied into the said inner volume (S1) instantaneously or at certain intervals, and at least a second operation mode wherein an amount of ozone gas above the limits determined by the health institutions is supplied into the inner volume (S1) of the refrigeration device (S) for certain period of time;
   - at least one switch (2) permitting the user to adjust the amount of ozone received from the ozone source (1) and to arrange the said operation modes under the control of the user;
   - at least one transfer line (1b) transferring the ozone received from the ozone source (1) into the said inner volume (S1);
   - at least one ozone outlet (1c) through which ozone received from the transfer line (1b) is introduced into the inner volume (S1) and which is positioned in the said inner volume (S1); and
   - at least control unit adjusting the amount of ozone received from the ozone source (1) in line with the commands from the said switch (2).

2. A refrigeration device (S) according to claim 1, **char-**

acterized in that the said switch (2) is a mechanical switch (2).

3. A refrigeration device (S) according to claim 1, **characterized in that** the said switch (2) is an electronic switch (2).

4. A refrigeration device (S) according to claim 1, **characterized in that** the surfaces forming the ozone source (1) of the refrigeration device (S) are made of an anti-bacterial material.

5. A refrigeration device (S) according to claim 1, **characterized in that** those parts where ozone outlet (1c) is located are made of an anti-bacterial material.

6. A refrigeration device (S) according to claim 1, **characterized in that** the said switch (2) has a graded structure such that in the second operation mode of the ozone source (1), the amount of ozone to be supplied into the inner volume (S1) and/or duration of the second operation mode may be adjusted by the user according to their needs.

7. A refrigeration device (S) according to claim 1, **characterized by** comprising at least one controlled valve adjusting the amount of ozone introduced into the said inner volume (S1).

8. A refrigeration device (S) according to claim 7, **characterized in that** the said controlled valve is positioned at the ozone outlet (1c).

9. A refrigeration device (S) according to claim 7 or 8, **characterized in that** the said controlled valve is a manually-controlled valve.

10. A refrigeration device (S) according to claim 7 or 8, **characterized in that** the said controlled valve is an electronically-controlled valve in connection with the control unit in the refrigeration device (S).

11. A refrigeration device (S) according to claim 1 or 7, **characterized by** comprising at least one timer for periodic ozone transfer into the inner volume therein.

12. A refrigeration device (S) according to claim 11, **characterized in that** this timer is connected with the said control unit.

13. A refrigeration device (S) according to claim 11, **characterized in that** this timer is connected with the controlled valve.

14. A refrigeration device (S) according to claim 1, **characterized by** comprising at least one ozone sensor which measures the amount of ozone inside the inner volume (S1) in order to control the amount of ozone supplied into the inner volume (S1).

15. A refrigeration device (S) according to claim 14, **characterized in that** the said ozone sensor is positioned in the inner volume (S1).

16. A refrigeration device (S) according to claim 1, **characterized by** comprising at least one guiding member (S2) for conveying the ozone received from the ozone source (1) into different compartments inside the refrigeration device (S).

17. A refrigeration device (S) according to claim 16, **characterized in that** the said guiding member (S2) is in the form of a damper, flap.

18. A refrigeration device (S) according to claim 16, **characterized in that** the said guiding member (S2) has an air channel form.

19. A refrigeration device (S) according to any one of the preceding claims, **characterized in that** the ozone source (1) in the refrigeration device (S) is in the form of a system comprising compressed ozone gas.

20. A refrigeration device (S) according to any one of the preceding claims, **characterized in that** the ozone source (1) in the refrigeration device (S) is in the form of an ozone generator comprising at least one aperture (1 a), through which ambient air is inputted so as to generate ozone gas.

21. A refrigeration device (S) according to claim 20, **characterized in that** the ozone generator (1) comprises at least one filter.

22. A refrigeration device (S) according to claim 20, **characterized in that** the ozone generator (1) comprises at least one anti-bacterial cleaning system.

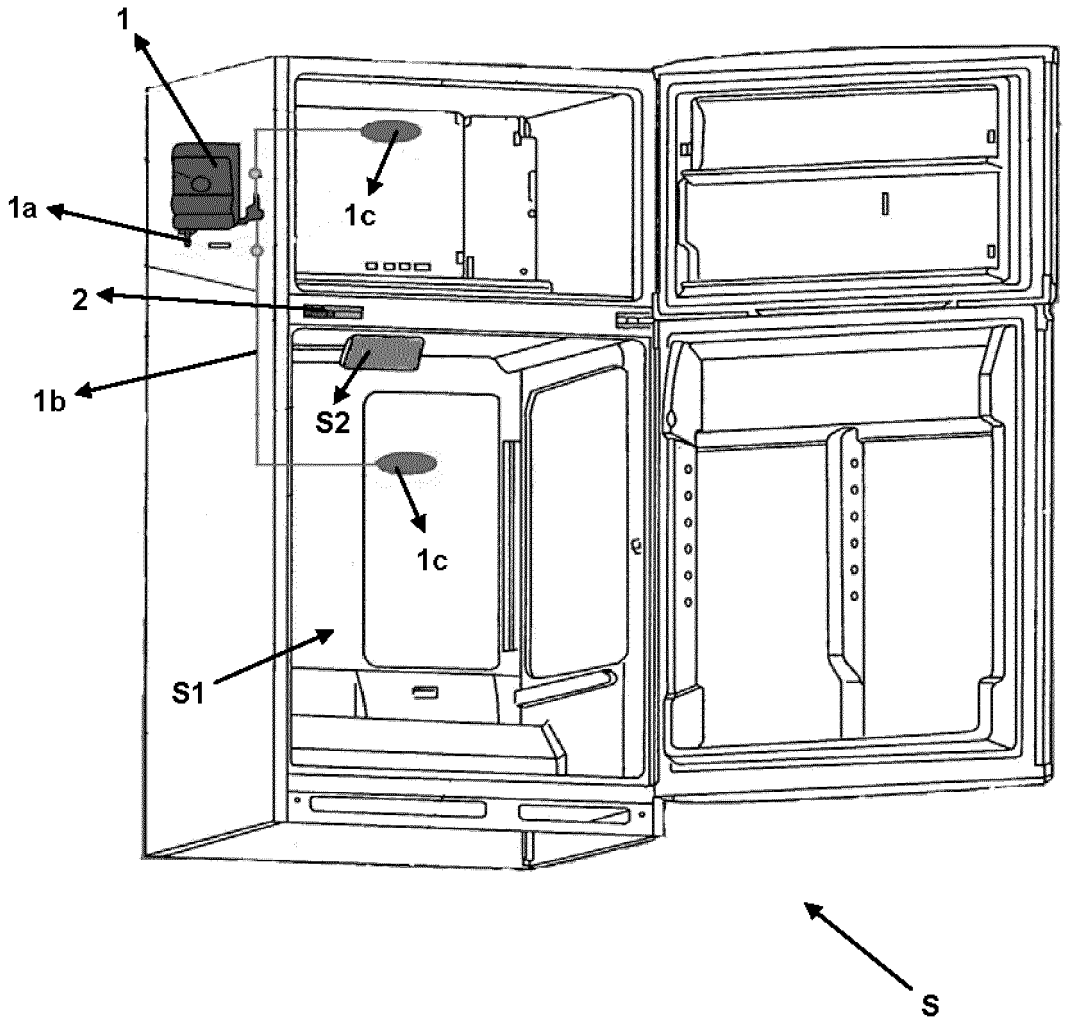

Figure 1

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EUROPEAN SEARCH REPORT

Application Number
EP 14 19 2606

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F24F
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 May 2015	Bejaoui, Amin

CATEGORY OF CITED DOCUMENTS

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