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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
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— *with international search report (Art. 21(3))*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: PROCEDURE FOR FOOD STRUCTURE IMPROVEMENT PRIOR TO COOKING AND RELATED EQUIPMENT

(57) Abstract: The invention consists in the definition of a procedure according to theoretical and experimental guidelines and related equipment that have allowed us to substantially modify regarding the prior art the treatment of food, especially of animal origin, in the Maturation and cooking phases, thus integrating most of the benefits of both processes. This process obtained according to the idea of the invention improves the characteristics of chewability, digestibility, presence of nutrients and hydration of the food. Moreover, this invention ensures the absence of toxic substances due to cooking processes and improves the contribution of food marination and aromatic substances.

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# DESCRIPTION

## BACKGROUND OF THE INVENTION.

### Field of application of the invention.

The fields of application of the invention in question may be identified:

1. Research in food technologies.
2. Large and small restaurants and catering.
3. Large and small distribution of food.

This invention relates to a new type of the device and the process bound to it, for the pre-cooking process and subsequent cooking phase of all foods, particularly those of animal origin.

## STATE OF THE ART

The treatment of some types of food before cooking is of fundamental importance in order to give such food some essential characteristics for human consumption, not only as regards the nutritional aspect but also regarding the taste of food and the pleasure derived from it. In this regard, the parameters such as the ease of chewing and the homogeneity of the tissues of food are not negligible and may deeply affect the success of sales and the distribution of the product. Speaking of meat, for example, the current state of the art provides processing protocol for certain cuts of this food so that the structure may change and enhance the characteristics to the detriment of others. It should be noted that the omission of these processing protocols before cooking make this food unpalatable and almost impossible to eat. The most important

procedure for purposes of this transformation is Ageing, where the muscle loses its rigidity due to enzymatic, chemical and physical transformations, being transformed into meat for human consumption. We may define this pre-cooking phase as meat maturation. Currently Ageing consists in storing the carcass of the animal, once it has been opened and cleaned, in a vertical position in an environment with controlled temperature and humidity. During Ageing different phenomena occur, which also affect the commercial factors: for example the lowering of the PH value (i.e. the degree of acidity) of the muscle and the relative loss of water from the tissue. This phenomenon changes the weight of the food and then the economic yield of the meat cut. The basic hardness of meat, i.e. its tenderness characteristic, is a parameter that depends also on the connective tissue present therein, as well as on the parameters of quantity and quality of the crosslinks. The traditional cooking phase, which is carried out at high temperature, modifies the tenderness parameters in a range that is more acceptable but by doing so it gives the food undesired characteristics. The most important are:

1. The high moisture loss both of proteins and carbohydrates. This situation often results in the kitchen use of sauces and substances to be added to the food in order to rehydrate it and render it soft.
2. The loss of nutrients.
3. An uninviting aspect.

Lastly, it should also be stressed that not all cuts of meat are equal and therefore the processes of Maturation and cooking are to depend on variables that are hardly controllable and may be assimilated to a single standard process for all types of meat. Regarding this heterogeneity of behaviour in many categories of food, a study has been launched on the foods in order to understand how to improve the state of the art of Maturation and cooking the meat to obtain from different types of animal muscle meat a product with a higher quality and palatability than that obtainable today with the prior art with a better yield regarding all respects (chewability, hydration of food, presence of most nutrients etc). This result, furthermore, has been seen to impact positively also on the economic yield from the sale of these foods. The study in question has led to the synthesis of a procedure and a device that is the object of the idea of the invention.

DESCRIPTION OF THE INVENTON

Procedure.

The invention consists in the definition of a procedure (which has been found) according to theoretical and experimental guidelines, which have allowed us to design and build a machine for the treatment of foods in the Maturation and cooking phases, thus integrating most of the benefits of both processes. With the example of meat, we have tried to understand how to obtain a method of Maturation that should intensify even more the characteristics of the food and make it reach a state of Maturation better than that of the

prior art. We will call this new type of Maturation a `Boosted Maturation". To obtain the Boosted Maturation we have resorted to a physical system to change the characteristics of the meat that characterise the final Hardness, i.e. the high presence in certain cuts of this food of the connective tissue discussed under paragraph `State of the Art". Excluding a priori a procedure for adding external substances, we have chosen a mechanical modelling action on the tissue provided primarily by waves of kinetic energy transmitted by ultrasound transducers. Such devices may in fact emit sound waves at a high frequency (with different levels of intensity and frequency) that impact on the food tissue when it is immersed in a liquid, causing a great change in the basic Hardness of the food. This is possible because the ultrasound waves inside the liquid create the formation of small air bubbles, which, due to the effect of the inhomogeneity of the pressure in the liquid itself, implode and allow to release their kinetic energy on the fibres of the food. This procedure was developed with the following conditions:

1. The meat must be immersed in a liquid to be affected in an effective manner by the ultrasounds but enclosed inside a container to allow not to be contaminated by the treatment liquid; such container shall permit the addition of aromatic and/or marinading substances during maturation. In fact it has been proved that during this phase, the marinade and the presence of aromatic substances is particularly enhanced with respect to the prior art. The container that hosts the food

must therefore be impermeable to liquids but permeable to the ultrasound waves transmitted in the liquid, making an effective transduction of these waves therein. This parameter must be taken into consideration during the electric driving of transducers; during this sequence, in fact, one must consider the transfer function of the energy in the container. The presence of the container that is impermeable to liquids and permeable to the ultrasound waves with its physical-mechanical characteristics is therefore essential to obtain a Boosted Maturation with ultrasound that allows important physical/structural food modifications.

2. The temperature of the food during boosted maturation with ultrasound must be kept constant in order to have excellent effectiveness. To ensure this condition can occur, it is necessary that the temperature of water or liquid surrounding the container where the food is inserted be treated with the emission of ultrasound waves, both controlled and then kept at the right value also by means of a recirculation that allows homogeneity in the distribution of thermal energy.
3. The modulation and the discretisation of the intensity of the ultrasound signal, the duration, range of frequencies and duty cycle are determined according to a function that is based on the idea of the invention. For every type of food subjected to the process of ultrasound Boosted Maturation there is a range of frequencies (DeltaF) [Fig7 (70)] a range of Power

(DeltaI) [Fig7 (71) a range of duration (DeltaT) [Fig7 (72)] and a range of cycle of emission of the ultrasound in the unit of time, i.e. the Duty Cycle (DeltaD) [Fig7 (73) such as to stabilise the temperature of the liquid that immerses the food in a predetermined range, avoiding its uncontrolled increase due to the effect of ultrasound. This controlled temperature value allows to avoid the cooking of food during the maturation phase. To obtain this requirement, according to the idea of the invention, we carry out an analysis of the energy levels of the harmonics constituting the driving signal of the ultrasound. By associating a correct power value to the harmonics, it is possible to control the amount of energy and then check the variation of the temperature to which the liquid is subjected, by distributing different levels of this energy in the frequency spectrum of the driving signal of the ultrasound transducers.

4. The necessary temperature stabilisation is to be further controlled according to the idea of the invention through a decrease of the gas dissolved in the liquid contained in the tank. This is possible because the maturation process is started in the tank under vacuum, i.e. a physical state that allows the stabilisation of the gaseous exchange between the liquid and the air contained in the tank itself. The physical status of the vacuum decreases the effect of refraction of ultrasound waves during scattering in the liquid as the lesser

presence of gas increases the ease of wave propagation and subsequently limits the increase in temperature of the liquid.

5. The physical status of the vacuum also allows to make constant the value of the acoustic impedance of the liquid, which then becomes a constant and not a variable. This factor is related to the amount of gas dissolved in the liquid. Making the value of the impedance of the liquid constant, this renders predictable the amount of power of the ultrasound wave in the impermeable containers that contain the product to be matured. This condition allows a controlled and stable scattering during time and for the energy transduced inside the container, allowing for control and a forecast of the result of the maturation induced by the ultrasound system.

Device.

The device created on the basis of the idea of the invention consists in its main parts in a tank made of stainless steel or other material [Fig1) (10) fitted with watertight cover [Fig1) (11) and equipped with one or more arrays of transducers for ultrasound waves [Fig1) (12) that may be transmitted in its cavity. The ultrasound transducers are coupled to a diverging convex metal lens with the appropriate size, positioned in the area of emission of the transducer. This lens allows to focus the energy of the ultrasound wave and is suitably designed according to the limits of the physical law of Snell-Descartes on Refraction, in order to minimise the generation of standing waves. The liquid inside the tank [Fig1 (18)] is circulated by a pump [Fig1

(13) while a second air intake pump [Fig1) (14) allows you to create a state of vacuum when necessary, between the liquid contained in the tank [Fig1 (18)] and the watertight cover [Fig1) (11). There are heating elements [Fig1 (15)], pressure [Fig1 (16)] temperature [Fig1 (17)] and liquid level sensors [Fig.1 (100)]. All devices listed inserted in the tank, i.e. those that generate ultrasound waves [Fig1 (12)], that measure pressure [Fig1 (16)], temperature [Fig1 (17)], liquid level [Fig.1 (100)], which produce heating [Fig1) (15), which generate a vacuum [Fig1) (14) and which move the liquid inside the tank [Fig1 (13)] are controlled by an external PLC [Fig1 (19) equipped with the appropriate drivers and with a user interface that allows the operator to display a monitor of the states and/or programs and/or edit the desired functions. In particular the liquid level sensor [Fig.1 (100)] allows you to automatically turn off the device that is the object of the idea of the invention, in order to avoid that the action of the ultrasound waves without the liquid contained in the tank (or with too low a level) is able to destroy the same equipment and/or make it dangerous for the user. The device made according to the idea of the invention of Fig.1 capable of performing the treatment according to the idea of the invention is described in the chapter "Description of the invention: Procedure", and it is designed to accommodate the container inside [Fig.2 (20)). Such container is equipped with an openable side [Fig.2 (21)] with hermetic closure [Fig.2 (22) made of a material that is permeable to both a temperature conditioning supplied from the outside and the

ultrasound waves generated outside it. There is food to be treated inside the container of Fig.2 [Fig.2 (23)). In addition to food, it is possible to insert in this container also a marinating liquid [Fig.3 (31)] and/or contour substances that may improve the olfactory and/or taste and/or nutritional characteristics of the food. The structure of the food container [Fig.4 (40)] is designed with a material such as to confer a strong permeability to ultrasound waves [Fig.4 (41) coming from the outside from the ultrasound transducers [Fig.1 (12)). These waves scatter inside [Fig.4 (42)] thanks to the physical properties of the structural material with which the container is built according to the idea of the invention where the density of the material constituting the container is selected to assume a value of acoustic impedance entirely similar to that of the liquid in which the tank is immersed in. This physical characteristic, permitted for example by the modelling of plastic materials such as polypropylene and polyamide, allows the adaptation of acoustic impedance between the liquid and the container, allowing the maximum energy transfer of ultrasound waves in its interior. [Fig.4 (40)).

Procedure of ultrasound boosted maturation by means of the device according to the idea of the invention.

One or more containers of the food [Fig5 (52)] are placed inside the device for ultrasound boosted maturation, and more precisely inside the tank [Fig5 (50)] automatically filled with the liquid [Fig5 (51)] under the strict control of the level sensor [Fig5 (500)]. At this point the treatment procedure is activated by means of the ultrasound

transducers [Fig5 (54)]. The pump [Fig6 (68) sucks the air contained inside the tank above the level of the water. The ultrasound waves [Fig5 (57)] strike the containers [Fig5 (52)], which transmit their energy inside the containers themselves [Fig5 (58)]. The air conditioning system of the temperature of the liquid is activated by heating elements [Fig5 (53)] while the recirculation of the liquid is carried out through the pump [Fig5 (55)] in order to better distribute the thermal energy. The temperature sensor [Fig5 (56)] monitors this parameter while all control is managed by the central PLC [Fig5 (59)]. Once the ultrasound Boosted Maturation has been carried out, the food inside of suitable containers [Fig2 (23)] has better physical/structural characteristics than a standard maturation process, i.e. that of the current State of the Art. The device made according to the idea of the invention at this point may optionally cook the food.

Cooking procedure by means of the device according to the idea of the invention.

Once the top cover [Fig6 (61)] of the tank [Fig6 (60)] has been sealed, the heating elements [Fig6 (62) will be activated to obtain an ideal liquid temperature [Fig6 (603)] and the speed of the pump is increased [Fig6 (63)] to create a greater and more sustained kinetic action given by the movement of the liquid [Fig6 (67)] in the food container [Fig6 (65). This action of the fluid, determined by the increased kinetic energy supplied by the pump [Fig6 (63)], is transmitted to the inside of the container [Fig6 (65)] thanks to the

semi-rigid nature of the material of which it is composed. We then activate the ultrasound transducers [Fig6 (64)] using a different profile of energy emission with respect to that supplied during the ultrasound Boosted Maturation phase. At the same time we activate the pump [Fig6 (68) to suck the air contained inside the tank above the level of the water. The execution of the vacuum between the liquid [Fig6 (603)] and the top cover [Fig6 (61) allows to increase the effectiveness of the ultrasound stimulation to the container immersed, also amplified by the strong kinetic movement imparted to the water [Fig6 (67)] from the pump [Fig6 (63)]. All these features are enabled and adjusted by the PLC [Fig6 (69)] under strict control of the indications of the temperature[Fig6 (601)] and pressure [Fig6 (602)] sensor. Once we have completed the cooking procedure it is possible to extract the food from the tank [Fig6 (60)] and the related container [Fig6 (65).

ADVANTAGES OF THE INVENTION

We describe below the advantages obtained by the processes of ultrasound Boosted Maturation according to the procedure and the device described according to the idea of the invention.

1. In ultrasound Boosted Maturation the food reaches a degree of homogeneity of the tissues greater than the state of the art of classical Maturation. This facilitates cooking, improves chewability and the nutritional quality of the treated food.

2. In ultrasound Boosted Maturation, we obtain a drastic reduction of the basic Hardness of the food if compared to the state of the art of classical Maturation.
3. In ultrasound Boosted Maturation, we carry out a transformation of the connective tissue of the food in its gelatinous form in a quantity greater than the state of the art of Ageing.
4. In ultrasound Boosted Maturation, we obtain a drastic reduction of the ageing time if compared to the state of the art.
5. In ultrasound Boosted Maturation, less water is lost from the tissues with respect to the state of the art of Ageing.
6. In ultrasound Boosted Maturation, it is possible to integrate in the food a marinade and/or aromatic substances with a higher efficiency with respect to the prior art in the treatment of foods.
7. Ultrasound Boosted Maturation takes place under strict control of the temperature on the food thanks to the method of parameterisation of the energy levels of the harmonics constituting the ultrasound wave.

We describe below the advantages obtained by the cooking methods according to the procedure and the device described according to the idea of the invention.

1. The food has the possibility to better stretch its fibres thanks to a distribution of heat without temperature gradients, resulting in a much more uniform method than traditional cooking. Cooking according to the idea of the invention is performed

with the use of a quantity of energy lower than other food cooking methods (e.g., grid, oven etc.) and less time with respect to traditional cooking techniques. This provides a high energy yield of the cooking device according to the idea of the invention.

2. Cooking according to the idea of the invention increases the digestibility of food.
3. The low temperature does not allow the proteins to reach the isoelectric point and therefore this restricts the loss of water molecules.
4. The nutrients are preserved due to the effect of low temperature. Cooking according to the idea of the invention the food preserves more nutritional levels (e.g. proteins and enzymes) with respect to the various traditional cooking methods.
5. Cooking according to the idea of the invention the temperature values administered to food are lower than those of the various types of traditional cooking, always avoiding chemical-structural alterations that can lead to the formation of toxic substances.
6. Cooking according to the idea of the invention makes food more hydrated and more pleasant to mastication with respect to the various various traditional cooking methods.

REFERENCE DOCUMENT

¿ DE102004011922

# CLAIMS

1) Procedure for the Maturation of food before cooking based on the controlled and parameterised administration of kinetic energy and thermal energy under vacuum of the cellular tissue forming the food by means of one or more transducers that emit ultrasound waves [Fig1 (12)] acting in a liquid [Fig1 (18) contained in a tank [Fig1) (10) placed in a vacuum state [Fig6 (68)], put in motion by a circulation pump [Fig1 (13) characterised by the following:

- The liquid [Fig1 (18)] immerses the food to be treated [Fig2] (23), which is inserted into a suitable plastic container impermeable to liquid [Fig2 (22)] but permeable to ultrasound waves.
- The ultrasound transducers [Fig8 (80)] are coupled to a convex lens [Fig 8 (82) positioned in the area of emission of the ultrasound transducer [Fig8 (81).

2) Maturation procedure according to claim 1 in which the levels of Intensity, Modulation, range of Frequencies and the Duty Cycle of the energy supplied to the food through the ultrasounds are parameterised [Fig.7] in order to keep constant the temperature of the liquid in the tank [Fig1 (10)] and stabilise the presence of gas dissolved in the liquid [Fig1 (18)].

3) Procedure for cooking food carried out by the administration of ultrasound [Fig6 (64)], a thermal method [Fig6 (62)] and the administration of kinetic energy to the food placed in the

appropriate container [Fig6 (65) thanks to the forced circulation of liquid [Fig6 (63)(67)]. This cooking is performed under vacuum [Fig6 (68)] and at a controlled temperature to obtain a limited thermal shock on the food.

4) Equipment capable of applying the procedures of ultrasound Boosted Maturation and cooking of claims 1, 2 and 3, constituted by a tank [Fig1 (10)] that is sealed and openable [Fig1) (11), capable of generating the state of vacuum thanks to an air suction pump [Fig1 (114)], an array of ultrasound transducers integrated into the tank [Fig1 (12)], a recirculation system of a liquid contained therein [Fig1 (13)] with an automatic control of its level [Fig1 (100)], a heating system of all the walls of the tank by means of electrical resistance [Fig1) (15), a series of temperature [Fig1 (17)] and pressure sensors [Fig1 (16)] and one or more waterproof plastic containers [Fig5 (52).

5) Equipment of claim 4, wherein each electronic and electromechanical device related to it [Fig1 (12)(13)(14)(15)(16)(17)(100)] is controlled by a PLC [Fig1 (19)] with which the user may start, stop, edit and add one or more procedures for cooking and ultrasound Boosted Maturation.

6) Plastic material that is impermeable to liquids [Fig2 (20), insertable inside the tank of the equipment of claims 4 and 5, capable of being scattered inside an ultrasound wave [Fig4 (42)] when stimulated with an ultrasound transducer characterised by

the density of the material of which it is composed, which confers an acoustic impedance equal to the value of the liquid in which it is immersed [Fig5 (52)] in the tank.

7) Plastic material container that is impermeable to the liquids of claim 6 [Fig4 (40), permeable to thermal conditioning induced from the outside.

8) Device according to claims 5 and 6, equipped with an improved energy efficiency compared to the state of the art thanks to the use of the ultrasound transducers [Fig6 (64)] and the state of vacuum [Fig6 (68)] that increases the efficiency of the scattering of the ultrasound waves in the liquid [Fig1 (18)].

Drawings

Fig1

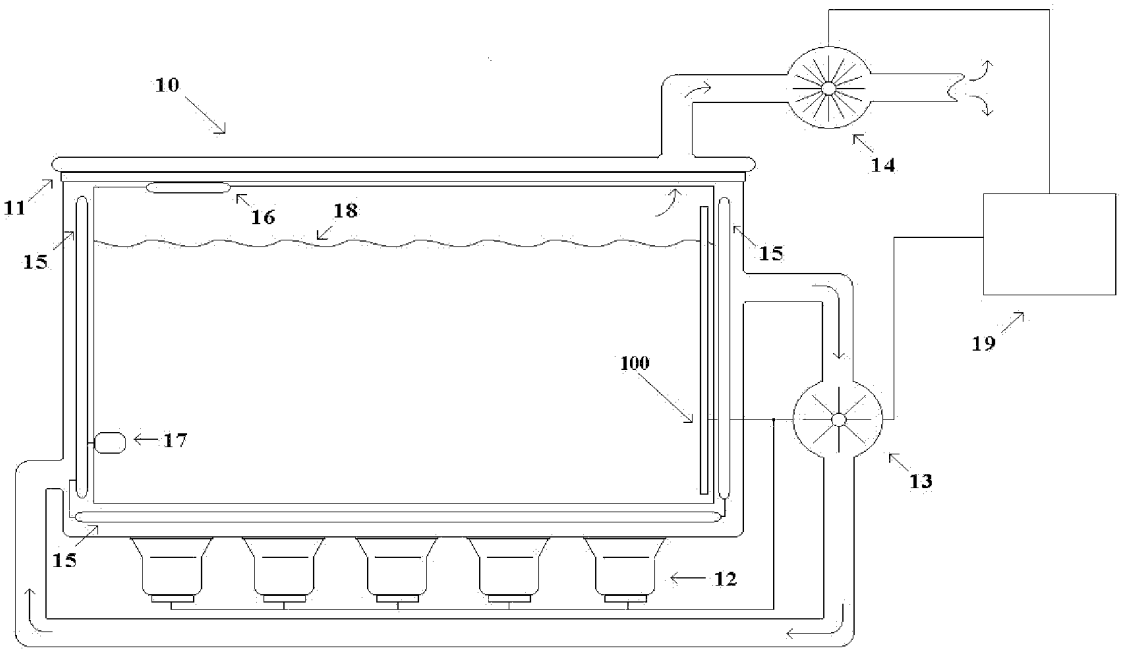


Fig2

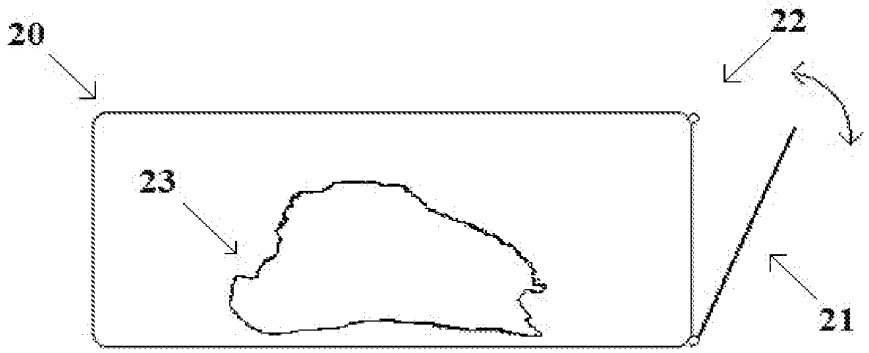

Fig3

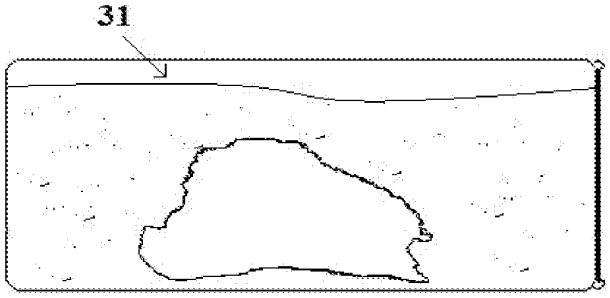


Fig4

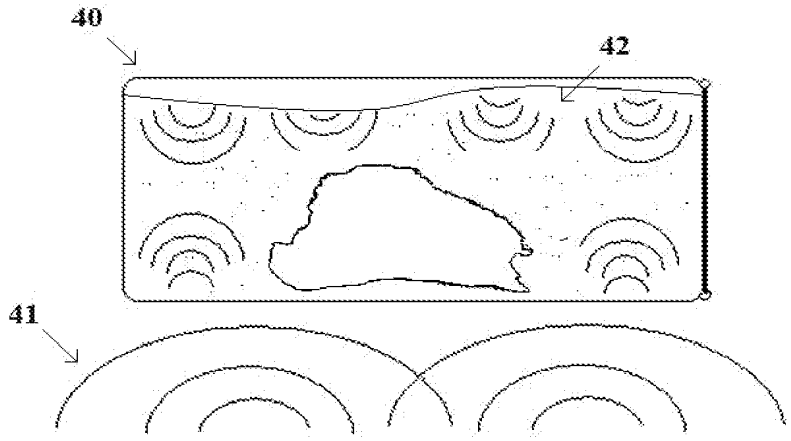


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Fig5

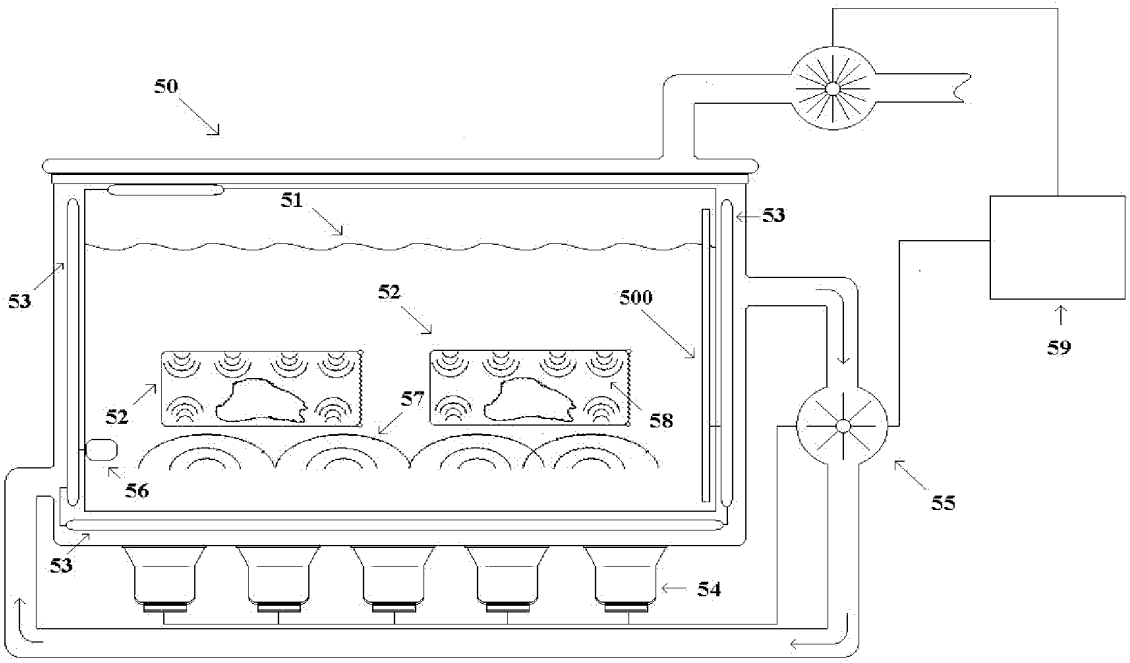
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Fig6

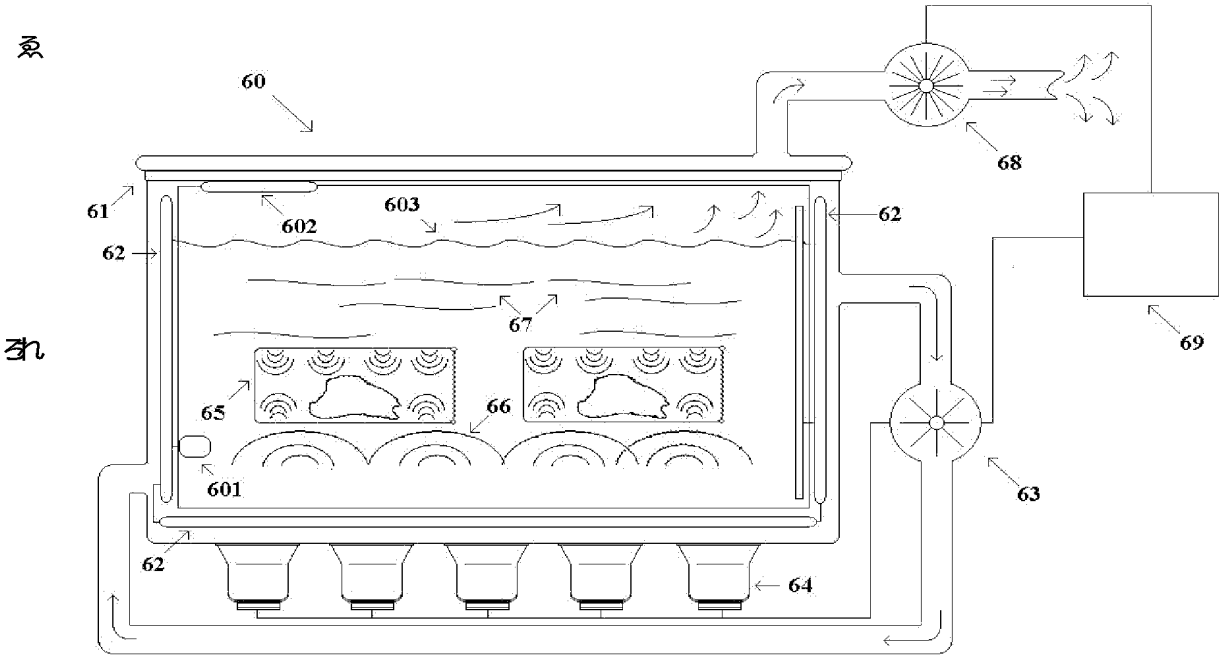
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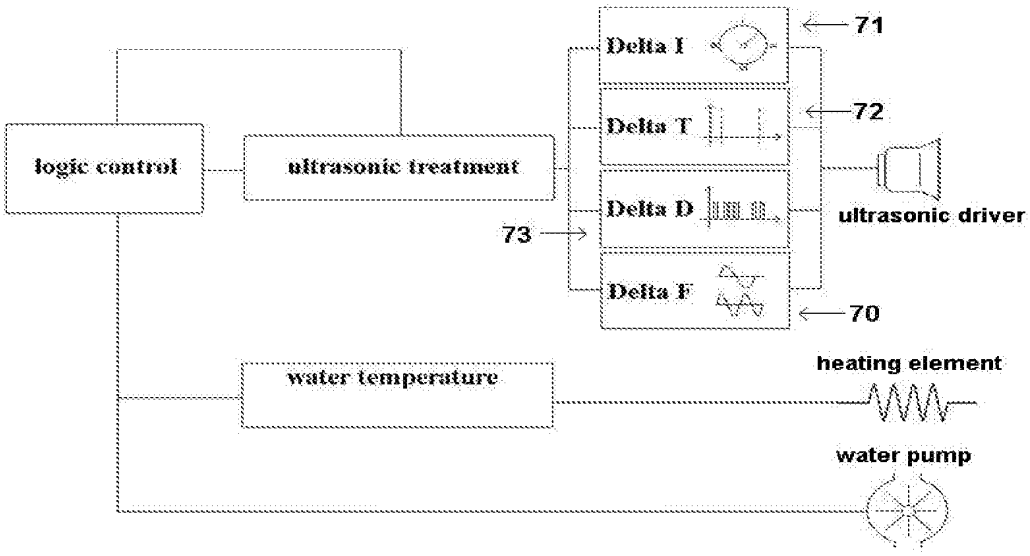
Fig7


Delta I
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Delta T
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logic control
ultrasonic treatment
Delta D
ultrasonic driver
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Delta F
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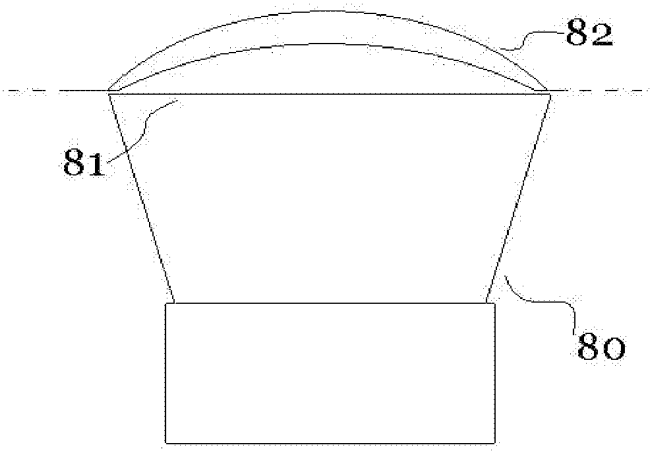
heating element
water temperature
water pump

Fig8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# INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2017/053465

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23L3/30 A23L5/10 A23L5/30 A23L13/70
ADD.

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

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data, BIOSIS, EMBASE, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | GB 2 458 739 A (SONIWAVE LTD [GB])<br>7 October 2009 (2009-10-07)<br>abstract<br>figures 1-3<br>pages 2-7 | 4,5,8 |
| X | JP 2003 047395 A (PRIMA MEAT PACKERS LTD)<br>18 February 2003 (2003-02-18)<br>abstract<br>paragraphs [0003], [0008], [0011], [0014], [0026], [0030], [0031], [0032], [0033]<br>figures 1,14 | 4,5,8 |

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
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| 11 August 2017 | 09/11/2017 |

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| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | JAYASOORIYA ET AL: "Effect of high power ultrasound and ageing on the physical properties of bovine Semitendinosus and Longissimus muscles", MEAT SCIENCE, ELSEVIER SCIENCE, GB, vol. 75, no. 4, 30 January 2007 (2007-01-30), pages 628-639, XP005865770, ISSN: 0309-1740, DOI: 10.1016/J.MEATSCI.2006.09.010 abstract pages 629-630 page 637 | 1,2,4,5, 8 |
| A | T.S. AWAD ET AL: "Applications of ultrasound in analysis, processing and quality control of food: A review", FOOD RESEARCH INTERNATIONAL, vol. 48, no. 2, 1 October 2012 (2012-10-01), pages 410-427, XP055036423, ISSN: 0963-9969, DOI: 10.1016/j.foodres.2012.05.004 abstract figure 2 pages 411-413 page 423 | 1,2,4,5, 8 |
| A | HAI-JUN CHANG ET AL: "Effects of Ultrasound Treatment on Connective Tissue Collagen and Meat Quality of Beef Semitendinosus Muscle", JOURNAL OF FOOD QUALITY., vol. 38, no. 4, 2 July 2015 (2015-07-02), pages 256-267, XP055327500, US ISSN: 0146-9428, DOI: 10.1111/jfq.12141 the whole document | 1,2,4,5, 8 |
| A | JAYASOORIYA S D ET AL: "EFFECT OF HIGH POWER ULTRASOUND WAVES ON PROPERTIES OF MEAT: A REVIEW", INTERNATIONAL JOURNAL OF FOOD PROPERTIES, MARCEL DEKKER, NEW YORK, NY, US, vol. 7, no. 2, 1 January 2004 (2004-01-01) , pages 301-319, XP008075539, ISSN: 1094-2912, DOI: 10.1081/JFP-120030039 the whole document | 1,2,4,5, 8 |

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# INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2017/053465

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | WO 2007/033416 A1 (SIMPLOT AUSTRALIA PTY LTD [AU]; CURULLI FRANCA [AU]; KLINGLER MARIO [A) 29 March 2007 (2007-03-29)<br>abstract<br>pages 3-4<br>claims 1-24 | 1,2,4,5,8 |
| A | DE 10 2004 011922 A1 (SEE GMBH & CO KG DEUTSCHE [DE])<br>29 September 2005 (2005-09-29)<br>cited in the application<br>abstract<br>paragraphs [0012] - [0014]<br>figure 1 | 1,2,4,5,8 |
| A | DE 101 02 903 A1 (RATIONAL AG [DE])<br>1 August 2002 (2002-08-01)<br>abstract<br>claims 1-7<br>page 1 | 1,2,4,5,8 |

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# INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2017/053465

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1, 2(completely); 4, 5, 8(partially)

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/** 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 2(completely); 4, 5, 8(partially)

   process for maturation of food before cooking and apparatus for carrying out said process

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2. claims: 3(completely); 4, 5, 8(partially)

   process for cooking food and apparatus for carrying out said process

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3. claims: 6, 7

   plastic material container

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2017/053465

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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| JP 2003047395 A | 18-02-2003 | NONE | |
| WO 2007033416 A1 | 29-03-2007 | CA 2622928 A1 | 29-03-2007 |
| | | EP 1937086 A1 | 02-07-2008 |
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| | | US 2009087524 A1 | 02-04-2009 |
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