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CELL THAWING DEVICE

Abstract

A cell thawing device is provided. A cell thawing device according to one embodiment of the present invention is a cell thawing device for thawing biological material comprising cells, the cell thawing device comprising: a housing; a body part which is disposed inside the housing and may form an accommodation space so as to surround at least a portion of a container in which the biological material is stored; a moving part for moving the body part toward the container so that the body part forms the accommodation space; a heating part which is installed in the body part and transfers heat to the container disposed in the accommodation space; and a sensing part for detecting a physical quantity of the body part or the container, wherein a heat transfer space is formed between the body part and the container such that heat can be transferred from the body part to the container in a non-contact manner.

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Background/Summary

TECHNICAL FIELD

[0001] The present invention relates to a cell thawing device.

BACKGROUND ART

[0002] In general, various biological materials are stored in a container such as a vial for long-term storage, and then stored at a low temperature.

[0003] As an example, plasma and tissue cells are stored at a maximum of −100 degrees Celsius, and stem cells are stored at a cryogenic temperature of up to −165 degrees Celsius by using a liquid nitrogen gas phase.

[0004] On the other hand, the experiments and usage of biological materials are performed in an environment whose temperature is higher than the storage temperature of the aforementioned low-temperature state. Therefore, in order to use the low-temperature biological material, the process of heating the same to thaw is required.

[0005] To this end, there has been proposed a cell thawing device that thaws a biological material by accommodating a container such as a vial and then heating the same under a certain condition.

[0006] However, in the case of conventionally proposed cell thawing devices, the method of transferring heat in a state of direct contact with a container has been adopted. Therefore, in the case of such cell thawing devices, there is a problem in that it is difficult to uniformly heat the container as a whole, and there is also a problem in that the container may be cracked or deformed when a high-temperature heating element directly contacts the container.

[0007] Considering this situation, it is urgent to develop a cell thawing device which is capable of uniformly heating the container as a whole and stably protecting the container during heating.

DISCLOSURE

Technical Problem

[0008] The present invention has been devised in view of the above points, and an object of the present invention is to provide a cell thawing device which is capable of uniformly heating the container as a whole while ensuring the stability of a container when heating the container including a biological material.

[0009] In addition, another object of the present invention is to provide a cell thawing device which is capable of effectively heating a container while increasing the efficiency of energy usage.

Technical Solution

[0010] In order to achieve the above-described objects, the present invention provides a cell thawing device for thawing a biological material including cells, the cell thawing device including a housing; a body part which is disposed inside the housing and may form an accommodation

space so as to surround at least a portion of a container in which the biological material is stored; a moving part for moving the body part toward the container such that the body part forms the accommodation space; a heating part which is installed in the body part and transfers heat to the container disposed in the accommodation space; and a sensing part for detecting a physical quantity of the body part or the container, wherein a heat transfer space is formed between the body part and the container such that heat can be transferred from the body part to the container in a non-contact manner.

[0011] In addition, the accommodation space may be formed in a cylindrical shape to correspond to the shape of the container, and the diameter of the accommodation space may be formed to be larger than the diameter of the container by a predetermined width.

[0012] In this case, the predetermined width may be 0.2 mm to 0.3 mm.

[0013] In addition, in the body part, a protruding member may be formed on an upper portion of an opposing surface facing the container so as to protrude up to an outer peripheral surface of the container along the circumferential direction of the opposing surface.

[0014] In addition, the body part may include a first body which surrounds one side portion of the container; and a second body which surrounds the other side portion of the container and forms the accommodation space together with the first body.

[0015] In addition, the moving part may include a rotation shaft; a moving member which is movably coupled to the rotation shaft; a first link member which connects one side of the moving member and the first body; and a second link member which connects the other side of the moving member and the second body, wherein as the moving member moves, the first body and the second body may be moved away from or closer to the container in the accommodation space.

[0016] In addition, the heating part may include a first heating part which is disposed on an outer side of the first body opposite to an opposing surface facing the container; and a second heating part which is disposed in the second body and arranged to be symmetrical to the first heating part with respect to the container.

[0017] In addition, the heating part may include a heater which is in contact with the body part through a contact surface; and a heat insulating member which surrounds an outer side of the heater excluding the contact surface such that heat generated from the heater is transferred in a direction toward the container.

[0018] In addition, the heater may include a heating element which generates heat when power is applied; and a support body which is made of a ceramic material and surrounds at least a portion of the heating element.

[0019] In addition, the sensor part may include a non-contact sensor that is disposed at a predetermined distance from the body part and provides information on whether the container is placed in the accommodation space.

[0020] In addition, the non-contact sensor may be an infrared sensor.

[0021] In addition, the cell thawing device may further include a control part which comprehensively controls the operations of the moving part, the heating part and the sensor part, wherein the control unit may be configured not to apply a control signal to operate the moving part or the heating part, when it is determined that the container is not present in the accommodation space based on information transmitted from the sensor part.

Advantageous Effects

[0022] According to the present invention, by heating a container which is disposed in the accommodation space formed by the body part through a non-contact heating manner using convection and radiation, the container can be uniformly heated along the longitudinal direction.

[0023] The present invention can prevent the cracks or thermal deformation of a container that may occur during heat conduction through contact by introducing the above-described non-contact heating manner.

[0024] In addition, the present invention can indirectly heat the container through a beating part,

thereby preserving the heat of the body part for a certain period of time. As a result, the present invention can improve the efficiency of energy usage during the continuous heating of a plurality of containers.

Description

DESCRIPTION OF DRAWINGS

[0025] FIG. **1** is a perspective view showing a cell thawing device according to one embodiment of the present invention;

[0026] FIG. **2** is a perspective view showing a body part, a moving part, a heating part and a sensor part of the cell thawing device according to one embodiment of the present invention;

[0027] FIG. **3** is a separation view of FIG. **2**;

[0028] FIG. **4** is a perspective view showing the formation of an accommodation space by the body part in FIG. **2**;

[0029] FIGS. **5** and **6** are cross-sectional views of FIG. **2**;

[0030] FIG. **7** is a view showing a heating part of the cell thawing device according to one embodiment of the present invention;

[0031] FIG. **8** is a side view of FIG. **2**; and

[0032] FIG. **9** is a block diagram for explaining the integrated control of a control part of the cell thawing device according to one embodiment of the present invention.

MODES OF THE INVENTION

[0033] Hereinafter, with reference to the accompanying drawings, the exemplary embodiments of the present invention will be described in detail so that those skilled in the art can easily practice the present invention. The present invention may be embodied in many different forms and is not limited to the exemplary embodiments set forth herein. In order to clearly describe the present invention in the drawings, parts that are irrelevant to the description are omitted, and the same reference numerals are assigned to the same or similar components throughout the specification. In addition, the size or shape of the components illustrated in the drawings may be exaggerated for the clarity and convenience of description.

[0034] The cell thawing device **100** according to one embodiment of the present invention is a device for heating and thawing a biological material that is maintained in a low temperature state (e.g., frozen state). Herein, the biological material may include cells, which are the structural basic unit of an organism.

[0035] In this case, in terms of heating a container **10** (hereinafter, referred to as a ‘container’) in which the biological material is stored, the cell thawing device **100** according to one embodiment of the present invention may heat the container in a non-contact manner in order to heat the container **10** more stably and effectively. Herein, the container **10** may be a known experimental/medical container such as a vial, a beaker or a test tube.

[0036] To this end, the cell thawing device **100** according to one embodiment of the present invention may include a housing **110**, a body part **120**, a moving part **130**, a heating part **140**, a sensor part **150** and a control part **160**.

[0037] First of all, referring to FIG. **1**, the housing **110** forms an outer surface of the cell thawing device **100**, and it may include a space such that the body part **120**, the moving part **130**, the heating part **140**, the sensor part **150** and the control part **160** to be described below may be disposed therein.

[0038] In this case, an opening **111** having a predetermined diameter may be formed in an upper portion of the housing **110** such that the container **10** may be inserted into the housing **110**. Herein, the opening **111** may be formed in a circular shape as illustrated in the drawings to correspond to the container **10** formed in a cylindrical shape. As a result, when the container **10** is inserted

through the opening **111**, only a cap part **11** of the container **10** may be exposed from the outside.
[0039] In addition, a manipulation part **112** for manipulating the operation of the cell thawing device **100** according to one embodiment of the present invention may be provided outside the housing **110**.
[0040] In this case, the manipulation part **112** is a medium for transmitting a command to the control part **160** to be described below, and it may be, for example, a pressurized physical button or a capacitive touch button. Through this, the user can transmit, for example, commands related to operation and stop of the cell thawing device **100**, heating temperature control and the like to the control part **160**.
[0041] Next, referring to FIGS. **2** and **3**, the cell thawing device **100** according to one embodiment of the present invention may include a body part **120** for forming an accommodation space S**1** inside the housing **110** so as to surround part or all of the container **10** described above.
[0042] As a specific example, the body part **120** may include a first body **121** and a second body **123** that are respectively disposed on both sides of the container **10**.
[0043] In this case, as illustrated in FIG. **3**, the first body **121** and the second body **123** may have opposing surfaces **122**, **124** that are curved inward to correspond to the shape of an outer circumferential part **12** of the container **10** formed in a cylindrical shape. That is, the opposing surfaces **122**, **124** may be formed by including curved surfaces obtained by cutting a cylinder in a vertical direction.
[0044] Through this, when the first body **121** and the second body **123** come into contact with each other as illustrated in FIG. **4**, the opposing surfaces **122**, **124** which are respectively formed on the first body **121** and the second body **123** may be connected to each other to form an accommodation space S**1** in a cylindrical form so as to sufficiently surround an outer side of the container **10**.
[0045] However, although the body part **120** is illustrated as including only the first body **121** and the second body **123** in the drawings, the example of the body part **120** of the cell thawing device **100** according to one embodiment of the present invention is not limited thereto.
[0046] In other words, the body part **120** is formed as a single entity, but may be formed so as to be able to adjust the diameter, or in addition to the first body **121** and the second body **123**, it may be formed by further including a third body (not illustrated) or a fourth body (not illustrated).
[0047] In one embodiment of the present invention, the body part **120** may be formed of a material having excellent thermal conductivity, such as metal.
[0048] Through this, the heat transferred to the body part **120** by the heating part **140**, which will be described below, is finally transferred to the opposing surfaces **122**, **124** via the body part **120** such that the container **10** adjacent to the opposing surfaces **122**, **124** may be heated.
[0049] In addition, the body part **120** may be formed to have a heat capacity that is higher than a certain level. This allows the body part **120** to keep the heat transferred from the heating part **140** inside for a certain period of time rather than immediately radiating the same to the outside, and thus, when a plurality of containers are sequentially heated, the time required for initial heating is minimized to enhance the efficiency of energy consumption.
[0050] Meanwhile, in one embodiment of the present invention, the opposing surfaces **122**, **124** forming the accommodation space S**1** and the outer circumferential part **12** of the container **10** maintain a non-contact state in which they do not come into contact with each other, and accordingly, non-contact heat transfer may be formed from the body part **120** to the side of the container **10**.
[0051] Hereinafter, the non-contact heating manner of the cell thawing device **100** according to one embodiment of the present invention will be described in more detail with reference to FIG. **5**.
[0052] As illustrated in FIG. **5**, when the first body **121** and the second body **123** are adjacent to the container **10** to form the accommodation space S**1**, a heat transfer space S**2** having a predetermined volume may be formed between the opposing surfaces **122**, **124** of the first body **121** and the second body **123** and the outer circumferential part **12** of the container. Herein, the heat transfer

space S**2** may be an outer part of the above-described accommodation space S**1**.
[0053] In this case, the reason that the heat transfer space S**2** may be formed is that as illustrated in FIG. **5**, the diameter D**1** of the accommodation space S**1** formed by the first body **121** and the second body **123** is formed to be greater than the diameter D**2** of the outer circumferential part **12** of the container by predetermined widths (D**1**-D**2**).
[0054] By forming the heat transfer space S**2** in this way, heat may be transferred from the high-temperature body part **120** to the side of the container **10** in a relatively low-temperature state through convection and radiation (instead of conduction).
[0055] As such, the cell thawing device **100** according to one embodiment of the present invention may transfer heat uniformly along the longitudinal direction of the container **10**, by using heat transfer through convection and radiation. That is, it is possible to prevent heat transfer from being biased to a specific area of the container **10** compared to a case in which a high-temperature body part or a heater is directly contacted to transfer heat.
[0056] Moreover, it is possible to prevent cracks or thermal deformation that may occur when the body part or the heater directly contacts the outer circumferential part **12** of the container, which is made of glass or plastic and has low strength.
[0057] In one embodiment of the present invention, the predetermined widths (D**1**-D**2**) formed between the opposing surfaces **122**, **124** of the body part **120** and the outer circumferential part **12** of the container may be 0.2 mm to 0.3 mm. These numerical values have been derived through repeated experiments, and these numerical values have been derived by comprehensively considering that if the heat transfer space is too large, excessive energy is required, and conversely, if the heat transfer space is too small, heat transfer through convection and radiation may be minimal.
[0058] Referring to FIGS. **5** and **6**, the body part **120**, for example, the upper portion of the opposing surfaces **122**, **124** facing the container in the first body **121** and the second body **123** of the container **10** may be formed with a protruding member **125** that can locally contact a portion of the outer circumferential part **12** of the container **10**.
[0059] In this case, the protruding member **125** may be formed to protrude from the opposite surfaces **122**, **124** in a direction of the container **10**, and it may have a ring shape by being continuously formed along the circumferential direction of the outer circumferential part **12** of the container.
[0060] As such, the cell thawing device **100** according to one embodiment of the present invention may spatially block the upper region of the heat transfer space S**2** through the protruding member **125**. Through this, by minimizing the heat flowing outward from the heat transfer space S**2** to the outer side of the body part **120**, the heat transfer efficiency may be maximized.
[0061] Meanwhile, the protruding member **125** may be formed of a material having elasticity in order to mitigate impact upon contact with the outer circumferential part **12** of the container and maximize the contact area. However, the material of the protruding member **125** is not limited thereto, and the protruding member **125** may be formed of the same material as the body part **120**, by being integrally formed with the body part **120** in consideration of the convenience of fabrication.
[0062] The cell thawing device **100** according to one embodiment of the present invention may include a base part **170** on which the container **10** can be seated.
[0063] In this case, as illustrated in FIG. **3**, in the center of the base part **170**, a seating groove **171** having an area corresponding to a flange part **13** that is formed in a lower portion of the container **10** may be formed to maintain a stable state when the container **10** is seated. By inserting the flange part **13** of the container **10** into the seating groove **171**, the container **10** may maintain an upright state without tilting in any one direction.
[0064] In addition, although not illustrated in the drawings, the center of the base part **170** may be formed with a seating protrusion (not illustrated) which is formed to protrude in a direction toward

a flange groove (not illustrated) so as to be inserted into the flange groove that is formed on a lower surface of the flange part **13**.

[0065] Moreover, in one embodiment of the present invention, when the first body **121** and the second body **123** are moved by the moving part **130**, the base part **170** may function as a guide rail to guide the movement of the first body **121** and the second body **123**. That is, when an external force is applied from the moving part **130** while the first body **121** and the second body **123** are movably coupled to the base part **170**, it may be moved along the longitudinal direction of the base part **170**.

[0066] Referring to FIGS. **3** to **6**, the cell thawing device **100** according to one embodiment of the present invention may include a moving part **130** for moving the body part **120** described above.

[0067] Specifically, before the container **10** is inserted into the housing **110**, the body part **120** may be disposed in a state of being spaced apart from each other around the seating groove **171** in which the container **10** is seated, as illustrated in FIG. **2**. This is to allow the container **10** to enter the inside of the housing **110** freely without being affected by the first body **121** and the second body **123**, when the container **10** is inserted into the inside of the housing **110**.

[0068] Afterwards, when the container **10** is inserted into the housing **110**, the first body **121** and the second body **123** form the above-described accommodation space S**1**, and in order to limit the heating range, as illustrated in FIG. **5**, it may be moved closer to the container **10** by the moving part **130**.

[0069] As a non-limiting example, such a moving part **130** may be formed by including a rotating shaft **131**, a moving member **132**, a first link member **133** and a second link member **134** as illustrated in FIGS. **5** and **6**.

[0070] In this case, the rotating shaft **131** may be a member that is capable of rotating in a clockwise or counterclockwise direction around a direction perpendicular to the ground, and for example, it may be directly connected to an electric motor to perform the above-described shaft rotation.

[0071] In this regard, the movable member **132** may be movably coupled to an outer side of the rotation shaft **131**, and may rise or fall in a direction perpendicular to the ground when the rotation shaft **131** rotates axially.

[0072] In this case, in order to convert a rotational motion of the rotating shaft **131** into a linear motion of the moving member **132**, for example, the outer circumferential surface of the rotating shaft **131** and the inner circumferential surface of the movable member **132** may respectively be formed with a screw thread (not illustrated) that is formed to engage with each other. However, the above-described example is only an example of the rotating shaft **131** and the moving member **132**, and other various structures that are capable of converting rotational motion into linear motion, such as a ball screw structure, may be applied.

[0073] Meanwhile, one end portion of each of the first link member **133** and the second link member **134** may be rotatably connected to both sides of the movable member **132**. In addition, the other end portions of the first link member **133** and the second link member **134** may be rotatably connected to the first body **121** and the second body **123**, respectively.

[0074] Accordingly, as illustrated in FIG. **5**, when the moving member **132** is raised or lowered by the axis rotation of the rotating shaft **131**, as the first link member **133** and the second link member **134** connected to the moving member **132** are moved in a direction away from or closer to the rotating shaft **131**, the first body **121** and the second body **123** connected thereto may also move away from or closer to the container **10** located above the rotating shaft **131**.

[0075] In this case, the first link member **133** and the second link member **134** have the same length such that the first body **121** and the second body **123** may be symmetrically moved to each other with respect to the container **10**. As a result, when the first body **121** and the second body **123** come into contact to form the accommodation space S**1**, it is possible to form the accommodation space S**1** with high airtightness without tolerance.

[0076] As described above, while the cell thawing device **100** according to one embodiment of the present invention is provided with a moving part **130** having a relatively simple structure, it has the advantage in that the first body **121** and the second body **123** may form left-right symmetry with high precision.
[0077] Meanwhile, the detailed configuration and movement mechanism of the moving part **130** described above is only an example of the moving part **130**, and the application of the cell thawing device **100** according to one embodiment of the present invention is not limited thereto. That is, other than the above-described examples, various structures of the moving part **130** may be applied.
[0078] The cell thawing device **100** according to one embodiment of the present invention may include a heating part **140** that transfers heat to the body part **120**.
[0079] In this case, the heating part **140** is a member that is capable of converting electrical energy into heat, and as illustrated in FIGS. **4** and **5**, it may be installed on one side of the body part **120** so as to be in contact with the body part **120**. Through this, the heating part **140** may transfer heat to the side of the body part **120** having thermal conductivity by using a conduction phenomenon.
[0080] In one embodiment of the present invention, the heating part **140** may include a first heating part **140***a* which is installed on the first body **121** and a second heating part **140***b* which is installed on the second body **123**.
[0081] In this case, referring to FIGS. **5** and **6**, the first heating part **140***a* and the second heating part **140***b* may be disposed parallel to the longitudinal direction of the container **10** on the outer side opposite to the opposing surfaces **122**, **124** facing the container, among the first body **121** and the second body **123**, respectively.
[0082] Through this, the heating part **140** may transfer heat uniformly without being biased to any one side with respect to the longitudinal direction of the container **10** in which the biological material is stored.
[0083] In addition, the first heating part **140***a* and the second heating part **140***a* may be disposed symmetrically with respect to the container **10**. As a result, the first heating part **140***a* and the second heating part **140***b* may be heated to have the same or similar heat distribution between the first body **121** and the second body **123** that are disposed on both sides of the container **10**.
[0084] In one embodiment of the present invention, referring to FIG. **7**, the heating part **140** may include a heater **141** and a heat insulating member **144**.
[0085] Specifically, the heater **141** may directly contact the first body **121** or the second body **123** through a contact surface to transfer heat toward the body part **120**.
[0086] In addition, the heat insulating member **144** may be formed of a material having heat insulating properties, and as illustrated in FIG. **7**, it is arranged to surround an outer side of the heater **141** except for the contact surface **145**, thereby preventing the heat generated from the heater **141** from leaking out in directions other than the body part **120**.
[0087] Through this, the cell thawing device **100** according to one embodiment of the present invention may induce the heat generated from the heater **141** to be intensively transferred only in a direction toward the container **10**, that is, toward the body part **120**. As a result, it is possible to improve the consumption efficiency of thermal energy, and it is possible to suppress an abnormal increase in the temperature of the inner space of the housing **110** such that mechanical stability may be secured.
[0088] Meanwhile, as a non-limiting example, the heater **141** may be formed of a ceramic heater.
[0089] More specifically, the heater **141** may include a heating element **142** which is formed of a resistor having a predetermined resistance and generating heat when power is applied, and a support body **143** surrounding the heating element **142**.
[0090] In this case, the support body **143** may be made of a ceramic material such as, for example, alumina, ZrO.sub.2, MgO, Si.sub.3N.sub.4, SiC, AlN, ZTA and the like. Through this, the cell thawing device **100** according to one embodiment of the present invention may secure reliability even under operating conditions where heating and cooling are repeatedly performed, and may

improve the lifespan cycle of the product.
[0091] In addition, as illustrated in the drawings, the support body **143** has a predetermined area and is arranged to surround the heating element **142**, thereby expanding the transfer area of heat diffused from the heating element **142**. As a result, since the heating area can be increased with respect to the body part **120** having a large area compared to the heating element **142**, there is an advantage in that the body part **120** may be uniformly heated as a whole.
[0092] However, the type of the heater **141** is not limited to the above-described ceramic heater, and various known heaters may be applied as needed.
[0093] Meanwhile, although the drawings illustrated that the heating part **140** is installed outside the body part **120**, according to the design, the heating part **140** may be installed inside the body part **120** so as not to be observed from the outside.
[0094] The cell thawing device **100** according to one embodiment of the present invention may include a sensor part **150** for sensing the physical quantity of the above-described body part **120** or container **10**. Herein, the physical quantity may be at least one of temperature, humidity, weight and distance.
[0095] In this case, the sensor part **150** may include a first sensor **151** and a second sensor **152**.
[0096] First of all, the first sensor **151** is for sensing the temperature of the first body **121** or the second body **123**, and as illustrated in FIG. **8**, it may be a contact sensor installed in direct contact with the first body **121** or the second body **123**.
[0097] As a non-limiting example, the first sensor **151** may be formed of a known contact type sensor such as a thermocouple, a resistance thermometer (RTD) or a thermistor.
[0098] As such, the first sensor **151** may more precisely measure the temperature through direct contact with the body part **120**, and may transmit the measured temperature information to the control part **160** to be described below.
[0099] Next, referring again to FIG. **8**, the second sensor **152** may be a non-contact sensor that is disposed to be spaced apart from the body part **120** unlike the first sensor **151**.
[0100] In this case, the second sensor **152** may detect whether the container **10** is located inside the body part **120**. This is to prevent the body part **120** from overheating due to an error in an operation command even when the container **10** is not disposed within the housing **110**.
[0101] As an illustrative example, the second sensor **152** may be formed of an infrared sensor (IR sensor). In this case, the infrared sensor detects a minute temperature change that occurs when the container **10** is located on the body part **120** even when the container **10** is spaced apart from the body part **120** such that it is possible to detect whether the container **10** is located inside the body part **120**.
[0102] That is, in the cell thawing device **100** according to one embodiment of the present invention, the heating part is not located in a region adjacent to the outer circumference **12** of the container **10**, but as described above, the heating part **140** is located at a relatively far distance from the opposing surfaces **122**, **124** adjacent to the container **10** such that the infrared sensor may not be affected by noise caused by the initial heating of the heating part **140**. Accordingly, although the infrared sensor is a non-contact sensor, it may relatively detect accurately whether the container **10** has entered.
[0103] However, the second sensor **152** may be various known non-contact sensors such as an ultrasonic sensor and a magnetic sensor, in addition to the above-described infrared sensor.
[0104] Meanwhile, the second sensor **152** may be located in a state of being installed in a separate fixture **153** at a distance adjacent to the body part **120** so as to be spaced apart from the body part **120** by a predetermined distance D**3**.
[0105] In this way, the reason why the second sensor **152** is disposed to be spaced apart from the body part **120** is that when the second sensor **152** is installed in the body part **120** to measure a physical quantity related to the container **10**, it may lower the airtightness of the accommodation space S**1**.

[0106] Moreover, when the sensor is disposed to be spaced apart from the body part **120** like the second sensor **152**, it is possible to prevent the durability of the sensor from deteriorating by a repeated temperature increase inside the accommodation space S**1** even if a separate heat insulating member is not added to the sensor.
[0107] The cell thawing device **100** according to one embodiment of the present invention may include a control part **160** that integrally controls the operations of the moving part **130**, the heating part **140** and the sensor part **150** described above.
[0108] In this case, the control part **160** may control the moving part **130**, the heating part **140** and the sensor part **150** based on a user's command transmitted from the manipulation part **112**.
[0109] In addition, the control part **160** may perform the determination by itself.
[0110] As a specific example, referring to FIG. **9**, if the control part **160** determines that the container **10** is absent in the body part **120** based on the information transmitted from the second sensor **152**, it may not apply a control signal for operating the moving part **130** or the heating part **140**.
[0111] Conversely, when it is determined that the container **10** is located within the body part **120**, the control part **160** may apply a control signal to operate the moving part **130** or the heating part **140** by a user's command or automatically.
[0112] Through this, it is possible to prevent energy from being wasted due to overheating of the body part **120** by the heating part **140** in the absence of the container **10**. Particularly, for example, before product shipment, repetitive test operations are required to check the performance of the product, and in this case, only when the container **10** is present in the accommodation space S**1** by the control part **160** described above, it is possible to improve the convenience of work by automatically operating the cell thawing device **100**.
[0113] Although one exemplary embodiment of the present invention has been described above, the spirit of the present invention is not limited to the exemplary **10** embodiments presented herein, and those skilled in the art who understand the spirit of the present invention may easily suggest other exemplary embodiments by changing, modifying, deleting or adding components within the scope of the same spirit, but this will also fall within the scope of the present invention.

Claims

1. A cell thawing device for thawing a biological material including cells, the cell thawing device comprising: a housing; a body part which is disposed inside the housing and may form an accommodation space so as to surround at least a portion of a container in which the biological material is stored; a moving part for moving the body part toward the container such that the body part forms the accommodation space; a heating part which is installed in the body part and transfers heat to the container disposed in the accommodation space; and a sensing part for detecting a physical quantity of the body part or the container, wherein a heat transfer space is formed between the body part and the container such that heat can be transferred from the body part to the container in a non-contact manner.
2. The cell thawing device of claim 1, wherein the accommodation space is formed in a cylindrical shape to correspond to the shape of the container, and wherein the diameter of the accommodation space is formed to be larger than the diameter of the container by a predetermined width.
3. The cell thawing device of claim 2, wherein the predetermined width is 0.2 mm to 0.3 mm.
4. The cell thawing device of claim 2, wherein in the body part, a protruding member is formed on an upper portion of an opposing surface facing the container so as to protrude up to an outer peripheral surface of the container along the circumferential direction of the opposing surface.
5. The cell thawing device of claim 1, wherein the body part comprises: a first body which surrounds one side portion of the container; and a second body which surrounds the other side portion of the container and forms the accommodation space together with the first body.

6. The cell thawing device of claim 5, wherein the moving part comprises: a rotation shaft; a moving member which is movably coupled to the rotation shaft; a first link member which connects one side of the moving member and the first body; and a second link member which connects the other side of the moving member and the second body, wherein as the moving member moves, the first body and the second body may be moved away from or closer to the container in the accommodation space.

7. The cell thawing device of claim 5, wherein the heating part comprises: a first heating part which is disposed on an outer side of the first body opposite to an opposing surface facing the container; and a second heating part which is disposed in the second body and arranged to be symmetrical to the first heating part with respect to the container.

8. The cell thawing device of claim 1, wherein the heating part comprises: a heater which is in contact with the body part through a contact surface; and a heat insulating member which surrounds an outer side of the heater excluding the contact surface such that heat generated from the heater is transferred in a direction toward the container.

9. The cell thawing device of claim 8, wherein the heater comprises: a heating element which generates heat when power is applied; and a support body which is made of a ceramic material and surrounds at least a portion of the heating element.

10. The cell thawing device of claim 1, wherein the sensor part comprises a non-contact sensor that is disposed at a predetermined distance from the body part and provides information on whether the container is placed in the accommodation space.

11. The cell thawing device of claim 10, wherein the non-contact sensor is an infrared sensor.

12. The cell thawing device of claim 1, further comprising: a control part which comprehensively controls the operations of the moving part, the heating part and the sensor part, wherein the control unit is configured not to apply a control signal to operate the moving part or the heating part, when it is determined that the container is not present in the accommodation space based on information transmitted from the sensor part.