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Inventor(s)	Murakami; Seigo

Sample producing apparatus

Abstract

A sample producing apparatus configured to produce an observation sample by placing an observation target object on a surface of a liquid pool on an optically transparent plate and then removing the liquid pool, comprising a holding unit configured to hold the plate, and a tilting unit configured to tilt the plate such that a liquid of the liquid pool on the plate held by the holding unit is discharged.

Inventors: **Murakami; Seigo (Kumamoto, JP)**

Applicant: **HIRATA CORPORATION** (Kumamoto, JP)

Family ID: **1000008765801**

Assignee: **HIRATA CORPORATION (Kumamoto, JP)**

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Primary Examiner: Nagpaul; Jyoti

Attorney, Agent or Firm: Buchanan Ingersoll & Rooney PC

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S) (1) This application is a continuation of International Patent Application No. PCT/JP2019/034768 filed on Sep. 4, 2019, the entire disclosures of which is incorporated herein by reference.

TECHNICAL FIELD
(1) The present invention mainly relates to a sample producing apparatus.
BACKGROUND ART
(2) An observation sample used in a microscope observation or the like is generally produced by placing an observation target object such as a tissue piece on an optically transparent plate that is also called a microscope slide (see PTL 1).
CITATION LIST
Patent Literature
(3) PTL 1: Japanese Patent Laid-Open No. 2010-266394
SUMMARY OF INVENTION
Technical Problem
(4) In a sample producing apparatus configured to produce the observation sample, improvements are required from various viewpoints such that an operator can produce an observation sample at a high working efficiency in a relatively short moving distance or within a predetermined moving range.
(5) It is one of the objects of the present invention to improve the working efficiency when producing an observation sample.
Solution to Problem
(6) One aspect of the present invention is related to a sample producing apparatus, and the sample producing apparatus is a sample producing apparatus configured to produce an observation sample by placing an observation target object on a surface of a liquid pool on an optically transparent plate and then removing the liquid pool, comprising a holding unit configured to hold the plate, and a tilting unit configured to tilt the plate such that a liquid of the liquid pool on the plate held by the holding unit is discharged.
Advantageous Effects of Invention
(7) According to the present invention, the working efficiency when producing an observation sample is improved.

Description

BRIEF DESCRIPTION OF DRAWINGS
(1) FIG. **1** is a perspective view showing an example of the configuration of a sample producing system;
(2) FIG. **2** shows a plan view and a front view showing an example of the configuration of the sample producing system;
(3) FIG. **3** is a perspective view showing the outer appearance of a sample producing apparatus viewed obliquely from above on the front side;
(4) FIG. **4** is a perspective view showing the outer appearance of the sample producing apparatus viewed obliquely from above on the rear side;
(5) FIG. **5** is a perspective view showing an example of the internal configuration of the sample producing apparatus;
(6) FIG. **6** is a perspective view for explaining each mechanism of an observation target object imparting unit;

(7) FIG. **7** is a schematic view for explaining an example of work contents in the sample producing apparatus;
(8) FIG. **8** is a view for explaining an example of the configuration of a placement member;
(9) FIG. **9** is a side view for explaining each mechanism of the observation target object imparting unit;
(10) FIG. **10** is a schematic view for explaining an example of an observation sample producing method;
(11) FIG. **11** is a schematic view for explaining an example of an observation sample producing method;
(12) FIG. **12** is a schematic view for explaining an example of an observation sample producing method;
(13) FIG. **13** is a perspective view for explaining an example of the configuration of a post-processing portion;
(14) FIG. **14** is a view for explaining an example of the configuration of a sample storage portion;
(15) FIG. **15** is a view for explaining another example of the configuration of the placement member;
(16) FIG. **16** is a schematic view for explaining another example of the observation sample producing method;
(17) FIG. **17** is a schematic view for explaining another example of the observation sample producing method;
(18) FIG. **18** is a schematic view for explaining another example of the observation sample producing method;
(19) FIG. **19** is a view for explaining still another example of the configuration of the placement member; and
(20) FIG. **20** is a view for explaining still another example of the configuration of the placement member.

DESCRIPTION OF EMBODIMENTS

(21) Hereinafter, embodiments will be described in detail with reference to the attached drawings. Note, the following embodiments are not intended to limit the scope of the claimed invention, and limitation is not made to an invention that requires a combination of all features described in the embodiments. Two or more of the multiple features described in the embodiments may be combined as appropriate. Furthermore, the same reference numerals are given to the same or similar configurations, and redundant description thereof is omitted.

First Embodiment

(22) [Sample Producing System]
(23) FIG. **1** is a perspective view showing an example of the entire configuration of a sample producing system SY according to the first embodiment. The system SY includes a sample producing apparatus **1**, a working table **91**, an observation target object producing device **92**, a chair **93**, an input device **94**, a computer **95**, a display terminal **96**, and an input terminal **97**.
(24) To facilitate understanding, FIG. **1** shows an X direction, a Y direction, and a Z direction, which cross each other (these are sometimes shown in other views to be described later). The X direction is one direction in the horizontal direction of the sample producing apparatus **1** and corresponds to the left-and-right direction or the widthwise direction. The Y direction is the other direction orthogonal to the one direction in the horizontal direction of the sample producing apparatus **1** and corresponds to the front-and-rear direction or the depth direction. The Z direction is the vertical direction of the sample producing apparatus **1** and corresponds to the up-and-down direction or the height direction. For example, the side in the −Y direction corresponds to the front side, and the side in the +Y direction corresponds to the rear side. Also, for example, the side in the +Z direction corresponds to the upper side, and the side in the −Z direction corresponds to the lower side.

(25) FIG. **2**(A) is a plan view of the system SY, and FIG. **2**(B) is a front view of the system SY.
(26) As will be described later in detail, the sample producing apparatus **1** produces a predetermined observation sample using an observation target object imparted by a working subject. Here, the observation target object is a tissue piece that is obtained by slicing a block formed by solidifying, using paraffin or the like, a tissue taken from a subject such as a patient (an observation target object OB to be described later). The observation sample is produced by placing the observation target object on an optically transparent plate (an observation sample SPL to be described later). This plate can also be expressed as a microscope slide, a sample plate, an observation target object placement plate, an optical observation plate, or the like (a plate PL to be described later). In addition, the working subject is a subject that performs a work concerning sample production and is typically an operator such as a technician, or may be a working robot including an imparting mechanism (manipulator or the like) configured to impart an observation target object. In this embodiment, the working subject is "operator", which will simply be referred to as an "operator" hereinafter.
(27) The working table **91** is a desk used by the operator to perform a work associated with production of an observation sample. The observation target object producing device **92**, the display terminal **96**, and the input terminal **97** are installed on the working table **91**. The operator can perform a work (for example, management or recording of information concerning an observation sample) on the working table **91** using these. The operator can also perform another work (for example, for example, a writing work). The sample producing apparatus **1** and the working table **91** are juxtaposed in the X direction. That is, the working table **91** is installed on a side (here, the side in the +X direction) of the sample producing apparatus **1**.
(28) In this embodiment, the observation target object producing device **92** is a microtome that produces a tissue piece as an observation target object. As another embodiment, the observation target object producing device **92** may be another device, for example, a medical instrument or an experimental instrument. As will be described later in detail, on the working table **91**, the observation target object producing device **92** is installed on the side of the sample producing apparatus **1**.
(29) In this embodiment, the chair **93** is a chair with casters. This allows the operator sitting on the chair **93** to easily move between the sample producing apparatus **1** and the working table **91** when performing a work.
(30) In this embodiment, the input device **94** is a foot switch installed under the working table **91**. The operator can perform a predetermined operation input by pressing the input device **94** with a foot. The input device **94** is electrically connected to the sample producing apparatus **1** by a cable (not shown), and as will be described later in detail, the sample producing apparatus **1** advances the step of a work in response to a predetermined operation input to the input device **94**.
(31) Note that as another embodiment, the input device **94** may wirelessly be connected to the sample producing apparatus **1**. As still another embodiment, the input device **94** may be installed on the working table **91**. Also, in place of the foot switch, a lever, a joystick, or the like to be operated by a hand or foot of the operator may be employed, or various kinds of motion sensors to be operated by the motion of a head, an eye, a hand, or a foot may be employed. Furthermore, the input device **94** may be an instrument that performs input by recognizing the voice, thinking, or the like of the operator.
(32) The computer **95** is a general-purpose computer and is installed under the working table **91** here. In this case, when the computer **95** is installed on the side opposite to the side of the sample producing apparatus **1**, the operator can be prevented from erroneously interfering with the computer **95**. As the display terminal **96**, a known display such as a liquid crystal display or a monitor is preferably used. As the input terminal **97**, a known input operation element such as a keyboard or a mouse is preferably used. The operator can, for example, perform information management concerning the observation sample using the input terminal **97** while visually

recognizing information indicating a plate and an observation target object on the display terminal **96**.

(33) [Sample Producing Apparatus]

(34) FIG. **3** is a perspective view showing the sample producing apparatus **1** viewed obliquely from above on the front side. FIG. **3** shows the sample producing apparatus **1** in a state in which a plurality of opening/closing members are opened. FIG. **4** is a perspective view showing the sample producing apparatus **1** viewed obliquely from above on the rear side. FIG. **4** shows the sample producing apparatus **1** in a state in which a plurality of opening/closing members are closed. The apparatus **1** includes a housing **100** including an exterior panel, and a plurality of units (to be described later) that implement the functions of the apparatus **1** are stored in the housing **100**.

(35) The sample producing apparatus **1** further includes elements **191** to **197** attached to parts (F**11** and the like to be described later) of the housing **100**. As will be individually described later in detail, for example, the front wall portion (front panel) F**11** of the housing **100** is provided with the opening/closing member **191**, the opening/closing member **192**, the storage portion **193**, and the plate material **196** as the above-described elements. For example, a side wall portion (side panel) F**12** of the housing **100** on the side of the working table **91** is provided with the opening/closing member **194**. For example, a side wall portion (side panel) F**14** opposite to the side wall portion F**12** of the housing **100** is provided with the opening/closing member **195**. Also, for example, a rear wall portion (rear panel) F**15** of the housing **100** is provided with the window member **197**.

(36) As will be described later in detail, a corner wall portion (corner panel) F**13** is provided at the corner portion between the front wall portion F**11** and the side wall portion F**12**. The corner wall portion F**13** is connected to one end portion (or one edge portion) of the front wall portion F**11** and one end portion of the side wall portion F**12**. That is, the housing **100** has a shape (chamfered shape) chamfered at the corner portion. The above-described wall portions F**11** to F**15** form the exterior panel of the housing **100**. Some or all of these may be molded integrally or separately. Note that the side wall portion F**12** corresponds to one side wall portion, and the side wall portion F**14** corresponds to the other side wall portion.

(37) The upper front surface of the housing **100** is provided with an operation display panel **181**. The operator can confirm the operation state (including a work progress state or the like) of the sample producing apparatus **1** based on display contents displayed on the operation display panel **181**. In addition, various kinds of settings of the sample producing apparatus **1** can be input to the operation display panel **181**. Examples of the input of various kinds of settings are information input of identification information **1131** to be described later, setting input of a temperature management time in a heating unit **122** to be described later, and temperature setting input in the sample producing apparatus **1**. In addition, operations in manually performing the operations of various kinds of units and an automatic driving operation in automatically operating various kinds of units can also be input to the operation display panel **181**. Note that as the operation display panel **181**, a known touch panel display is used, and the operation display panel **181** may simply be expressed as an operation panel, a display panel, or the like.

(38) FIG. **5** is a perspective view showing the internal structure of the sample producing apparatus **1**. The apparatus **1** further includes a pre-processing portion **11**, a post-processing portion **12**, a sample storage portion **13**, a transfer unit **14**, and an observation target object imparting unit **15**. As will be described later in detail, the pre-processing portion **11** includes units **111** to **114** configured to perform pre-processing that is processing before impartment of an observation target object. Also, the post-processing portion **12** includes units **121** to **123** configured to perform post-processing that is processing after impartment of an observation target object. The sample storage portion **13** is a unit configured to store (or save or keep) a produced observation sample. The sample storage portion **13** may simply be expressed as a storage portion, or may be expressed as a sample saving portion (or a saving portion simply) or a sample keeping portion (or a keeping portion simply). In this embodiment, the transfer unit **14** is a manipulator capable of gripping a

plate. The transfer unit **14** receives a plate with an imparted observation target object from the post-processing portion **12** as the observation sample SPL and transfers it to the sample storage portion **13**.

(39) The observation target object imparting unit **15** is a unit that is accessible when the operator imparts an observation target object. The unit **15** is installed at an access point for the operator when imparting the observation target object (an observation target object imparting position or an imparting position P**10** simply). The unit **15** may be expressed as a working subject access unit, an observation target object receiving unit, or the like from the viewpoint of receiving the observation target object from the operator.

(40) The sample producing apparatus **1** further includes control units **172** and **173**. For example, the control unit **172** performs drive control of the pre-processing portion **11**, the unit **15**, and the post-processing portion **12**, and also performs management control of the entire sample producing apparatus **1**. The control unit **173** performs dedicated drive control to drive the transfer unit **14**. As another embodiment, some of the functions of a unit (for example, the unit **173**) may be implemented by another unit (for example, the unit **172**), or some or all of the functions of these may be implemented by a single unit.

(41) Each of the control units **172** and **173** can typically be configured to incorporate a control board on which electronic components such as an ASIC (Application Specific Integrated Circuit) are mounted. However, the present invention is not limited to this configuration. For example, each of the control units **172** and **173** may be configured to include a CPU (Central Processing Unit) and a memory, and the functions thereof may be implemented by executing a program by a computer. That is, the individual functions of the control units **172** and **173** may be implemented by hardware or software.

(42) The above-described elements **191** to **197** are fixed to a frame member or a base, which supports the exterior panel of the housing **100**, by fastening using, for example, bolts, screws, and the like. In this embodiment, the housing **100** includes an upper support member UF, a lower support member LF, and connection support members CF. The pre-processing portion **11**, the post-processing portion **12**, and the unit **15** are arranged on the upper support member UF. The lower support member LF is provided on the lower side with an interval to the upper support member UF. The connection support members CF connect the upper support member UF and the lower support member LF. The housing **100** is defined into an upper space US and a lower space LS as the upper support member UF as the boundary. The upper space US is a space to arrange the pre-processing portion **11**, the post-processing portion **12**, and the unit **15**, and the lower space LS is a space to arrange the sample storage portion **13**. In addition, the upper space US and the lower space LS communicate to form a communication space CS. The communication space CS is a transport space for the observation sample SPL to be transported by the transfer unit **14** from the post-processing portion **12** to the sample storage portion **13**.

(43) The pre-processing portion **11** and the unit **15** are installed on the side of the front wall portion F**11** and almost at the central portion in the Z direction in the housing **100**. The housing **100** further includes a pre-processing arrangement portion **11**S in which the pre-processing portion **11** is arranged at a predetermined height on the side of the front wall portion F**11**, and an observation target object imparting arrangement portion **15**S in which the unit **15** is arranged. The pre-processing portion **11** is located on the side of the side wall portion F**14**, and the unit **15** is located on the side of the side wall portion F**12**. The unit **15** is located close to the corner wall portion F**13**. Similarly, the pre-processing arrangement portion **11**S is provided on the side of the side wall portion F**14**, the observation target object imparting arrangement portion **15**S is provided on the side of the side wall portion F**12**, and the observation target object imparting arrangement portion **15**S is provided at a position close to the corner wall portion F**13**. In this embodiment, the pre-processing arrangement portion **11**S and the observation target object imparting arrangement portion **15**S are provided on the upper support member UF.

(44) The post-processing portion **12** is installed on the side of the side wall portion F**12** and almost at the central portion in the Z direction and juxtaposed to the unit **15** in the Y direction in the housing **100**. The housing **100** further includes a post-processing arrangement portion **12**S at a position close to the side wall portion F**12**. In this embodiment, the post-processing arrangement portion **12**S is provided on the lower support member LF. The sample storage portion **13** is installed on the lower side of the pre-processing portion **11** in the housing **100**. The housing **100** further includes a sample storage arrangement portion **13**S on the lower side of the pre-processing arrangement portion **11**S. In this embodiment, the sample storage portion **13** is arranged in the lower space LS, and the sample storage arrangement portion **13**S is provided on the upper support member UF.
(45) The control unit **172** is installed on the lower side of the post-processing portion **12** in the housing **100**. In addition, the control unit **173** is installed on the upper side in the housing **100**. The housing **100** further includes a first control unit arrangement portion **172**S in which the control unit **172** is arranged on the lower side of the post-processing arrangement portion **12**S. In this embodiment, the first control unit arrangement portion **172**S is provided on the lower support member LF. Also, the housing **100** further includes a second control unit arrangement portion **173**S in which the control unit **173** installed on the upper side in the housing is arranged. In this embodiment, the second control unit arrangement portion **173**S is provided on a connecting member RF disposed between the connection support members CF on the side of the upper space US on the upper side of the upper support member UF.
(46) The transfer unit **14** is installed on the side of the rear wall portion F**15** in the housing **100**. The transfer unit **14** can pivot about an axis in the Z direction while moving its distal end in the Z direction, and can access both the post-processing portion **12** and the sample storage portion **13** by this installation mode. The housing **100** further includes a transfer unit arrangement portion **14**S on the side of the rear wall portion F**15**. In this embodiment, the transfer unit arrangement portion **14**S is provided on the lower support member LF. The distal end of the transfer unit **14** is arranged to be movable across the upper space US, the lower space LS, and the communication space CS.
(47) Also, the storage portion **193** that stores a liquid tank **1931** is further installed on the lower side of the unit **15** in the housing **100**. The liquid tank **1931** stores a liquid to be used in production of the observation sample to be described later. The liquid tank **1931** may be expressed as a liquid storage portion (or a storage portion simply), a container, or the like. The storage portion **193** includes a storage member **193***a* that stores the liquid tank **1931**, and a moving mechanism **193***b* configured to be able to move the storage member **193***a* between a storage position and an extraction position. The storage member **193***a* stored in the housing **100** can be extracted by the moving mechanism **193***b* in the −Y direction, as shown in FIG. **3**. This allows the operator to access the liquid tank **1931** stored in the housing **100** (storage member **193***a*). For example, the operator can extract the storage member **193***a*, thereby replenishing the liquid in the liquid tank **1931** or exchanging the old liquid tank **1931** stored in the storage member **193***a* with a new one. In this embodiment, a storage arrangement portion **193**S is provided on the lower support member LF.
(48) [Observation Target Object Imparting Unit]
(49) FIG. **6** is a perspective view showing the above-described observation target object imparting unit **15** and the state of the peripheral region thereof. FIG. **9** is an enlarged view showing a part of the unit **15**. The unit **15** includes a moving unit **151**, a tilting mechanism **152**, and a liquid supply unit **153**. The unit **15** further includes a transfer unit **155** that transfers the observation sample SPL between the unit **15** and the post-processing portion **12**.
(50) The moving unit **151** includes a base **1510**, a moving support table (or rotation support table) **1511**, a holding portion **1512**, and the tilting mechanism **152**.
(51) The tilting mechanism **152** includes a tilting fixed body **1514***b*, a tilting moving body **1514***a*, an engaging portion **1515**, and a lifting mechanism **1522**. The tilting fixed body **1514***b* is supported on the moving support table **1511**. The tilting moving body **1514***a* is supported to be movable with

respect to the tilting fixed body **1514***b*. The engaging portion **1515** is formed on the side of one end portion of the tilting moving body **1514***a*, and the lifting mechanism **1522** is locked in the engaging portion **1515** and moves the tilting moving body **1514***a*. The lifting mechanism **1522** includes a moving lock portion **1521** locked in the engaging portion **1515**, and a lifting driving portion **1522***a* that moves the moving lock portion **1521**. In this embodiment, a lifting mechanism is employed as a moving mechanism that moves the tilting moving body **1514***a*. However, for example, a moving mechanism such as a swing mechanism or a cam mechanism capable of reciprocally tilting the tilting moving body **1514***a* may be employed.

(52) The moving support table **1511** is supported on the base **1510** to be movable (rotatable) in a predetermined direction, and the tilting fixed body **1514***b* is arranged on its upper surface. In this embodiment, four tilting fixed bodies **1514***b* are arranged at a predetermined interval, more specifically, at an interval of 90° radially about the rotation shaft of the moving support table **1511**. The tilting fixed body **1514***b* movably (pivotally) supports the tilting moving body **1514***a* such that one end portion and the other end portion of the tilting moving body **1514***a* that supports the holding portion **1512** are located at heights different from each other.

(53) As will be described later in detail, the holding portion **1512** is configured to be able to hold the plate PL and attached to the upper portion of the tilting moving body **1514***a*. In this embodiment, four holding portions **1512** are provided. There may be a single holding portion **1512** or a plurality of holding portions **1512**. The four holding portions **1512** are arranged at a predetermined interval about a moving (rotation) axis **1511**C of the moving (rotation) support table **1511**, which extends in the up-and-down direction, and moved.

(54) The holding engaging portion **1513** is provided for each of the four holding portions **1512**, and functions as a fall prevention member that locks the plate PL to prevent the plate PL held by the holding portion **1512** from falling. The holding engaging portion **1513** is provided on the side of the engaging portion **1515** of the tilting moving body **1514***a*.

(55) The engaging portion **1515** is provided for each of the four holding portions **1512**. The engaging portion **1515** is a member formed into an almost C shape with one side opening under the holding portion **1512**, and is provided in a posture with the open side directed outward in the radial direction of the base **1510**.

(56) The moving lock portion **1521** is a member having an inverted L shape on a side view, and includes a pair of left and right plate portions **1521***a* and **1521***b* extending from the upper end of a main body portion **1521***mb* inward in the radial direction of the base **1510**. A fixed shaft **1521***f* on which a roller **1521***r* is fitted is provided between the plate portions **1521***a* and **1521***b*. The roller **1521***r* is provided to be rotatable with respect to the fixed shaft **1521***f*. The roller **1521***r* engages with one of the four engaging portions **1515** at a predetermined position. More specifically, when the moving support table **1511** pivots, and the engaging portion **1515** is horizontally moved, the engaging portion **1515** is fitted on the moving lock portion **1521** such that the opening portion of the engaging portion **1515** stores (sandwiches) the moving lock portion **1521**. Accordingly, the moving lock portion **1521** (roller **1521***r*) and the engaging portion **1515** engage with each other, and the holding portion **1512** is tiltably supported, as will be described later in detail. In addition, the lifting driving portion **1522***a* is provided to be connected to the main body portion **1521***mb* of the moving lock portion **1521**.

(57) Here, as described above, the holding portion **1512** is pivotally supported by the tilting moving body **1514***a* and the tilting fixed body **1514***b*. For this reason, when the lifting driving portion **1522***a* is vertically moved (moved up and down) in a state in which the moving lock portion **1521** engages with the engaging portion **1515**, the tilting moving body **1514***a* is made to pivot with respect to the tilting fixed body **1514***b*, and this tilts the holding portion **1512**. In other words, of the four holding portions **1512**, only the holding portion **1512** engaging with the moving lock portion **1521** can be tilted by the lifting driving portion **1522***a*.

(58) Note that a mode in which the engaging portion **1515** stores the moving lock portion **1521** has

been exemplified here. As another embodiment, the moving lock portion **1521** and the engaging portion **1515** may be configured such that their functions have a reverse relationship. That is, the moving lock portion **1521** may include a pair of upper and lower plate portions extending from the upper end of the main body portion **1521***mb* inward in the radial direction of the base **1510**, and a roller to be fitted between the pair of upper and lower plate portions may be provided on the side of the engaging portion **1515**.

(59) A summary will be made concerning the moving unit **151** and the tilting mechanism **152**. When one of the four holding portions **1512** moves to the imparting position P**10** along with the rotation of the rotation support table **1511**, the engaging portion **1515** corresponding to the holding portion **1512** engages with the moving lock portion **1521**. When the moving lock portion **1521** is vertically moved in this state, the holding portion **1512** pivots, that is, the holding portion **1512** and the plate PL held by this can be tilted. With this configuration, the posture of the plate PL can be changed to, for example, a horizontal posture or a tilt posture.

(60) The above-described moving unit **151** can stop the holding portion **1512** and the plate PL held by this at least three positions/regions. First, the moving unit **151** stops the holding portion **1512** in a region where the plate PL is received from the pre-processing portion **11**, and the holding portion **1512** is caused to hold the plate PL. Second, the moving unit **151** stops the holding portion **1512** and the plate PL held by this in a region where the operator imparts an observation target object to the plate PL. Third, the moving unit **151** stops the holding portion **1512** and the plate PL held by this in a region where the plate PL to which observation target object is imparted is extracted as an observation sample from the holding portion **1512** by the transfer unit **155** to be described later. Here, the base **1510** incorporates a rotation driving mechanism, and the control unit **172** intermittently drives the rotation support table **1511** such that at least one of the four holding portions **1512** is located in one of the above-described three regions. Details of these will be described later.

(61) The moving unit **151** may be expressed as a conveyance unit, a transport unit, or the like from the viewpoint of sequentially moving the plate PL held by the holding portion **1512** to a predetermined position. In addition, the tilting mechanism **152** may be expressed as a posture change unit, a posture adjustment unit, or the like from the viewpoint of changing the posture of the plate PL.

(62) The liquid supply unit **153** includes a nozzle **1531** capable of discharging a liquid, and a moving mechanism **154** that moves the nozzle **1531** between a liquid supply position and a standby position. The liquid supply unit **153** also includes a supply mechanism (a pump or the like) (not shown) configured to suck a liquid from the liquid tank **1931** and discharge the liquid from the nozzle **1531**. Hence, the liquid supply unit **153** can move the nozzle **1531** to the liquid supply position and supply the liquid onto the plate PL held by the holding portion **1512**. As will be described later in detail, this can form a liquid pool on the plate PL.

(63) In this embodiment, the moving mechanism **154** is a slide mechanism, and can move the liquid supply unit **153** in the direction of an arrow in FIG. **6**. In this embodiment, the moving mechanism **154** moves the liquid supply unit **153** between the position (liquid supply position) to supply the liquid onto the plate PL and a standby position that is also called a home position or the like. For example, when liquid supply is not performed, the moving mechanism **154** causes the liquid supply unit **153** to stand by at the standby position. When executing liquid supply, the moving mechanism **154** moves the liquid supply unit **153** to the liquid supply position such that the nozzle **1531** is located on the plate PL.

(64) In this embodiment, the transfer unit **155** is a manipulator capable of gripping the plate PL. As will be described later in detail, the transfer unit **155** receives the plate PL with the imparted observation target object as an observation sample from the holding portion **1512** and transfers the plate PL to the post-processing portion **12**.

(65) Note that as shown in FIG. **5**, the sample producing apparatus **1** further includes a storage tank

171. An excess or fallen part of the liquid supplied by the liquid supply unit **153** is guided to the storage tank **171** and stored in the storage tank **171**.
(66) [Work Procedure in Sample Producing Apparatus]
(67) FIG. **7** is a schematic view for explaining work contents in the pre-processing portion **11**, work contents in the unit **15**, and work contents in the post-processing portion **12**.
(68) The pre-processing portion **11** includes the plate storage portion **111**, the conveyance unit **112**, the printing unit **113**, and the reading unit **114**. The plate storage portion **111** is a magazine (also expressed as a cartridge, a cassette, or the like) that stores the plate PL before the observation target object is imparted, that is, the cleaned or unused plate PL to be used for production of an observation sample. The plate storage portion **111** can store a plurality of plates PL and sequentially send the plurality of plates PL to the conveyance unit **112**. In this embodiment, the plurality of plates PL are stacked and stored in the plate storage portion **111**. In this embodiment, the conveyance unit **112** is a conveyance belt, and conveys the plates PL sent from the plate storage portion **111** one by one to the unit **15**.
(69) In this embodiment, the printing unit **113** is an inkjet printhead, and performs printing on the plate PL that is being conveyed by the conveyance unit **112**, thereby imparting, for example, the predetermined identification information **1131**. As the identification information **1131**, for example, a two-dimensional code is used, but a character, a number, a symbol, a graphic, or the like may alternatively/additionally be used.
(70) The reading unit **114** can read the identification information **1131** imparted to the plate PL and output the result to the computer **95**. The computer **95** can also cause the display terminal **96** to display contents representing the identification information **1131**. This makes it possible to associate the identification information **1131** with the (information of) observation target object imparted to the plate PL with the identification information and manage the pieces of information.
(71) As shown in FIG. **13** in detail, the post-processing portion **12** includes a transport unit **121**, the heating unit **122**, and a confirmation unit **123**. In this embodiment, the transport unit **121** is a walking beam type transport device, and includes a sample placement portion **1211** and a sample transport mechanism **1212**. The sample placement portion **1211** is a long plate material on which a plurality of observation samples can be placed one by one. The sample placement portion **1211** may simply be expressed as a placement portion. Also, the confirmation unit **123** to be described later is arranged at a transport end portion **1211***a* of the sample placement portion **1211**, and the state of the observation sample transported to the transport end portion **1211***a* is confirmed.
(72) The sample transport mechanism **1212** includes a pair of beam members arranged on both sides of the sample placement portion **1211**, and a driving mechanism configured to drive these. When driven by the driving mechanism, the pair of beam members operate in the vertical and horizontal directions simultaneously in parallel. More specifically, ascending of the pair of beam members, movement (feeding operation) in one conveyance direction, descending, and movement (return operation) in the other conveyance direction are continuously performed in this order, and this transports the observation sample on the sample placement portion **1211** intermittently in one direction. The sample transport mechanism **1212** may simply be expressed as a transport mechanism, or may be expressed as a sample conveyance mechanism (or a conveyance mechanism simply), or the like.
(73) The heating unit **122** is installed on the lower side of the transport unit **121**, and heats the observation sample that is placed on the sample placement portion **1211** and is being transported by the sample transport mechanism **1212**. Accordingly, the observation target object on the plate PL is extended. The heating unit **122** may be expressed as a temperature processing unit or the like, or may be expressed as a temperature processing unit or an observation target object extending unit for the same viewpoint.
(74) The confirmation unit **123** confirms the processed state of the observation sample heated by the heating unit **122**. In this embodiment, the confirmation unit **123** includes an illumination device

1231 and an image capturing device **1232**. As the illumination device **1231**, a known lamp body including an LED or the like as a light source is preferably used. As the image capturing device **1232**, a known camera including a CCD/CMOS image sensor is preferably used. The confirmation unit **123** causes the image capturing device **1232** to capture the observation sample while causing the illumination device **1231** to irradiate the observation sample with light, records the image as image information, and associates it with the identification information **1131**. The confirmation unit **123** also confirms the processed state of the observation sample and performs predetermined determination. The confirmation unit **123** can also output the results of confirmation and determination to the computer **95**. This allows the computer **95** to cause the display terminal **96** to display information representing whether the observation sample is appropriately produced. As another embodiment, the confirmation and determination may be executed by the computer **95**.

(75) Work contents in the pre-processing portion **11**, the unit **15**, and the post-processing portion **12** will be summarized by referring back to FIG. **7**. In the pre-processing portion **11**, the identification information **1131** is imparted to the plate PL (shown as "plate PL**0**" for the sake of discrimination) to be conveyed to the unit **15**. The unit **15** receives the plate PL from the pre-processing portion **11** (shown as "plate PL**1**" for the sake of discrimination). After that, the unit **15** moves the plate PL received from the pre-processing portion **11** to a position where the operator imparts (places) an observation target object (observation target object OB) (shown as "plate PL**2**" for the sake of discrimination).

(76) As will be described later in detail, a liquid is supplied onto the plate PL by the liquid supply unit **153** to form a liquid pool. The operator can place the observation target object OB in the liquid pool on the plate PL using, for example, a tool T**11** such as a tweezer. After that, the tilting mechanism **152** tilts the plate PL, thereby removing the liquid pool from the plate PL. Note that a solution or drug liquid having no substantial chemical effect on the observation target object OB is used as the liquid. In this embodiment, pure water is used. As another embodiment, a physiological saline solution or the like may be used.

(77) After that, the unit **15** moves the plate PL with the imparted observation target object OB to a position where the transfer unit **155** can access (shown as "plate PL**3**" for the sake of discrimination). The transfer unit **155** then extracts the plate PL with the imparted observation target object OB as an observation sample from the unit **15**, and transfers it to the transport unit **121** (shown as "plate PL**4**" for the sake of discrimination). After that, the plate PL is transported in a predetermined direction by the transport unit **121** and simultaneously undergoes heating processing by the heating unit **122**, and the observation target object on the plate PL is extended. At the transport end portion of the transport unit **121**, the confirmation unit **123** confirms whether the observation sample is appropriately produced (shown as "plate PL**5**" for the sake of discrimination). The transfer unit **14** extracts, from the transport unit **121**, the plate PL and the observation target object OB on it as an observation sample and stores it in the sample storage portion **13**.

(78) Note that the timing of driving the unit **15** (for example, the timing of moving the plate PL) can be decided when the operator presses, by a foot, the input device **94** (see FIGS. **1** and **2**) connected to the control unit **172**. For example, preferably, after the plate PL from the pre-processing portion **11** is moved by the unit **15** to a predetermined position, the operator imparts the observation target object OB to the plate PL and then presses the input device **94**.

(79) FIG. **14** is a perspective view showing an example of the configuration of the sample storage portion **13**. The sample storage portion **13** includes a frame member **130**, an upper plate material **131**A, a lower plate material **131**B, and an atmosphere adjustment unit **132**. The plate materials **131**A and **131**B are disposed in the frame member **130** while being tilted to a predetermined angle. A rack **131** of two shelves is formed by the plate materials **131**A and **131**B. In the plate materials **131**A and **131**B, a plurality of storage portions **1312** are provided at predetermined positions. Each storage portion **1312** is formed by a pair of storage members **1312***a* and **1312***b* provided at a

predetermined interval, and permits placement and extraction of a case **1311** in a first tilting direction d**1**. Using a pair of rack members **1312***a* and **1312***b* as one storage portion **1312**, the plurality of storage portions **1312** are provided on the plate materials **131**A and **131**B.

(80) Since the case **1311** is tilted in the first tilting direction d**1** and placed on the storage portion **1312**, saving of the observation sample SPL by the transfer unit **14** can be performed from a second tilting direction d**2** crossing the first tilting direction d**1**, and the observation sample SPL can efficiently be stored in the case. In addition, since the tilting direction for placement of the case **1311** on the storage portion **1312** and extraction of the case **1311** from the storage portion **1312** is set to the first tilting direction d**1**, the handling work of the case **1311** by the operator can be performed easily and efficiently.

(81) Two plate materials, that is, the plate materials **131**A and **131**B have been exemplified here. However, the number of plate materials (that is, the number of rack shelves) is not limited to this. In addition, in each storage portion **1312** of the plate materials **131**A and **131**B, one or more cases **1311** capable of saving a set of a predetermined number of observation samples (observation samples SPL) can be saved. This allows the operator to easily manage the plurality of observation samples SPL.

(82) In this embodiment, the atmosphere adjustment unit **132** is a blower installed on the lower side of the plate materials **131**A and **131**B, and adjusts the atmosphere in the sample storage portion **13** to a desired environment. For example, the atmosphere adjustment unit **132** includes an environment adjustment unit (not shown) capable of maintaining the atmosphere in the sample storage portion **13** at a desired temperature and/or maintaining the atmosphere at a desired humidity. The atmosphere adjustment unit **132** may be expressed as an environment maintaining unit, an environment management unit, an air conditioning unit, or the like.

(83) [Attached Members of Housing]

(84) Referring back to FIGS. **3** and **4**, the opening/closing members **191**, **192**, **194**, and **195**, the plate material **196**, and the window member **197** are attached to the housing **100** such that the operator can visually recognize the inside of the housing **100**, and/or the operator can access the inside of the housing **100** as needed. These are partition members configured to partition the inside/outside of the housing **100** together with the housing **100**. Note that a notification lamp **182** is provided on the top of the housing **100**, and if access to the inside of the housing **100** is necessary, the operator is notified by lighting or blinking of the notification lamp **182**.

(85) The opening/closing member **191** is an optically transparent cover openably/closably provided on the upper portion of the front wall portion F**11**. The operator can access the pre-processing portion **11** by opening the opening/closing member **191** and, for example, replenish plates PL in the plate storage portion **111** or exchange the plate storage portion **111** with a new one.

(86) The opening/closing member **192** is an optically transparent cover openably/closably provided on the front wall portion F**11**. The operator can access the sample storage portion **13** by opening the opening/closing member **192** and, for example, extract the observation sample SPL by extracting the case **1311** from the sample storage portion **13**.

(87) The opening/closing member **194** is a door member openably/closably provided on the side wall portion F**12**, and is a door member including a window member. The operator can access each element of the post-processing portion **12** by opening the opening/closing member **194** and, for example, remove an observation sample determined by the confirmation unit **123** not to have been appropriately produced.

(88) The opening/closing member **195** is a door member openably/closably provided on the side wall portion F**14**, and is a door member including a window member. The opening/closing member **195** is provided, on the side wall portion F**1**, in a size for, for example, including the operation range of the transfer unit **14**. When the opening/closing member **195** is opened, maintenance in the housing **100** by the operator can easily be performed. The opening/closing member **195** may be expressed as a maintenance door or the like.

(89) The window member **197** is an optically transparent plate material provided in the rear wall portion F**15**. The operator can visually recognize the state in the housing **100** from the rear side of the producing apparatus **1** as well.
(90) In this embodiment, the plate material **196** is an optically transparent plate material fixed on the upper portion of the front wall portion F**11**. The plate material **196** exposes a part of the above-described unit **15** (see FIGS. **6**, **9**, and **7**) as a region (imparting region) that the operator can access to impart the observation target object OB. The imparting position P**10** described with reference to FIG. **3** is included in the imparting region.
(91) As is apparent from FIG. **3**, a work assisting portion P**11** on which the operator can place a portion of an arm or hand is provided near the imparting position P**10**. Hence, when the operator imparts (places) the observation target object OB to the plate PL at the imparting position P**10**, a part of the arm or hand of the operator himself/herself can be placed on (brought into contact with) the work assisting portion P**11** and fixed (stabilized), and in a stable posture, the observation target object OB can be imparted to the plate PL. Note that in this embodiment, the work assisting portion P**11** is the upper side portion of the corner wall portion F**13**. However, a dedicated member such as an arm rest member may be installed and used.
(92) Here, in the unit **15**, the rotation support table **1511** rotates, and one of the four holding portions **1512** thus moves to the imparting position P**10**. On the other hand, the remaining three holding portions **1512** are located in the housing **100**. A predetermined gap is formed on the lower side of the plate material **196** (in this embodiment, between the plate material **196** and the upper surface of the rotation support table **1511**), and each holding portion **1512** passes through the gap along with the rotation of the rotation support table **1511**.
(93) [Installation Mode of Observation Target Object Imparting Unit and the Like]
(94) As is apparent from FIG. **3**, the observation target object imparting unit **15** and the imparting position P**10** (a portion of the unit **15** exposed by the plate material **196**) are provided close to the corner portion of the housing **100** (on the side of the corner wall portion F**13**) and set as the imparting region. Here, “close to the corner portion” means “closer than the remaining corner portions”. This allows the operator to efficiently perform the work on the sample producing apparatus **1** and the working table **91**.
(95) In this embodiment, the distance between the observation target object producing device **92** and (the imparting position P**10** of) the unit **15** is short. It is therefore possible to efficiently perform a work of extracting the observation target object OB from the device **92** and transferring it to the unit **15**. The distance (height difference) between the unit **15** and the device **92** in the up-and-down direction is preferably short (for example, 50 cm or less, preferably, 30 cm or less, and more preferably, 20 cm or less). When both of these are located on the upper side of the position of the waist of the operator and on the lower side of (below) the shoulders, burdens on the body of the operator can be reduced, and the work can efficiently be performed. Note that the heights of the sample producing apparatus **1** and/or the working table **91** may be adjusted to meet such a condition.
(96) Also, the housing **100** of the sample producing apparatus **1** has a chamfered shape on the corner portion (includes the corner wall portion F**13**), and this can reduce interference of the feet of the operator with the housing **100**. To appropriately implement this, the width of the corner wall portion F**13** in the horizontal direction is, for example, about 10 cm, and preferably, about 15 cm or more. In addition, both the first angle (interior angle) between the front wall portion F**11** and the corner wall portion F**13** the second angle between the side wall portion F**12** and the corner wall portion F**13** are, for example, about 110 to 160 [degrees], and preferably, about 130 to 140 [degrees].
(97) Also, as can be seen from FIG. **3**, in this embodiment, in the corner portion of the housing **100**, the corner wall portion F**13** is arranged throughout from the upper end portion to the lower end portion to form the chamfered shape. As another embodiment, the chamfered shape may be

provided partially (for example, on the upper end portion and the intermediate portion) and is preferably provided on a necessary portion.

(98) [Configuration of Holding Portion]

(99) FIG. **8** is a perspective view showing the structure of the holding portion **1512**. The holding portion **1512** includes a placement portion **201** and a wall portion **202**. The placement portion **201** is a portion that forms a placement surface configured to place the plate PL, and is preferably made of a material hard to make the plate PL slip and formed in a shape (here, in a long shape) according to the size of the plate PL. The placement surface has a three-dimensional shape. In this embodiment, contact portions (convex portions) **2011** that contact the lower surface of the plate PL and non-contact portions (concave portions) **2012** that do not contact the lower surface of the plate PL are provided alternately in the widthwise direction and in a groove shape along the longitudinal direction. For example, if an excessive liquid is supplied onto the plate PL, the excess portion of the liquid enters the non-contact portions **2012**, and adhesion that can be generated by the tensile force of the liquid that has entered between the lower surface of the plate PL and the contact portions (convex portions) **2011** in contact can be reduced.

(100) The wall portion **202** is provided on the three side portions of the placement portion **201**, and in this embodiment, includes side wall portions **2021** and **2022** and an end side wall portion **2023**. The side wall portions **2021** and **2022** are provided along the longitudinal direction at the two end portions of the placement portion **201** in the widthwise direction. The end side wall portion **2023** is provided along the widthwise direction at one end portions of the placement portion **201** in the longitudinal direction. In this embodiment, the wall portions **2021** to **2023** are connected to each other. That is, the wall portion **202** is integrally molded in an almost U shape such that the three side portions of the placement portion **201** are closed, and the remaining one side portion is opened. In addition, the side wall portions **2021** and **2022** and the end side wall portion **2023** each include a wall surface having a height equal to or more than the thickness of the plate PL and extending upward from the placement surface of the contact portions **2011**. That is, the inner peripheral surface is formed by a side wall surface **2021***w* included in the side wall portion **2021**, a side wall surface **2022***w* included in the side wall portion **2022**, and a side wall surface **2023***w* included in the end side wall portion **2023**. With this configuration, if the plate PL is placed on the placement portion **201**, the wall portion **202** surrounds three sides of the plate PL. The wall portion **202** may be expressed as a frame portion or the like.

(101) The wall portion **202** includes a lyophobic portion (a liquid-repellent portion with liquid repellency) having a lyophobic property at least on the surface. That is, at least the surface of the wall portion **202** is made of a lyophobic material that is hard to fit with a liquid, or the wall portion **202** is surface-treated with a material having a lyophobic property. For example, if water is used as the liquid, a silicone resin or a fluororesin having hydrophobicity or water-repellency is used. The lyophobic property is a relative property indicating a property to a liquid on an upper surface, and can typically be decided based on whether the contact angle of a droplet on the upper surface satisfies a predetermined condition. For example, let θ.sub.W be the contact angle of a droplet. If, for example, 45°<θ.sub.W, or preferably, 60°<θ.sub.W is satisfied, it may be decided that a material has a lyophobic property.

(102) Note that in this embodiment, the placement portion **201** and the wall portion **202** are integrally molded. As another embodiment, the whole or a part of the wall portion **202** may be configured as a separate member attachable to the placement portion **201**. In addition, a member that has undergone a lyophobic treatment may be arranged on the upper portion of the wall portion **202**.

(103) With this configuration, the holding portion **1512** appropriately holds the plate PL placed on the placement portion **201** while surrounding it by the wall portion **202**. The holding portion **1512** may be expressed as a plate placement member (or a placement member simply), a base plate, or a jig for observation sample production. If a liquid is supplied onto the plate PL by the liquid supply

unit **153**, the liquid is retained on the plate PL while forming a liquid surface higher than the upper surface of the wall portion **202** by the lyophobic portion of the wall portion **202**, and a liquid pool is thus appropriately formed on the plate PL. In addition, if the holding portion **1512** and the plate PL are tilted by the tilting mechanism **152** to the open side of the wall portion **202** (the side where the wall portion **202** is not provided or the side opposite to the end side wall portion **2023**), the liquid of the liquid pool flows to the open side of the wall portion **202** having an almost U shape and is discharged, and the liquid pool is removed from the plate PL.

(104) [Mode of Imparting Observation Target Object onto Plate]

(105) FIG. **10** shows, side by side, a plan view showing the configuration of the holding portion **1512** and a sectional view taken along a line d**1**-d**1** shown at almost the intermediate position of the plan view (to be simply referred to as a "sectional view" hereinafter, and this also applies to the other sectional views in this embodiment). A state S**100** shows a plan view and a sectional view showing a state before the plate PL is arranged on the holding portion **1512** (the state of only the holding portion **1512**). A state S**101** shows a plan view and a sectional view showing a state after the plate PL is arranged on the holding portion **1512**. In this embodiment, the plate PL includes a placement portion **211** on which the observation target object OB should be placed, and a frosted portion **212** on which the identification information **1131** can be printed.

(106) As described above, when the plate PL is tilted by the tilting mechanism **152**, the liquid of the liquid pool can be discharged from the open side of the wall portion **202** having an almost U shape, and the liquid pool can thus be removed from the plate PL. That is, one end portion of the plate PL on the open side of the wall portion **202** corresponds to an end portion (liquid discharge downstream side end portion) on the downstream side of a direction (moving direction) in which the liquid flows when discharging the liquid, and the other end portion on the opposite side (the side of the end side wall portion **2023**) corresponds to an end portion (liquid discharge upstream side end portion) on the upstream side. From this viewpoint, the end portion of the holding portion **1512** on the open side of the wall portion **202** may be expressed as a liquid discharge portion or the like.

(107) FIG. **11** is a sectional view showing each step of production of the observation sample SPL in the unit **15**. The method of producing the observation sample SPL is roughly divided into a step of forming a liquid pool W**1** on the plate PL held by the holding portion **1512**, a step of placing the observation target object OB on the liquid pool W**1**, and a step of fixing the observation target object OB to the plate PL while removing the liquid pool W**1**.

(108) A state S**200** shows a sectional view showing a step of tilting the plate PL together with the holding portion **1512** and then supplying a liquid onto the plate PL. First, the holding portion **1512** and the plate PL in a horizontal posture are tilted in a first direction indicated by arrows and set in a first tilt posture. Accordingly, the other end portion of the plate PL on the side of the end side wall portion **2023** becomes lower than the one end portion on the open side of the wall portion **202**. The tilt angle (the angle made by the surface (upper surface) of the plate **1** and the horizontal plane: θ.sub.200) at this time is preferably set to about 0.5 to 5 [degrees], and in this embodiment, set to about 1 [degree].

(109) Next, a liquid is supplied onto the plate PL in the state S**200** by the nozzle **1531** (of the liquid supply unit **153**). As described above, the holding portion **1512** includes the wall portion **202** having a lyophobic property. For this reason, on the plate PL in the tilt posture at the tilt angle θ.sub.200, the supplied liquid is blocked by the wall portion **202** and appropriately retained on the plate PL, and the liquid pool W**1** is thus formed on the plate PL. More specifically, the supplied liquid is repelled by the lyophobic effect of the wall portion **202** and retained on the plate PL, and the liquid pool W**1** is formed such that its surface (the surface on which the observation target object OB is placed later) is located on the upper side of the upper surface of the wall portion **202**. The depth (liquid depth) of the liquid of the liquid pool W**1** is deeper on the other end portion side that is the side of the end side wall portion **2023** than on the one end portion side that is the open

side of the wall portion **202**.
(110) A state S**201** shows a sectional view showing the step of placing the observation target object OB on the liquid pool W**1**. The operator places the observation target object OB on the liquid pool W**1** using the tool T**11**. As described above, the liquid depth of the liquid pool W**1** is deeper on the other end portion side that is the side of the end side wall portion **2023** than on the one end portion side that is the open side of the wall portion **202**. As will be described later in detail, at this stage, the operator preferably holds the observation target object OB by the tool T**11** by pressing the observation target object against the liquid pool W**1** such that its position does not vary. Note that the tilt angle in the state S**201** is shown as a tilt angle θ.sub.201 (=θ.sub.200).
(111) A state S**202** shows a sectional view showing a step of tilting the plate PL with the observation target object OB placed on the liquid pool W**1** in a second direction opposite to the above-described state S**201** to set the plate PL in a second tilt posture (shown as a tilt angle θ.sub.202) and starting discharge of the liquid of the liquid pool W**1**. This guides the liquid of the liquid pool W**1** to the one end portion side that is the open side of the wall portion **202**.
(112) Here, in the state S**202**, the liquid depth of the liquid pool W**1** is shallower on the other end portion side that is the side of the end side wall portion **2023** than on the one end portion side that is the open side of the wall portion **202**. For this reason, the observation target object OB is placed close to the surface of the plate PL at least from the other end portion side, and can therefore directly contact the surface of the plate PL on the other end portion side.
(113) FIG. **12** is a sectional view showing steps of further tilting the plate PL in the second direction to promote the discharge of the liquid of the liquid pool W**1** on the plate PL until completion.
(114) In a state S**203**, the tilt angle of the plate PL is further increased (a tilt posture steeper than the second tilt posture is set) to obtain a third tilt posture (shown as a tilt angle θ.sub.203 (>θ.sub.202)). In the state S**203**, the liquid height level of the liquid lowers (the liquid moves to the open side of the wall portion **202**) along with the discharge of the liquid of the liquid pool W**1**. Hence, the observation target object OB on the liquid pool W**1** directly contacts the surface of the plate PL on the other end portion side (the side of the end side wall portion **2023**), and/or the contact area becomes large. On the other hand, on the one end portion side (the open side of the wall portion **202**), the observation target object OB is still located on the liquid pool W**1**.
(115) Note that in the state **203** (or in the above-described state **202**), since the observation target object OB is partially fixed to the plate surface at least on the liquid discharge upstream side, the operator may release the tool T**11** from the observation target object OB.
(116) In a state S**204**, the tilt angle of the plate PL is further increased (a tilt posture steeper than the third tilt posture is set) to obtain a fourth tilt posture (shown as a tilt angle θ.sub.204 (>θ.sub.203)). In the state S**204**, the area of contact between the observation target object OB on the liquid pool W**1** and the surface of the plate PL becomes larger. Accordingly, the observation target object OB can be attached to the surface of the plate PL without causing wrinkles or twists in the observation target object OB.
(117) In a state S**205**, the tilt angle of the plate PL is further increased (a tilt posture steeper than the fourth tilt posture is set) to obtain a fifth tilt posture (shown as a tilt angle θ.sub.205 (>θ.sub.204)). In the state S**205**, the discharge of the liquid of the liquid pool W**1** is completed, and the whole observation target object OB is attached to the surface of the plate PL, thereby producing the observation sample SPL. The tilt angle θ.sub.205 is, for example, about 40 to 60 [degrees] and is about 55 [degrees] in this embodiment.
(118) As a summary, according to the steps of the states S**200** to S**205**, the observation target object OB is continuously attached to the surface of the plate PL from the other end portion side (the side of the end side wall portion **2023**) to the one end portion side (the open side of the wall portion **202**) along with the discharge of the liquid spreading on the surface of the plate PL (flow-out of the liquid from between the observation target object OB and the surface of the plate PL). That is, after

the observation target object OB is partially brought into contact with the surface of the plate PL on the liquid discharge upstream side, the observation target object OB contacts the surface of the plate PL sequentially from the liquid discharge upstream side to the liquid discharge downstream side. This makes it possible to finally fix the observation target object OB to the surface of the plate PL. Hence, according to this embodiment, on the plate PL, the observation target object OB is set in a state in which wrinkles and twists are eliminated/a state easy to observe, and the observation sample SPL can appropriately be produced.

Summary of First Embodiment

(119) As described above, according to this embodiment, the holding portions **1512** capable of holding the plate PL are provided on the tilting moving body **1514***a*. With this configuration, the posture of the plate PL can be changed (set to, for example, a horizontal posture or a tilt posture), and the liquid of the liquid pool W**1** on the plate PL can be flowed and appropriately discharged. According to this, the liquid pool W**1** is appropriately removed from the plate PL, the observation target object OB is appropriately gradually fixed to the surface of the plate PL from one side and the observation sample SPL is appropriately produced. Hence, according to this embodiment, it is advantageous in improving the working efficiency when producing the observation sample SPL.

(120) Also, in the sample producing system SY, the imparting region where the working subject (here, the operator) accesses the plate PL and imparts the observation target object OB is provided at the corner portion of the housing **100**. In this embodiment, the imparting region is a region set on the upper portion of the corner wall portion F**13** and including the imparting position P**10**. The control unit **172** controls the moving unit **151** to move the holding portion **1512** and the plate PL from the supply position of the plate PL from the pre-processing portion **11** to the holding portion **1512** to the imparting position P**10** in the imparting region. Hence, according to this embodiment, since the working subject can appropriately access the plate PL, it can be said, in this viewpoint as well, that it is more advantageous in improving the working efficiency when producing the observation sample SPL.

(121) Note that after that, the control unit **172** controls the moving unit **151** to move the holding portion **1512** and the plate PL from the imparting position P**10** in the imparting region to the position where the transfer unit **155** extracts the plate PL with the imparted observation target object OB. Also, according to the installation mode of the unit **15** (see FIG. **3**), it can be said that the plate material **196** partitions the pre-processing portion **11** and the post-processing portion **12** into the inside of the housing **100** and the outside of the housing **100**.

Second Embodiment

(122) In the above-described first embodiment, a mode in which the liquid pool W**1** on the plate PL in the unit **15** is flowed, discharged, and removed by tilting the plate PL has been exemplified. However, the method of removing the liquid pool W**1** is not limited to this.

(123) FIG. **15** is a perspective view showing the structure of a holding portion **1512**′ according to the second embodiment. The holding portion **1512**′ includes a placement portion **201**, a wall portion **202**, and a hole portion **203**. The hole portion **203** is an opening portion provided at the boundary portion between the placement portion **201** and an end side wall portion **2023** so as to extend through the placement portion **201**. Also, a part of the hole portion **203** is formed, in a side wall surface **2023***w*′ of the end side wall portion **2023**, continuously up to the upper surface of the end side wall portion **2023**. The other contents are the same as those of the above-described holding portion **1512** (see the first embodiment).

(124) FIG. **16** shows, side by side, a plan view showing the configuration of the holding portion **1512**′ and a sectional view taken along a line d**1**-d**1** in the plan view (to be simply referred to as a "sectional view" hereinafter, and this also applies to the other sectional views in this embodiment). A state S**300** shows a plan view and a sectional view showing a state before a plate PL is arranged on the holding portion **1512**′ (the state of only the holding portion **1512**′). A state S**301** shows a plan view and a sectional view showing a state after the plate PL is arranged on the holding portion

1512′.
(125) As will be described later in detail, a liquid discharge mechanism configured to discharge a liquid can be installed in the hole portion **203** of the holding portion **1512**′, and a liquid pool W**1** can thus be removed. The liquid discharge mechanism includes a nozzle **221** configured to suck a liquid, a tube **222** configured to discharge the sucked liquid, and a suction driving mechanism (for example, a pump) (not shown) connected to the tube **222** and configured to execute suction of the liquid by the nozzle **221**. That is, one end portion of the plate PL on the side of the nozzle **221** corresponds to an end portion (liquid discharge downstream side end portion) on the downstream side of a direction in which the liquid flows when sucking and discharging the liquid by the nozzle **221**, and the other end portion on the opposite side corresponds to an end portion (liquid discharge upstream side end portion) on the upstream side. From this viewpoint, the hole portion **203** (and the liquid discharge mechanism) may be expressed as a liquid discharge portion or the like.
(126) The nozzle **221** includes a channel **221***a* through which the liquid to be discharged passes, and is formed into a tubular shape. The distal end portion of the channel **221***a* is opened on one side from the axis of the tube, and is formed by an opening lower portion **221***b*, an opening side portion **221***c*, and an opening upper portion **221***d*. On the opening side portion **221***c* provided at one end portions of the opening lower portion **221***b* and the opening upper portion **221***d*, a part (the outer peripheral portion and a part of the channel portion) of the channel **221***a* is continuously formed. The opening lower portion **221***b* forms a part of the placement surface of the placement portion **201**. The opening upper portion **221***d* is formed in the same size as the outer diameter of the nozzle **221**.
(127) The thus formed nozzle **221** is inserted into the hole portion **203** provided in the placement portion **201** and arranged to receive a part of an end portion of the plate PL placed on the placement portion **201**. When the liquid discharge mechanism (not shown) is operated in this state to start discharging the liquid on the plate PL, the liquid on the plate PL placed on the placement portion **201** moves to the opening side portion **221***c* of the nozzle **221** via a gap formed between the opening upper portion **221***d* and the upper surface of the plate PL and is guided to the channel **221***a* via a path formed by the opening side portion **221***c* and the end portion of the plate PL and having a semicircular section. The liquid on the plate PL can efficiently be discharged.
(128) FIG. **17** is a sectional view showing each step of production of an observation sample SPL in a unit **15**. The method of producing the observation sample SPL is roughly divided into a step of forming the liquid pool W**1** on the plate PL held by the holding portion **1512**′, a step of placing an observation target object OB on the liquid pool W**1**, and a step of fixing the observation target object OB to the plate PL while removing the liquid pool W**1**.
(129) A state S**400** shows a sectional view showing a step of tilting the plate PL together with the holding portion **1512**′ and then supplying a liquid onto the plate PL. First, the holding portion **1512**′ and the plate PL in a horizontal posture are tilted in a direction indicated by arrows and set in a first tilt posture. Accordingly, one end portion of the plate PL on the side of the nozzle **221** becomes lower than the other end portion. The tilt angle (the angle made by the surface (upper surface) of the plate **1** and the horizontal plane: θ.sub.400) at this time is preferably set to about 0.5 to 5 [degrees], and in this embodiment, set to about 1 [degree].
(130) Next, a liquid is supplied onto the plate PL in the state S**400** by a nozzle **1531** (of a liquid supply unit **153**). As described above, the holding portion **1512**′ includes the wall portion **202** having a lyophobic property. For this reason, on the plate PL in the tilt posture at the tilt angle θ.sub.400, the supplied liquid is blocked by the wall portion **202** and appropriately retained on the plate PL, and the liquid pool W**1** is thus formed on the plate PL. More specifically, the supplied liquid is repelled by the lyophobic effect of the wall portion **202** and retained on the plate PL, and the liquid pool W**1** is formed such that its surface (the surface on which the observation target object OB is placed later) is located on the upper side of the upper surface of the wall portion **202**. The liquid depth of the liquid pool W**1** is shallower on the other end portion side than on the one

end portion side on the side of the nozzle **221**.
(131) A state S**401** shows a sectional view showing the step of placing the observation target object OB on the liquid pool W**1**. The operator places the observation target object OB on the liquid pool W**1** using a tool T**11**. As described above, the liquid depth of the liquid pool W**1** is shallower on the other end portion side than on the one end portion side on the side of the nozzle **221**. For this reason, the observation target object OB is placed close to the surface of the plate PL on at least the other end portion side. Alternatively, since the observation target object OB can partially sink in the liquid pool W**1**, it can directly contact the surface of the plate PL on the other end portion side. Note that the tilt angle in the state S**401** is shown as a tilt angle θ.sub.401 (=θ.sub.400).
(132) A state S**402** shows a sectional view showing a step of further tilting the plate PL with the observation target object OB placed on the liquid pool W**1** and starting discharge of the liquid of the liquid pool W**1**. That is, the operator further increases the tilt angle of the plate PL (sets a tilt posture steeper than the second tilt posture) at a desired timing to obtain a second tilt posture (shown as a tilt angle θ.sub.402 (>θ.sub.401)). Accordingly, the liquid of the liquid pool W**1** is guided to the nozzle **221**, and liquid discharge by the nozzle **221** is started.
(133) The operation of tilting the plate (the operation of changing the tilt angle from θ.sub.401 to θ.sub.402) after the observation target object OB is placed on the liquid pool W**1** and the operation of sucking the liquid by the nozzle **211** may be started almost simultaneously. However, the timings of the start need not always match, and the operations need only be executed while overlapping at least partially. Typically, to prevent the liquid of the liquid pool W**1** from flowing from the upper portion of the wall portion **202** of the holding portion **1512**′, the operation of increasing the tilt angle can be started after the elapse of a predetermined time from the start of the operation of sucking the liquid by the nozzle **211**.
(134) FIG. **18** is a sectional view showing steps of further tilting the plate PL to promote the discharge of the liquid of the liquid pool W**1** on the plate PL until completion.
(135) In a state S**403**, the tilt angle of the plate PL is further increased (a tilt posture steeper than the second tilt posture is set) to obtain a third tilt posture (shown as a tilt angle θ.sub.403 (>θ.sub.402)). In the state S**403**, the liquid height level of the liquid lowers (the liquid moves to the side of the nozzle **221**) along with the increase of the tilt angle and/or the discharge of the liquid of the liquid pool W**1**. Hence, the observation target object OB on the liquid pool W**1** directly contacts the surface of the plate PL on the other end portion side (the side opposite to the nozzle **221**), and/or the contact area becomes large. On the other hand, on the one end portion side (the side of the nozzle **221**), the observation target object OB is still located on the liquid pool W**1**.
(136) In a state S**404**, the tilt angle of the plate PL is further increased (a tilt posture steeper than the third tilt posture is set) to obtain a fourth tilt posture (shown as a tilt angle θ.sub.404 (>θ.sub.403)). In the state S**404**, the area of contact between the observation target object OB on the liquid pool W**1** and the surface of the plate PL becomes larger. Accordingly, the observation target object OB can be attached to the surface of the plate PL without causing wrinkles or twists in the observation target object OB.
(137) In a state S**405**, the tilt angle of the plate PL is further increased (a tilt posture steeper than the fourth tilt posture is set) to obtain a fifth tilt posture (shown as a tilt angle θ.sub.405 (>θ.sub.404)). In the state S**405**, the discharge of the liquid of the liquid pool W**1** is completed, and the whole observation target object OB is attached to the surface of the plate PL, thereby producing the observation sample SPL. The tilt angle θ.sub.405 is, for example, about 40 to 60 [degrees] and is about 45 [degrees] in this embodiment.
(138) As a summary, according to the steps of the states S**400** to S**405**, the observation target object OB is continuously attached to the surface of the plate PL from the other end portion side (the side opposite to the nozzle **221**) to the one end portion side (the side of the nozzle **221**) along with the discharge of the liquid spreading on the surface of the plate PL (flow-out of the liquid from between the observation target object OB and the surface of the plate PL). That is, after the

observation target object OB is partially brought into contact with the surface of the plate PL on the liquid discharge upstream side, the observation target object OB contacts the surface of the plate PL sequentially from the liquid discharge upstream side to the liquid discharge downstream side. This makes it possible to finally fix the observation target object OB to the surface of the plate PL. Hence, according to this embodiment, on the plate PL, the observation target object OB is set in a state in which wrinkles and twists are eliminated/a state easy to observe, and the observation sample SPL can appropriately be produced.

(139) As described above, according to this embodiment as well, the same effects as in the above-described first embodiment can be obtained. That is, it can be said that it is advantageous in improving the working efficiency when producing the observation sample SPL. Note that the points different from the first embodiment have intensively been described here, but the contents of the first embodiment will be applied to the contents omitted in the above explanation.

(140) (Modification)

(141) FIG. **19** is a perspective view showing a structure in which an attachment member **1512**A separate from the holding portion **1512**′ is attached to the holding portion **1512**′ as a modification of the second embodiment. A state S**500** shows a state in which the attachment member **1512**A is attached to the holding portion **1512**′. As is apparent from FIG. **19**, in the state S**500**, a gap is formed between the attachment member **1512**A and the placement portion **201** of the holding portion **1512**′, and the plate PL is inserted into the gap and installed (held by the holding portion **1512**′). A state S**501** shows a state in which the attachment member **1512**A is detached from the holding portion **1512**′. The holding portion **1512**′ and the attachment member **1512**A are detachable, and these may be fixed to each other by a known fixing method using, for example, a seal, a screw, or the like, or may be fixed by an adhesive.

(142) FIG. **20** is a plan view for explaining the use method of the holding portion **1512**′ to which the attachment member **1512**A is attached. A state S**502** shows a plan view of a state in which the attachment member **1512**A is attached to the holding portion **1512**′. At least the exposed surface of the attachment member **1512**A is made of a lyophobic material (application processing), and in this embodiment, includes a lyophobic portion **231** all over the exposed surface.

(143) The attachment member **1512**A includes a narrow guide portion **241** formed in almost the same width as the diameter of the hole portion **203** and in a predetermined length from the upper portion of the hole portion **203** provided at one end portion of the holding portion **1512**′ to the other end portion side of the holding portion **1512**′. The attachment member **1512**A also includes a wide guide portion **242** formed in a width larger than the narrow guide portion **241** and in a predetermined length from the narrow guide portion **241** to the other end portion side of the holding portion **1512**′. A connecting portion **241***a* extending in the widthwise direction is formed at the boundary portion between the narrow guide portion **241** and the wide guide portion **242**.

(144) In place of the attachment member **1512**A, an attachment member **1512**B may be attached to the holding portion **1512**′. In the attachment member **1512**B, the lyophobic portion **231** is formed, on the exposed surface, from the narrow guide portion **241**, the wide guide portion **242**, and the connecting portions **241***a* to predetermined regions around these (application processing).

(145) A state S**503** shows a plan view of a state in which the plate PL is installed between the attachment member **1512**A and the placement portion **201** of the holding portion **1512**′, and the observation target object OB is arranged and imparted on the wide guide portion **242**. This state is a state in which the liquid is supplied from the nozzle **1531** to the plate PL (see the state S**400** in FIG. **17**). The supplied liquid is retained in the narrow guide portion **241**, the wide guide portion **242**, and the connecting portions **241***a*, and the liquid pool W**1** is thus appropriately formed. More specifically, the liquid pool W**1** is formed such that its upper portion is regulated by the narrow guide portion **241**, the wide guide portion **242**, and the connecting portions **241***a*.

(146) After that, the observation target object OB is placed on the liquid pool W**1** (see the state S**401** in FIG. **17**). More specifically, the observation target object OB is placed on the liquid pool

W**1** in the wide guide portion **242**. The observation target object OB need only be storable in the wide guide portion **242** and be larger than the narrow guide portion **241**. Accordingly, the movement of the observation target object OB in the widthwise direction is regulated by the wide guide portion **242**, and the movement to the side of the narrow guide portion **241** along with the flow of the liquid when discharging the liquid pool W**1** is regulated by the connecting portions **241***a*. It can be said, in this viewpoint, that the narrow guide portion **241** functions as a liquid guide portion (or a guide portion simply) configured to discharge the liquid and can efficiently guide the liquid to the hole portion **203** and discharge it.

(147) The above-described contents are merely examples, and various modifications can be made without departing from the scope of the present invention. For example, in the above-described modification, the holding portion **1512**′ and the attachment member **1512**A are separate bodies and are attachable/detachable to/from each other. However, these may be integrally molded. Alternatively, the placement portion **201** and the wall portion **202** may be detachable separate bodies, and the wall portion **202** and the attachment member **1512**A may be integrated. The contents of the above-described modification may be applied to the first embodiment (the attachment member **1512**A or **1512**B may be configured to be attachable to the holding portion **1512**), and similarly, the first embodiment may partially be applied to the modification.

SUMMARY

(148) As described above, one aspect of the present invention is related to the sample producing apparatus **1**, and the apparatus **1** produces the observation sample SPL by placing the observation target object OB on the surface of the liquid pool W**1** on the plate PL and then removing the liquid pool W**1**. In the embodiment, the holding portion (placement member) **1512** capable of holding the plate PL is provided on the tilting moving body **1514***a*. With this configuration, the posture of the plate PL can be changed (for example, set to a horizontal posture or a tilt posture), and the liquid of the liquid pool W**1** on the plate PL can be flowed and appropriately discharged (see FIGS. **11** and **12**). Hence, the liquid pool W**1** is appropriately removed from the plate PL, the observation target object OB is simultaneously appropriately fixed to the surface of the plate PL, and the observation sample SPL is appropriately produced. Hence, the sample producing apparatus **1** according to the present invention is useful in improving the working efficiency when producing the observation sample SPL.

(149) Also, as another aspect of the present invention, the imparting region where the working subject (the operator, a working robot, or the like) accesses the plate PL and imparts the observation target object OB to the plate PL is provided on the upper portion of the corner portion close to both the front wall portion F**11** and the side wall portion F**12** of the housing **100**. The sample producing apparatus **1** is installed on a side portion of the working table **91** such that the corner portion is located on the side of the upper surface of the working table **91**. The control unit **172** controls the moving unit **151** to move the holding portion **1512** from the supply position of the plate PL from the pre-processing portion **11** to the holding portion **1512** to a predetermined position (in this embodiment, the imparting position P**10**) in the imparting region. After that, the observation target object OB extracted by the working subject from the observation target object producing device **92** is imparted to the placement surface of the plate PL. According to the present invention, when the plate PL and the observation target object producing device **92** are arranged in a close distance, the working subject can efficiently appropriately access the plate PL and the observation target object producing device **92**. For this reason, when producing the observation sample SPL, the moving distance needed by the working subject can be short. Hence, the sample producing apparatus **1** obtains a high working efficiency and is useful in this point as well.

(150) In the above description, to facilitate understanding, the elements have names associated with their functional aspects. However, the elements are not limited to those having the contents described in the embodiments as main functions, and may have the functions auxiliarily. In addition, the individual terms in this specification have been merely used for the purpose of

explaining the present invention. That is, the present invention is not limited to the strict meanings of the terms. For example, an apparatus may be expressed as a unit, an assembly, a device, or a module, and vice versa. Also, for example, “move” of a symmetrical object may be expressed as convey or transfer, and vice versa.
(151) The invention is not limited to the foregoing embodiments, and various variations/changes are possible within the spirit of the invention.

Claims

1. A sample producing apparatus configured to produce an observation sample by placing an observation target object on a surface of a liquid pool on a plate and then removing the liquid pool, comprising: a holding unit configured to hold the plate, the plate being optically transparent and the holding unit including a placement portion configured to place the plate, and a wall portion provided at an edge portion of the placement portion, wherein the wall portion includes a lyophobic portion in at least an upper portion, the lyophobic portion being configured to form into the liquid pool from liquid supplied on the plate which is being held by the holding unit.
2. The sample producing apparatus according to claim 1, further comprising a tilting unit configured to tilt the plate such that a liquid of the liquid pool on the plate held by the holding unit is discharged.
3. The sample producing apparatus according to claim 2, further comprising a drive control unit configured to control drive of the tilting unit, wherein after the observation target object is placed on the surface of the liquid pool on the plate, the drive control unit controls the drive of the tilting unit such that an amount of the liquid of the liquid pool becomes larger than on the one end portion side of the plate than on the other end portion side, and the observation target object is attached and fixed to a surface of the plate sequentially from the other end portion side to the one end portion side.
4. The sample producing apparatus according to claim 2, wherein the holding unit includes a plurality of placement portions configured to place the plate, and the tilting unit includes a tilting mechanism configured to individually tilt the plurality of placement portions.
5. The sample producing apparatus according to claim 1, further comprising: a liquid discharge unit configured to discharge, from one end portion side of the plate, a liquid of the liquid pool on the plate held by the holding unit.
6. The sample producing apparatus according to claim 1, wherein the wall portion further includes a plurality of side wall portions and an end side wall portion, which are provided so as to surround three sides of the plate to be placed on the placement portion.
7. The sample producing apparatus according to claim 6, wherein the lyophobic portion is an attachment member having a lyophobic property.
8. The sample producing apparatus according to claim 1, wherein the wall portion is provided on an edge portion of the placement portion to surround the plate placed on the placement portion, and the holding unit further includes a liquid discharge portion configured to discharge the liquid of the liquid pool.
9. The sample producing apparatus according to claim 8, wherein the lyophobic portion includes a liquid guide portion configured to guide the liquid to the liquid discharge portion.
10. The sample producing apparatus according to claim 8, further comprising a liquid discharge unit configured to suck, from one end portion side of the plate, a liquid of the liquid pool on the plate held by the holding unit and discharging the liquid, wherein the liquid discharge unit further includes: a suction unit configured to suck the liquid of the liquid pool on the plate in the liquid discharge portion; and a driving unit configured to drive the suction unit to remove the liquid of the liquid pool on the plate by the suction.
11. The sample producing apparatus according to claim 1, further comprising: a liquid supply unit

capable of supplying a liquid onto the plate; and a moving unit configured to move the liquid supply unit between a liquid supply position where the liquid pool is formed on the plate and a position different from the liquid supply position.

12. The sample producing apparatus according to claim 1, further comprising a conveyance unit capable of conveying a target to at least three regions, wherein the at least three regions include: a first region where the holding unit is caused to hold the plate; a second region where the observation target object is placed on the plate held by the holding unit; and a third region where the plate with the placed observation target object is extracted as the observation sample from the holding unit.

13. The sample producing apparatus according to claim 12, comprising a transfer unit provided to access the third region and configured to extract the observation sample from the holding unit and transfer the observation sample to another position.

14. The sample producing apparatus according to claim 12, wherein the conveyance unit comprises: a rotation support table configured to be rotatable; and a rotation driving mechanism configured to perform intermittent drive to rotate and stop the rotation support table, the holding unit includes a plurality of placement portions arranged about a rotation shaft of the rotation support table to place the plate, and the rotation driving mechanism intermittently drives the rotation support table such that at least one of the plurality of placement portions is located in one of the first region, the second region, and the third region.

15. The sample producing apparatus according to claim 1, further comprising a temperature processing unit configured to perform temperature processing of the observation sample, wherein the observation sample is one of a plurality of observation samples, and the temperature processing unit includes: a sample placement portion capable of placing the plurality of observation samples thereon; and a heating unit configured to heat the observation sample placed on the sample placement portion.

16. The sample producing apparatus according to claim 15, further comprising: an observation sample keeping unit, to which the observation sample temperature-processed by the temperature processing unit is transferred, configured to keep the observation sample; and an observation sample transfer unit configured to extract the observation sample from the temperature processing unit and to transfer the observation sample to the observation sample keeping unit.

17. The sample producing apparatus according to claim 16, wherein the observation sample keeping unit includes: a saving portion capable of saving the observation sample to be transferred; and an atmosphere adjustment unit configured to adjust an atmosphere in the saving portion to a predetermined environment.

18. A placement member, which is mounted on a sample producing apparatus configured to produce an observation sample by placing an observation target object on a surface of a liquid pool on a plate and then removing the liquid pool, the plate being placed on the placement member, comprising: a placement portion on which the plate is placed, the plate being optically transparent, a wall portion provided on an edge portion of the placement portion to surround the plate placed on the placement portion, and a liquid discharge portion configured to discharge a liquid of a liquid pool, wherein the wall portion includes a lyophobic portion in at least an upper portion, the lyophobic portion being configured to form into the liquid pool from liquid supplied on the plate which is being held by the holding unit.

19. The placement member according to claim 18, wherein the lyophobic portion includes a guide portion configured to guide the liquid of the liquid pool to the liquid discharge portion.

20. The placement member according to claim 19, wherein the placement member includes a fall prevention member configured to prevent the plate placed on the placement portion from falling.

21. The placement member according to claim 19, wherein the placement portion includes a contact portion configured to contact the placed plate, and a non-contact portion that does not contact the placed plate.

22. A sample producing apparatus configured to produce an observation sample by placing an observation target object on a surface of a liquid pool on an optically transparent plate and then removing the liquid pool, comprising: a holding unit configured to hold the plate, including: a placement portion configured to place the plate, a wall portion provided at an edge portion of the placement portion, and an attachment member provided on an upper face of the wall portion, wherein the attachment member defines a position on the plate of the observation target object which is to be placed on the surface of the liquid pool on the plate.