

US Patent & Trademark Office

Patent Public Search | Text View

United States Patent Application Publication

20250262620

Kind Code

A1

Publication Date

August 21, 2025

Inventor(s)

IIDA; Shin

REAGENT CONTAINER AND AUTOMATIC ANALYZER

Abstract

A reagent container according to the embodiment is installed in a reagent storage that rotates in an automatic analyzer. The reagent container includes a shielding portion. The shielding portion partially shields the inner diameter side and the outer diameter side in the rotation inside the reagent container. A gap between the shielding portion and the side surface of the reagent container is configured to increase from the upper portion toward the lower portion of the shielding portion.

Inventors: IIDA; Shin (Ota, JP)

Applicant: CANON MEDICAL SYSTEMS CORPORATION (Otawara-shi, JP)

Family ID: 1000008460181

Assignee: CANON MEDICAL SYSTEMS CORPORATION (Otawara-shi, JP)

Appl. No.: 19/053493

Filed: February 14, 2025

Foreign Application Priority Data

JP	2024-022162	Feb. 16, 2024
----	-------------	---------------

Publication Classification

Int. Cl.: B01L3/00 (20060101); G01N35/02 (20060101)

U.S. Cl.:

CPC B01L3/52 (20130101); G01N35/025 (20130101); B01L2200/026 (20130101); B01L2200/16 (20130101)

Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2024-22162, filed on Feb. 16, 2024, the entire contents of which are incorporated herein by reference.

FIELD

[0002] Embodiments disclosed in the present specification and drawings relate to a reagent container and an automatic analyzer.

BACKGROUND

[0003] Conventionally, in an automatic analyzer, a reagent and a sample are dispensed into a reaction container, and changes in color tone, turbidity, and the like caused by a reaction of a mixed solution of the reagent and the sample are optically measured to measure test items. When the reagent is dispensed, the reagent container is moved to a suction position where the reagent is sucked by a reagent dispensing probe by rotating the reagent storage in which the reagent container is installed.

[0004] Furthermore, conventionally, the automatic analyzer has a liquid level detection function of detecting the liquid level of the reagent in order to appropriately lower the reagent dispensing probe to the liquid level in the reagent container at the suction position. However, when bubbles are generated in the reagent in the reagent container when the reagent storage is rotated and stopped, the liquid level detection function may erroneously detect the bubbles as the liquid level. In this case, the reagent dispensing probe cannot be appropriately lowered to the liquid level, and it is difficult for the reagent dispensing probe to appropriately suck the reagent.

[0005] Therefore, in order to reduce bubbles generated in the reagent, a baffle may be provided in the reagent container. The baffle reduces bubbles generated in the reagent by suppressing movement of the reagent in the reagent container.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a block diagram illustrating a configuration example of an automatic analyzer according to a first embodiment;

[0007] FIG. 2 is a diagram illustrating a configuration of an analysis mechanism illustrated in FIG. 1;

[0008] FIG. 3 is a side view illustrating a configuration example of a reagent container according to the first embodiment;

[0009] FIG. 4 is a perspective view illustrating a configuration example of the reagent container according to the first embodiment;

[0010] FIG. 5 is a front view illustrating a shielding portion of the reagent container according to the first embodiment;

[0011] FIG. 6 is a diagram illustrating an example of movement of a reagent in the reagent container according to the first embodiment;

[0012] FIG. 7 is a diagram illustrating an example of movement of a reagent in a reagent container according to a comparative example;

[0013] FIG. 8 is a front view illustrating a shielding portion of a reagent container according to a first modification of the first embodiment;

[0014] FIG. 9 is a front view illustrating a shielding portion of a reagent container according to a second modification of the first embodiment;

[0015] FIG. **10** is a front view illustrating a shielding portion of a reagent container according to a third modification of the first embodiment;
[0016] FIG. **11** is a front view illustrating a shielding portion of a reagent container according to a fourth modification of the first embodiment;
[0017] FIG. **12** is a front view illustrating a first shielding portion of a reagent container according to a second embodiment; and
[0018] FIG. **13** is a diagram illustrating an example of movement of a reagent in the reagent container according to the second embodiment.

DETAILED DESCRIPTION

[0019] Hereinafter, an embodiment of an automatic analyzer will be described in detail with reference to the drawings. In the following description, components having substantially the same functions and configurations will be given the same reference numerals, and redundant description thereof will be made only when necessary.

First Embodiment

[0020] FIG. **1** is a block diagram illustrating a configuration example of an automatic analyzer **1** according to a first embodiment. The automatic analyzer **1** illustrated in FIG. **1** includes an analysis mechanism **2**, an analysis circuitry **3**, a drive mechanism **4**, an input interface **5**, an output interface **6**, a communication interface **7**, a memory **8**, and a control circuitry **9**.

[0021] The analysis mechanism **2** obtains a mixed solution (that is, reaction liquid) of a sample and a reagent by adding the reagent used in each test item set in the sample to a sample such as a standard sample (that is, calibrator) and a test sample. The analysis mechanism **2** measures the mixed solution of the sample and the reagent, and generates standard data and test data represented by, for example, absorbance or a scattered light amount. The standard data represents measurement data of absorbance, fluorescence intensity, or scattered light amount, or measurement data of light emission, phosphorescence, or a combination thereof for a standard sample in which the concentration of the detection target included in the standard sample is known. Furthermore, the test data represents measurement data of the absorbance, the fluorescence intensity, or the scattered light quantity for the test sample. Note that, in the following description, in a case where the standard sample and the test sample are expressed without distinction, these samples may be simply referred to as a “sample”.

[0022] The analysis circuitry **3** is a processor that analyzes the standard data and the test data generated by the analysis mechanism **2** and generates calibration data, analysis data, and the like. The calibration data indicates, for example, a relationship between the standard data and a standard calibration curve set in advance for the standard sample. The standard calibration curve is, for example, a calibration curve with high measurement accuracy calculated by a reagent manufacturer using the standard sample. Furthermore, the analysis data is data obtained by analyzing the test data on the basis of the calibration data, and is represented as, for example, a concentration value and an activity value of an enzyme.

[0023] The analysis circuitry **3** executes an operation program stored in the memory **8** and realizes a function corresponding to the operation program to generate calibration data, analysis data, and the like. For example, the analysis circuitry **3** calculates calibration data on the basis of standard data obtained for a standard sample with absorbance or scattered light quantity that is known and with a concentration of zero, and a plurality of standard samples with absorbance or scattered light quantity that is known and with concentrations each of which is known, a standard calibration curve set in advance for these standard samples, a photometric timing set in advance, and the like. Furthermore, the analysis circuitry **3** generates analysis data on the basis of test data, calibration data of a test item corresponding to the test data, a photometric timing set in advance, and the like. The analysis circuitry **3** outputs the generated calibration data, analysis data, and the like to the control circuitry **9**.

[0024] The drive mechanism **4** drives the analysis mechanism **2** under the control of the control

circuitry **9**. The drive mechanism **4** is implemented by, for example, a gear, a stepping motor, a belt conveyor, a lead screw, and the like.

[0025] The input interface **5** receives, for example, setting of an analysis parameter or the like of each test item related to the sample requested to be measured from the operator or via an in-hospital network NW. The input interface **5** is implemented by, for example, a mouse, a keyboard, a touch pad to which an instruction is input by touching the operation surface, and the like. The input interface **5** is connected to the control circuitry **9**, converts an operation instruction input from the user into an electric signal, and outputs the electric signal to the control circuitry **9**. Note that, in the present specification, the input interface **5** is not limited to the interface including physical operation components such as a mouse and a keyboard. For example, also an electric signal processing circuitry that receives an electric signal corresponding to an operation instruction input from an external input device provided separately from the automatic analyzer **1** and outputs the electric signal to the control circuitry **9** is included in examples of the input interface **5**.

[0026] The output interface **6** is connected to the control circuitry **9** and outputs the signal supplied from the control circuitry **9**. The output interface **6** is implemented by, for example, a display circuitry, a print circuitry, and the like. Examples of the display circuitry include a CRT display, a liquid crystal display, an organic EL display, an LED display, and a plasma display. Note that the display circuitry also includes a processing circuitry that converts data representing a display target into a video signal and outputs the video signal to the outside. The print circuitry includes, for example, a printer. Note that an output circuitry that outputs data representing a printing target to the outside is also included in the print circuitry.

[0027] The communication interface **7** is connected to, for example, the in-hospital network NW. The communication interface **7** performs data communication with a hospital information system (HIS) via the in-hospital network NW. Note that the communication interface **7** may perform data communication with the HIS via a laboratory information system (LIS) connected to the in-hospital network NW.

[0028] The memory **8** is a non-transitory storage device that stores various types of information, and is, for example, a hard disk drive (HDD), an optical disc, a solid-state drive (SSD), an integrated circuitry storage device, or the like. The memory **8** stores, for example, a control program for controlling the automatic analyzer **1** and various pieces of data used to execute the control program. The memory **8** may be a drive device that reads and writes various types of information from and to a portable storage medium such as a compact disc (CD), a digital versatile disc (DVD), or a flash memory, a semiconductor memory device such as a random-access memory (RAM), or the like, in addition to the HDD, the SSD, and the like. Note that the memory **8** need not necessarily be implemented by a single storage device. For example, the memory **8** may be implemented by a plurality of storage devices.

[0029] More specifically, the memory **8** stores an operation program executed by the analysis circuitry **3** and an operation program executed by the control circuitry **9**. The memory **8** stores calibration curve information related to the reagent held in the analysis mechanism **2**. The calibration curve information includes data on a standard calibration curve set in advance for a reagent for each test item. The calibration curve information is provided from a reagent manufacturer in units of lots of reagents, for example, via the communication interface **7**. Note that the calibration curve information may be provided from a reagent manufacturer together with a reagent, for example, and may be input by the user from the input interface **5**.

[0030] The control circuitry **9** is a processor that functions as a center of the automatic analyzer **1**. The control circuitry **9** realizes a function corresponding to the operation program by executing the operation program stored in the memory **8**. Note that the control circuitry **9** may include a storage area that stores at least part of the data stored in the memory **8**.

[0031] FIG. **2** is a schematic diagram illustrating an example of a configuration of the analysis mechanism **2** illustrated in FIG. **1**. The analysis mechanism **2** illustrated in FIG. **2** includes a

reaction disk **201**, a thermostatic unit **202**, a sample disk **203**, a first reagent storage **204**, and a second reagent storage **205**.

[0032] The reaction disk **201** conveys a reaction container **2011** along a predetermined path. Specifically, the reaction disk **201** holds a plurality of the reaction containers **2011** arranged in a ring shape. The reaction disk **201** is alternately rotated and stopped at predetermined time intervals by the drive mechanism **4**.

[0033] For example, the reaction container **2011** rotationally moves in the direction of an arrow R1 in FIG. 2 every one cycle time, and stops at a stop position different from the position before the movement. For example, the reaction container **2011** rotationally moves in the R1 direction every one cycle time by the rotational drive of the reaction disk **201**, and stops at the position of the reaction container **2011** adjacent to the reaction container in the R1 direction with respect to the reaction container **2011** located at an angle of 90° in the R1 direction from the position before the movement. Then, the reaction container **2011** stops at the same stop position every one round time, which is longer than one cycle time.

[0034] The stop positions of the reaction container **2011** include a sample discharge position, a first reagent discharge position, a second reagent discharge position, a first stirring position, a second stirring position, and a cleaning position to be described later.

[0035] The reaction container **2011** is formed of, for example, glass. The reaction container **2011** has a quadrangular prism shape and has an opening in the upper portion. Among first to fourth side walls forming the quadrangular prism, the light emitted from a light source provided in a photometric unit **214** is incident from the outer surface of the first side wall. Among the first to fourth side walls, the light incident from the outer surface of the first side wall is emitted from the outer surface of the second side wall facing the first side wall.

[0036] The thermostatic unit **202** stores a heating medium set at a predetermined temperature. The thermostatic unit **202** raises the temperature of the mixed solution contained in the reaction container **2011** by immersing the reaction container **2011** in the stored heating medium.

[0037] The sample disk **203** holds a plurality of sample containers containing samples. The sample disk **203** is rotated and stopped every one cycle time by the drive mechanism **4**.

[0038] The first reagent storage **204** refrigerates a plurality of reagent containers **2042** containing a standard sample and a first reagent that reacts with a predetermined component included in a test sample. The first reagent may be, for example, a buffer solution containing bovine serum albumin (BSA) or the like. A reagent label is attached to the reagent container **2042**. An optical mark representing reagent information is printed on the reagent label. As the optical mark, for example, an optional pixel code such as a one-dimensional pixel code and a two-dimensional pixel code is used. The reagent information is information on a reagent contained in the reagent container **2042**, and includes, for example, a reagent name, a reagent manufacturer code, a reagent item code, a bottle type, a bottle size, a volume, a production lot number, a valid period, and the like.

[0039] Furthermore, the first reagent storage **204** refrigerates a plurality of standard sample containers containing standard samples. The standard sample containers may contain standard samples of the same component having different concentrations. Note that the standard sample container may be held on the sample disk **203**.

[0040] In the first reagent storage **204**, a reagent rack **2041** is rotatably provided. The reagent rack **2041** holds a plurality of the reagent containers **2042** and a plurality of standard sample containers arranged in an annular shape. The reagent rack **2041** is rotated and stopped every one cycle time by the drive mechanism **4**. Furthermore, in the first reagent storage **204**, a reader (not illustrated) that reads reagent information from a reagent label attached to the reagent container **2042** is provided. The read reagent information is stored in the memory **8**.

[0041] A first reagent suction position is set at a predetermined position on the first reagent storage **204**. The first reagent suction position is provided, for example, at a position where the rotation trajectory of a first reagent dispensing probe **209** intersects with the movement trajectory of the

opening of the reagent container **2042** and the standard sample container arranged in an annular shape in the reagent rack **2041**.

[0042] The second reagent storage **205** refrigerates a plurality of reagent containers **2052** containing the second reagent paired with the first reagent of the two reagent systems. The second reagent may be, for example, a solution containing a predetermined antigen or antibody contained in the sample and an insoluble carrier, for example, a carrier particle on which an antigen or antibody bound or separated by a specific antigen-antibody reaction is immobilized. An enzyme, a substrate, an aptamer, or a receptor may be bound or separated by a specific reaction. In the second reagent storage **205**, a reagent rack **2051** is rotatably provided.

[0043] The reagent rack **2051** holds a plurality of the reagent containers **2052** arranged in an annular shape. Note that, in the second reagent storage **205**, a standard sample container containing a standard sample may be refrigerated. The reagent rack **2051** is rotated and stopped every one cycle time by the drive mechanism **4**. Furthermore, in the second reagent storage **205**, a reader (not illustrated) that reads reagent information from a reagent label attached to the reagent container **2052** is provided. The read reagent information is stored in the memory **8**.

[0044] A second reagent suction position is set at a predetermined position on the second reagent storage **205**. The second reagent suction position is provided, for example, at a position where the rotation trajectory of a second reagent dispensing probe **211** intersects with the movement trajectory of the opening of the reagent container **2052** arranged in an annular shape in the reagent rack **2051**.

[0045] Furthermore, the analysis mechanism **2** illustrated in FIG. **2** includes a sample dispensing arm **206**, a sample dispensing probe **207**, a first reagent dispensing arm **208**, the first reagent dispensing probe **209**, a second reagent dispensing arm **210**, the second reagent dispensing probe **211**, a first stirring unit **212**, a second stirring unit **213**, the photometric unit **214**, and a cleaning unit **215**. The sample dispensing probe **207** is an example of a first dispensing probe. The first reagent dispensing probe **209** and the second reagent dispensing probe **211** are examples of a second dispensing probe.

[0046] The sample dispensing arm **206** is provided between the reaction disk **201** and the sample disk **203**. The sample dispensing arm **206** is provided to be movable up and down in the vertical direction and to be rotatable in the horizontal direction by the drive mechanism **4**. The sample dispensing arm **206** holds the sample dispensing probe **207** at one end.

[0047] The sample dispensing probe **207** rotates along an arc-shaped rotation trajectory as the sample dispensing arm **206** rotates. The opening of the sample container held by the sample disk **203** is located on the rotation trajectory. Furthermore, a sample discharge position for discharging the sample sucked by the sample dispensing probe **207** to the reaction container **2011** is provided on the rotation trajectory of the sample dispensing probe **207**. The sample discharge position corresponds to an intersection point between the rotation trajectory of the sample dispensing probe **207** and the movement trajectory of the reaction container **2011** held by the reaction disk **201**.

[0048] The sample dispensing probe **207** is driven by the drive mechanism **4** and moves in the vertical direction immediately above the opening of the sample container held by the sample disk **203** or at the sample discharge position. Furthermore, the sample dispensing probe **207** dispenses a sample according to the operation of a dispensing pump connected to the sample dispensing probe **207**. That is, the sample dispensing probe **207** sucks the sample from the sample container located immediately below by the suction operation of the dispensing pump according to the control of the dispensing pump by the control circuitry **9**. Furthermore, the sample dispensing probe **207** discharges the sucked sample to the reaction container **2011** located immediately below the sample discharge position by the discharge operation of the dispensing pump according to the control of the dispensing pump by the control circuitry **9**.

[0049] The first reagent dispensing arm **208** is provided in the vicinity of the outer periphery of the first reagent storage **204**. The first reagent dispensing arm **208** is provided to be movable up and

down in the vertical direction and to be rotatable in the horizontal direction by the drive mechanism **4**. The first reagent dispensing arm **208** holds the first reagent dispensing probe **209** at one end. [0050] The first reagent dispensing probe **209** rotates along an arc-shaped rotation trajectory as the first reagent dispensing arm **208** rotates. The first reagent suction position is provided on this rotation trajectory. Furthermore, a first reagent discharge position for discharging the first reagent or the standard sample sucked by the first reagent dispensing probe **209** to the reaction container **2011** is set on the rotation trajectory of the first reagent dispensing probe **209**. The first reagent discharge position corresponds to an intersection point between the rotation trajectory of the first reagent dispensing probe **209** and the movement trajectory of the reaction container **2011** held by the reaction disk **201**.

[0051] The first reagent dispensing probe **209** is driven by the drive mechanism **4** and moves in the vertical direction at the first reagent suction position or the first reagent discharge position on the rotation trajectory. The first reagent dispensing probe **209** dispenses the first reagent or the standard sample according to the operation of the first reagent pump connected to the first reagent dispensing probe **209**. That is, the first reagent dispensing probe **209** sucks the first reagent or the standard sample from the reagent container **2042** located immediately below the first reagent suction position by the suction operation of the first reagent pump according to the control of the first reagent pump by the control circuitry **9**. Furthermore, the first reagent dispensing probe **209** discharges the sucked first reagent or standard sample to the reaction container **2011** located immediately below the first reagent discharge position by the discharge operation of the first reagent pump according to the control of the first reagent pump by the control circuitry **9**.

[0052] The second reagent dispensing arm **210** is provided in the vicinity of the outer periphery of the first reagent storage **204**. The second reagent dispensing arm **210** is provided to be movable up and down in the vertical direction and to be rotatable in the horizontal direction by the drive mechanism **4**. The second reagent dispensing arm **210** holds the second reagent dispensing probe **211** at one end.

[0053] The second reagent dispensing probe **211** rotates along an arc-shaped rotation trajectory as the second reagent dispensing arm **210** rotates. The second reagent suction position is provided on this rotation trajectory. Furthermore, a second reagent discharge position for discharging the second reagent sucked by the second reagent dispensing probe **211** to the reaction container **2011** is set on the rotation trajectory of the second reagent dispensing probe **211**. The second reagent discharge position corresponds to an intersection point between the rotation trajectory of the second reagent dispensing probe **211** and the movement trajectory of the reaction container **2011** held by the reaction disk **201**.

[0054] The second reagent dispensing probe **211** is driven by the drive mechanism **4** and moves in the vertical direction at the second reagent suction position or the second reagent discharge position on the rotation trajectory. The second reagent dispensing probe **211** dispenses the second reagent according to the operation of the second reagent pump connected to the second reagent dispensing probe **211**. That is, the second reagent dispensing probe **211** sucks the second reagent from the reagent container **2052** located immediately below the second reagent suction position by the suction operation of the second reagent pump according to the control of the second reagent pump by the control circuitry **9**. Furthermore, the second reagent dispensing probe **211** discharges the sucked second reagent to the reaction container **2011** located immediately below the second reagent discharge position by the discharge operation of the second reagent pump according to the control of the second reagent pump by the control circuitry **9**.

[0055] The first stirring unit **212** is provided in the vicinity of the outer periphery of the reaction disk **201**. The first stirring unit **212** includes a first stirring arm **2121** and a first stirrer provided at the distal end of the first stirring arm **2121**. The first stirring unit **212** stirs the standard sample and the first reagent contained in the reaction container **2011** located at the first stirring position on the reaction disk **201** with the first stirrer. Furthermore, the first stirring unit **212** stirs the sample and

the first reagent contained in the reaction container **2011** located at the first stirring position on the reaction disk **201** with the first stirrer.

[0056] The second stirring unit **213** is provided in the vicinity of the outer periphery of the reaction disk **201**. The second stirring unit **213** includes a second stirring arm **2131** and a second stirrer provided at the distal end of the second stirring arm **2131**. The second stirring unit **213** stirs the standard sample, the first reagent, and the second reagent contained in the reaction container **2011** located at the second stirring position on the reaction disk **201** with the second stirrer. Furthermore, the second stirring unit **213** stirs the sample, the first reagent, and the second reagent contained in the reaction container **2011** located at the second stirring position with the second stirrer.

[0057] The photometric unit **214** optically measures a mixed solution of the sample, the first reagent, and the second reagent discharged into the reaction container **2011** at a photometric position. More specifically, the photometric unit **214** performs photometry of the mixed solution held in the reaction container **2011** that has passed through the photometric position by the rotation of the reaction disk **201** by the drive mechanism **4**. The photometric unit **214** includes a light source and a photodetector. The photometric unit **214** emits light from the light source under the control of the control circuitry **9**. The emitted light is incident from the first side wall of the reaction container **2011** and emitted from the second side wall facing the first side wall. The photometric unit **214** detects the light emitted from the reaction container **2011** with a photodetector.

[0058] For example, the photodetector is disposed on the optical axis of the light emitted from the light source to the reaction container **2011**. The photodetector detects light transmitted through the mixed solution of the standard sample, the first reagent, and the second reagent in the reaction container **2011**, and generates standard data represented by absorbance on the basis of the intensity of the detected light. Furthermore, the photodetector detects light transmitted through the mixed solution of the test sample, the first reagent, and the second reagent in the reaction container **2011**, and generates test data represented by absorbance on the basis of the intensity of the detected light. The photometric unit **214** outputs the generated standard data and test data to the analysis circuitry **3**.

[0059] The cleaning unit **215** cleans the reaction container **2011** located at the cleaning position and subjected to the measurement. More specifically, the cleaning unit **215** cleans the inside of the reaction container **2011** in which the measurement of the mixed solution has been completed by the photometric unit **214**.

[0060] The control circuitry **9** illustrated in FIG. **1** is a circuitry that controls the entire operation of the automatic analyzer **1** in accordance with an electric signal of an input operation input from the input interface **5**. For example, the control circuitry **9** has a system control function **91**, a calibration control function **92**, and a measurement control function **93**.

[0061] Here, for example, each processing function executed by the system control function **91**, the calibration control function **92**, and the measurement control function **93**, which are components of the control circuitry **9** illustrated in FIG. **1**, is recorded in the memory **8** in the form of a program executable by a computer. The control circuitry **9** is, for example, a processor. The processor constituting the control circuitry **9** reads each program from the memory **8** and executes the program to implement the function corresponding to the read program. In other words, the control circuitry **9** that has read each program has the corresponding function illustrated in the control circuitry **9** in FIG. **1**.

[0062] Note that FIG. **1** illustrates a case where each processing function of the system control function **91**, the calibration control function **92**, and the measurement control function **93** is realized by the single control circuitry **9**, but the embodiment is not limited thereto. For example, the control circuitry **9** may be configured by combining a plurality of independent processors together, and each processor may realize the corresponding processing function by executing the corresponding program. Furthermore, each processing function of the control circuitry **9** may be realized while being appropriately distributed or integrated into one or a plurality of control

circuitries.

[0063] The system control function **91** is a function of integrally controlling each unit in the automatic analyzer **1** on the basis of input information input from the input interface **5**.

[0064] The calibration control function **92** is a function of controlling the analysis mechanism **2** and the drive mechanism **4** so as to generate standard data. Specifically, the control circuitry **9** executes the calibration control function **92** at a predetermined timing. The predetermined timing is, for example, at the time of initial setting, at the time of device activation, at the time of maintenance, and when an instruction to start calibration operation is input from the user.

[0065] When the calibration control function **92** is executed, the control circuitry **9** controls the analysis mechanism **2** and the drive mechanism **4**. By controlling the analysis mechanism **2** and the drive mechanism **4**, standard data is generated in the analysis mechanism **2**. Specifically, for example, by being driven by the drive mechanism **4**, the first reagent dispensing probe **209** of the analysis mechanism **2** sucks the standard sample from the first reagent storage **204**, and discharges the sucked standard sample to the reaction container **2011**. The first reagent dispensing probe **209** sucks the first reagent from the first reagent storage **204**, and discharges the sucked first reagent to the reaction container **2011** from which the standard sample is discharged. The first stirring unit **212** stirs a solution obtained by adding the first reagent to the standard sample.

[0066] The second reagent dispensing probe **211** sucks the second reagent from the second reagent storage **205**, and discharges the sucked second reagent to the mixed solution in which the standard sample and the first reagent are mixed. The second stirring unit **213** stirs the solution obtained by adding the second reagent to the mixed solution. The photometric unit **214** generates standard data by optically measuring a mixed solution obtained by stirring the standard sample, the first reagent, and the second reagent. The photometric unit **214** outputs the generated standard data to the analysis circuitry **3**. The photometric unit **214** repeats the measurement of the mixed solution a preset number of times at a preset cycle, and outputs the generated standard data to the analysis circuitry **3**. The analysis mechanism **2** repeats the above operation for a standard sample having a plurality of concentrations set in advance, and outputs the generated standard data to the analysis circuitry **3**.

[0067] The measurement control function **93** is a function of controlling the analysis mechanism **2** and the drive mechanism **4** so as to generate test data. Specifically, the control circuitry **9** executes the measurement control function **93** in accordance with a predetermined instruction. The predetermined instruction is, for example, a measurement operation start instruction input from the user, an instruction indicating that a preset time has been reached, or the like.

[0068] When the measurement control function **93** is executed, the control circuitry **9** controls the analysis mechanism **2** and the drive mechanism **4**. By controlling the analysis mechanism **2** and the drive mechanism **4**, test data is generated in the analysis mechanism **2**. Specifically, for example, by being driven by the drive mechanism **4**, the sample dispensing probe **207** of the analysis mechanism **2** sucks the test sample from the sample disk **203**, and discharges the sucked test sample to the reaction container **2011**. The first reagent dispensing probe **209** sucks the first reagent from the first reagent storage **204**, and discharges the sucked first reagent to the reaction container **2011** from which the test sample is discharged. When the first reagent is sucked by the first reagent dispensing probe **209**, the control circuitry **9** detects the liquid level of the first reagent in the reagent container **2042** on the basis of the contact state of the first reagent dispensing probe **209** with the reagent in the reagent container **2042**. For example, the control circuitry **9** detects the liquid level of the first reagent on the basis of a change in electrical characteristics (for example, capacitance or resistance value) when the lower end portion of the first reagent dispensing probe **209** comes into contact with the first reagent. Then, the control circuitry **9** causes the drive mechanism **4** to lower the first reagent dispensing probe **209** until the liquid level of the first reagent is detected, and causes the first reagent dispensing probe **209** to suck the first reagent. The first stirring unit **212** stirs a solution obtained by adding the first reagent to the test sample.

[0069] The second reagent dispensing probe **211** sucks the second reagent from the second reagent storage **205**, and discharges the sucked second reagent to the mixed solution in which the test sample and the first reagent are mixed. Similarly to the case of the suction of the first reagent by the first reagent dispensing probe **209**, when the second reagent is sucked by the second reagent dispensing probe **211**, the control circuitry **9** causes the drive mechanism **4** to lower the second reagent dispensing probe **211** until the liquid level of the second reagent is detected, and causes the second reagent dispensing probe **211** to suck the second reagent. The second stirring unit **213** stirs the solution obtained by adding the second reagent to the mixed solution. The photometric unit **214** generates test data by optically measuring a mixed solution obtained by stirring the test sample, the first reagent, and the second reagent. The photometric unit **214** outputs the generated test data to the analysis circuitry **3**. The photometric unit **214** repeats the measurement of the mixed solution a preset number of times at a preset cycle, and outputs the generated test data to the analysis circuitry **3**.

[0070] The analysis circuitry **3** is a processor that analyzes the standard data and the test data generated by the analysis mechanism **2** and generates calibration data, analysis data, and the like. The calibration data indicates, for example, a relationship between the standard data and a standard calibration curve set in advance for the standard sample. The standard calibration curve is, for example, a calibration curve with high measurement accuracy calculated by a reagent manufacturer using the standard sample. Furthermore, the analysis data is data obtained by analyzing the test data on the basis of the calibration data, and is represented as, for example, a concentration value and an activity value of an enzyme.

[0071] The analysis circuitry **3** executes an operation program stored in the memory **8** and realizes a function corresponding to the operation program to generate calibration data, analysis data, and the like. For example, the analysis circuitry **3** calculates calibration data on the basis of standard data obtained for a standard sample with absorbance or scattered light quantity that is known and with a concentration of zero, and a plurality of standard samples with absorbance or scattered light quantity that is known and with concentrations each of which is known, a standard calibration curve set in advance for these standard samples, a photometric timing set in advance, and the like. Furthermore, the analysis circuitry **3** generates analysis data on the basis of test data, calibration data of a test item corresponding to the test data, a photometric timing set in advance, and the like. The analysis circuitry **3** outputs the generated calibration data, analysis data, and the like to the control circuitry **9**.

[0072] Next, details of the reagent container **2042** according to the first embodiment will be described. Note that the configuration of the reagent container **2042** installed in the first reagent storage **204** will be described below, and the configuration of the reagent container **2052** installed in the second reagent storage **205** may be similar to the reagent container **2042**. FIG. **3** is a side view illustrating a configuration example of the reagent container **2042** according to the first embodiment. FIG. **4** is a perspective view illustrating a configuration example of the reagent container **2042** according to the first embodiment. FIG. **5** is a front view illustrating shielding portions **13A**, **13B**, **13C**, and **13D** of the reagent container **2042** according to the first embodiment. In FIGS. **3** to **5**, a D1 direction is defined as the inner side in the rotation radial direction of the first reagent storage **204**, that is, the inner diameter side. Furthermore, a D2 direction is defined as the outer side in the rotation radial direction of the first reagent storage **204**, that is, the outer diameter side. Furthermore, a D3 direction is defined as upward. Furthermore, a D4 direction is defined as downward.

[0073] As illustrated in FIGS. **3** and **4**, the reagent container **2042** includes a plate-like lid portion **11** in which an outlet **14** of the first reagent is formed, and a main body portion **12** having the lid portion **11** fixed to the upper portion thereof. The reagent container **2042** is installed in the first reagent storage **204** that rotates in the automatic analyzer **1**. The reagent container **2042** includes four shielding portions **13A**, **13B**, **13C**, and **13D** configured by a first shielding portion **13A**, a

second shielding portion **13B**, a third shielding portion **13C**, and a fourth shielding portion **13D**. Note that the number of the shielding portions **13A**, **13B**, **13C**, and **13D** is not limited to four. For example, the number of the shielding portions may be one or more and three or less, or may be five or more.

[0074] The shielding portions **13A**, **13B**, **13C**, and **13D** partially shield the inner diameter side and the outer diameter side in the rotation of the first reagent storage **204** inside the reagent container **2042**. The first shielding portion **13A** is disposed on the innermost diameter side **D1** of the four shielding portions **13A**, **13B**, **13C**, and **13D**. The first shielding portion **13A** is disposed on the inner diameter side **D1** with respect to the outlet **14**. The first shielding portion **13A** partially shields a region on the inner diameter side **D1** with respect to the first shielding portion **13A** and a region on the outer diameter side **D2** with respect to the first shielding portion **13A** in the reagent container **2042**. The second shielding portion **13B** is disposed on the outer diameter side **D2** of the first shielding portion **13A**. The second shielding portion **13B** is disposed on the outer diameter side **D2** with respect to the outlet **14**. The second shielding portion **13B** partially shields a region on the inner diameter side **D1** with respect to the second shielding portion **13B** and a region on the outer diameter side **D2** with respect to the second shielding portion **13B** in the reagent container **2042**. The third shielding portion **13C** is disposed on the outer diameter side **D2** of the second shielding portion **13B**. The third shielding portion **13C** partially shields a region on the inner diameter side **D1** with respect to the third shielding portion **13C** and a region on the outer diameter side **D2** with respect to the third shielding portion **13C** in the reagent container **2042**. The fourth shielding portion **13D** is disposed on the outer diameter side **D2** of the third shielding portion **13C**. The fourth shielding portion **13D** partially shields a region on the inner diameter side **D1** with respect to the fourth shielding portion **13D** and a region on the outer diameter side **D2** with respect to the fourth shielding portion **13D** in the reagent container **2042**.

[0075] Here, the shielding portions **13A**, **13B**, **13C**, and **13D** are provided to reduce bubbles generated in a first reagent **R**. However, if gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and side surfaces **1221** and **1222** of the reagent container are not appropriately held, there is a possibility that bubbles are generated in the first reagent **R** due to the structure of the shielding portions **13A**, **13B**, **13C**, and **13D**.

[0076] Therefore, in order to suppress generation of bubbles in the first reagent **R** due to the structure of the shielding portions **13A**, **13B**, **13C**, and **13D**, in the first embodiment, the gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container are appropriately held. Specifically, as illustrated in FIG. 5, the gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container is configured to increase from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**. More specifically, the gap **G1** between one end portion **131** of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation direction **R1** of the first reagent storage **204** and one side surface **1221** (that is, a first side surface) of the reagent container **2042** in the rotation direction **R1** of the first reagent storage **204** facing the end portion **131** is configured to increase from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**. Furthermore, the gap **G2** between the other end portion **132** of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation direction **R1** of the first reagent storage **204** and the other side surface **1222** (that is, a second side surface) of the reagent container **2042** in the rotation direction **R1** of the first reagent storage **204** facing the end portion **132** is configured to increase from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**. At the same height, the sizes of the two gaps **G1** and **G2** may be the same as each other.

[0077] As illustrated in FIG. 3, the shielding portions **13A**, **13B**, **13C**, and **13D** are provided on an inner upper surface **111** (that is, the lower surface of the lid portion **11**) of the reagent container **2042** so as to extend to the downward direction **D4**, which is a direction toward a bottom surface **121** of the reagent container **2042**. The shielding portions **13A**, **13B**, **13C**, and **13D** are integrally

molded with the lid portion **11** using, for example, a mold.

[0078] The outlet **14** described above is provided at a position on the inner diameter side **D1** on the inner upper surface **111** of the reagent container **2042** so as to penetrate the inner upper surface **111**. As illustrated in FIGS. **3** and **4**, the bottom surface **121** of the reagent container **2042** is inclined so as to be away from the inner upper surface **111** as approaching the outlet **14** in the rotation radial direction of the first reagent storage **204**. Since the bottom surface **121** of the reagent container **2042** is inclined so as to be away from the inner upper surface **111** as approaching the outlet **14**, it is possible to reduce a dead volume, which is a space of the reagent container **2042** in which the first reagent is not sucked and is accumulated. As illustrated in FIG. **4**, the bottom surface **121** is provided with a recess **121a** facing the outlet **14**, so that the dead volume can be further reduced.

[0079] As described above, the four shielding portions **13A**, **13B**, **13C**, and **13D** are disposed at intervals in the rotation radial direction of the first reagent storage **204**. The first shielding portion **13A** and the second shielding portion **13B** close to the outlet **14** among the four shielding portions **13A**, **13B**, **13C**, and **13D** extend to the downward direction **D4** (that is, the bottom surface **121** side) more than the third shielding portion **13C** and the fourth shielding portion **13D** far from the outlet **14** among the four shielding portions **13A**, **13B**, **13C**, and **13D**. Note that the third shielding portion **13C** closer to the outlet **14** than the fourth shielding portion **13D** extends to the downward direction **D4** more than the fourth shielding portion **13D**. The lower end portions of the shielding portions **13A**, **13B**, **13C**, and **13D** may be in contact with the bottom surface **121** or may be away from the bottom surface **121** in the upward direction **D3** side.

[0080] As illustrated in FIG. **5**, a width **W** of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation direction **R1** of the first reagent storage **204** are reduced from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**. In the example illustrated in FIG. **5**, the width **W** of the shielding portions **13A**, **13B**, **13C**, and **13D** is continuously reduced from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**. More specifically, the end portions **131** and **132** of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation direction **R1** of the first reagent storage **204** have linear shapes inclined with respect to the side surfaces **1221** and **1222** of the reagent container. That is, the shielding portions **13A**, **13B**, **13C**, and **13D** have a trapezoidal shape (that is, a wedge shape) when viewed from the rotation radial direction of the first reagent storage **204**.

[0081] The angle (hereinafter, also referred to as a first inclination angle) formed by the end portions **131** and **132** of the shielding portions **13A**, **13B**, **13C**, and **13D** with respect to the side surfaces **1221** and **1222** of the reagent container in the rotation direction **R1** of the first reagent storage **204** may be 1.5° or more. The first inclination angle is preferably 2° or more, or more preferably 3° or more.

[0082] The first inclination angle is larger than a second inclination angle formed by the end portion **133** of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation radial direction with respect to side surfaces (that is, second side surfaces of the reagent container) **1223** and **1224** having a direction intersecting the rotation radial direction of the first reagent storage **204**. The side surfaces **1223** and **1224** having directions intersecting with the rotation radial direction connect the side surfaces **1221** and **1222** having directions intersecting with the rotation direction **R1**. In the example illustrated in FIG. **3**, the second inclination angle is almost 0°. The first inclination angle can also be referred to as a gradient of the shielding portions **13A**, **13B**, **13C**, and **13D** in the width direction. The second inclination angle can also be referred to as a gradient of the shielding portions **13A**, **13B**, **13C**, and **13D** in the thickness direction.

[0083] As illustrated in FIG. **3**, the reagent container **2042** further includes a reinforcing portion **15** that is connected to the shielding portions **13A**, **13B**, **13C**, and **13D** and reinforces the shielding portions **13A**, **13B**, **13C**, and **13D**. In the example illustrated in FIG. **3**, the reinforcing portion **15** protrudes toward the outer diameter side **D2** from the central position of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation direction **R1**. The reinforcing portion **15** may protrude

toward the inner diameter side D1 from the central position of the shielding portions 13A, 13B, 13C, and 13D in the rotation direction R1.

[0084] Each of the lid portion 11 and the main body portion 12 provided with the shielding portions 13A, 13B, 13C, and 13D may be formed by, for example, resin molding using a mold.

[0085] Next, an example of movement of the reagent in the reagent container 2042 configured as described above will be described. FIG. 6 is a diagram illustrating an example of movement of a reagent in the reagent container 2042 according to the first embodiment.

[0086] When the reagent container 2042 installed in the first reagent storage 204 is moved to the first suction position, the drive mechanism 4 rotates the first reagent storage 204 in the rotation direction R1. When the first reagent storage 204 is rotated, a centrifugal force due to the rotation of the first reagent storage 204 acts on the first reagent R in the reagent container 2042. When the centrifugal force acts, the first reagent R in the reagent container 2042 is moved to the outer diameter side D2 of the reagent container 2042 as illustrated in FIG. 6 (step S1).

[0087] When the first reagent storage 204 reaches the first suction position, the drive mechanism 4 stops the rotation of the first reagent storage 204. When the rotation of the first reagent storage 204 is stopped, the centrifugal force due to the rotation of the first reagent storage 204 does not act on the first reagent R in the reagent container 2042. When the centrifugal force no longer acts on the first reagent R, the first reagent R that has been moved to the outer diameter side D2 of the reagent container 2042 tends to return to the inner diameter side D1.

[0088] At this time, since the gaps G1 and G2 between the shielding portions 13A, 13B, 13C, and 13D and the side surfaces 1221 and 1222 of the reagent container increase from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D, as indicated by an arrow A1 in FIG. 6, the first reagent R located on the downward direction D4 side in which the gaps G1 and G2 are wide returns to the inner diameter side D1 earlier than the first reagent R located on the upward direction D3 side in which the gaps G1 and G2 are narrow (step S2).

[0089] When the first reagent R on the downward direction D4 side first returns to the inner diameter side D1, the first reagent can smoothly return to the inner diameter side D1. As a result, it is possible to suppress the occurrence of entrainment in the first reagent R on the upward direction D3 side (step S3). Note that an arrow A2 superimposed with a symbol "x" in FIG. 6 indicates that the first reagent R indicated by the arrow A2 is prevented from being entrained. Note that the shielding portions 13A, 13B, 13C, and 13D may also suppress the first reagent R from being entrained when the first reagent storage 204 rotates from the stopped state. Since the entrainment of the first reagent R can be suppressed, bubbles generated in the first reagent R, that is, air bubbles can be reduced.

[0090] FIG. 7 is a diagram illustrating an example of movement of a reagent in the reagent container 2042 according to a comparative example. On the other hand, if the gaps G1 and G2 between the shielding portions 13A, 13B, 13C, and 13D and the side surfaces 1221 and 1222 of the reagent container decrease from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D, as indicated by an arrow A3 in FIG. 7, the first reagent R on the upward direction D3 side in which the gaps G1 and G2 are wide first returns to the inner diameter side D1 (step S2). When the first reagent R on the upward direction D3 side first returns to the inner diameter side D1, the first reagent R on the upward direction D3 side is entrained as indicated by an arrow A4 in FIG. 7 (step S3). When the first reagent R is entrained, bubbles are generated in the first reagent R.

[0091] As described above, in the first embodiment, the gaps G1 and G2 between the shielding portions 13A, 13B, 13C, and 13D and the side surfaces 1221 and 1222 of the reagent container is configured to increase from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D.

[0092] With this configuration, when the first reagent R moves in accordance with rotation or stop of the first reagent storage 204, the first reagent R on the downward direction D4 side can be

moved first to suppress the entrainment of the first reagent R. Since the entrainment of the first reagent R can be suppressed, bubbles generated in the first reagent R can be appropriately reduced. Since the generation of bubbles can be appropriately reduced, the liquid level of the first reagent R can be appropriately detected by the measurement control function **93** using the first reagent dispensing probe **209**. Since the liquid level of the first reagent R can be appropriately detected, the first reagent R can be appropriately dispensed by the first reagent dispensing probe **209**.

Furthermore, even in a case where the measurement control function **93** is configured to detect an abnormality associated with the generation of bubbles (for example, detection of pressure abnormality of the first reagent R in the flow path connected to the first reagent dispensing probe **209**, detection of abnormality of the measurement result, and the like), it is possible to reduce the detection of the abnormality and the occurrence of error processing accordingly. As a result, the throughput of the automatic analyzer **1** can be improved.

[0093] Furthermore, in the first embodiment, the shielding portions **13A**, **13B**, **13C**, and **13D** are provided on the inner upper surface **111** of the reagent container **2042** so as to extend toward the bottom surface **121** of the reagent container **2042**.

[0094] As a result, the configuration of the shielding portions **13A**, **13B**, **13C**, and **13D** provided on the lid portion **11** can be changed in design according to the conditions of rotation and stop of the first reagent storage **204** while the configuration on the main body portion **12** side of the reagent container **2042** is common, so that the cost can be reduced. Moreover, since the shielding portions **13A**, **13B**, **13C**, and **13D** do not come into contact with the bottom surface **121** of the reagent container **2042**, the number of corner portions on the bottom surface in which the reagent easily remains can be reduced as compared with a configuration in which the shielding portion is provided on the bottom surface (for example, the comparative example of FIG. 7), and the dead volume can be reduced.

[0095] Furthermore, in the first embodiment, the outlet **14** for the first reagent R is provided on the inner upper surface **111**. Furthermore, the bottom surface **121** is inclined so as to be away from the inner upper surface **111** as approaching the outlet **14**. Furthermore, a plurality of shielding portions **13A**, **13B**, **13C**, and **13D** is disposed at intervals in the rotation radial direction of the first reagent storage **204**. Furthermore, the shielding portion close to the outlet **14** among the plurality of shielding portions **13A**, **13B**, **13C**, and **13D** extends to the downward direction **D4** more than the shielding portion far from the outlet **14** among the plurality of shielding portions **13A**, **13B**, **13C**, and **13D**.

[0096] As a result, since each of the shielding portions **13A**, **13B**, **13C**, and **13D** can appropriately suppress rapid movement of the first reagent R, bubbles generated in the first reagent R can be further appropriately reduced.

[0097] Furthermore, in the first embodiment, the width **W** of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation direction of the first reagent storage **204** are reduced from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**.

[0098] As a result, with a simple configuration in which the width **W** is reduced from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**, the gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container can be formed so as to increase from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**.

[0099] Furthermore, in the first embodiment, the width **W** of the shielding portions **13A**, **13B**, **13C**, and **13D** is continuously reduced from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**.

[0100] As a result, with a simpler configuration in which the width **W** is continuously reduced from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**, the gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container can be formed so as to increase from the upper portion to the lower

portion of the shielding portions **13A**, **13B**, **13C**, and **13D**.

[0101] Furthermore, in the first embodiment, the end portions **131** and **132** of the shielding portions **13A**, **13B**, **13C**, and **13D** in the rotation direction of the first reagent storage **204** have linear shapes inclined with respect to the side surfaces **1221** and **1222** of the reagent container.

[0102] As a result, with a simpler configuration in which the end portions **131** and **132** of the shielding portions **13A**, **13B**, **13C**, and **13D** have inclined linear shapes, the gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container can be formed so as to increase from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**.

[0103] Furthermore, in the first embodiment, the reagent container **2042** further includes the reinforcing portion **15** connected to the shielding portions **13A**, **13B**, **13C**, and **13D**.

[0104] As a result, even if the width **W** of the shielding portions **13A**, **13B**, **13C**, and **13D** are partially reduced as the sizes of the gaps **G1** and **G2** are changed in the vertical direction, the strength of the shielding portions **13A**, **13B**, **13C**, and **13D** can be appropriately secured by the reinforcing portion **15**.

(First Modification)

[0105] Next, a first modification of the first embodiment in which the widths **W** of the shielding portions **13A**, **13B**, **13C**, and **13D** are made different will be described focusing on a difference from the above-described embodiment. FIG. **8** is a view illustrating the shielding portions **13A**, **13B**, **13C**, and **13D** of the reagent container **2042** according to the first modification of the first embodiment.

[0106] In the example illustrated in FIG. **8**, the gaps **G1** and **G2** between the shielding portion on the outer diameter side **D2** among the plurality of shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container are larger than the gaps **G1** and **G2** between the shielding portion on the inner diameter side **D1** among the plurality of shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container. Specifically, at the same height, the gaps **G1** and **G2** between the second shielding portion **13B** and the side surfaces **1221** and **1222** of the reagent container are larger than the gaps **G1** and **G2** between the first shielding portion **13A** and the side surfaces **1221** and **1222** of the reagent container. Furthermore, at the same height, the gaps **G1** and **G2** between the third shielding portion **13C** and the side surfaces **1221** and **1222** of the reagent container are larger than the gaps **G1** and **G2** between the second shielding portion **13B** and the side surfaces **1221** and **1222** of the reagent container. Furthermore, at the same height, the gaps **G1** and **G2** between the fourth shielding portion **13D** and the side surfaces **1221** and **1222** of the reagent container are larger than the gaps **G1** and **G2** between the third shielding portion **13C** and the side surfaces **1221** and **1222** of the reagent container.

[0107] That is, in the example illustrated in FIG. **8**, the shielding portion on the outer diameter side **D2** among the plurality of shielding portions **13A**, **13B**, **13C**, and **13D** has the width **W** smaller than the shielding portion on the inner diameter side **D1** among the plurality of shielding portions **13A**, **13B**, **13C**, and **13D**. Specifically, at the same height, the width **W** of the second shielding portion **13B** is smaller than the width **W** of the first shielding portion **13A**. Furthermore, at the same height, the width **W** of the third shielding portion **13C** is smaller than the width **W** of the second shielding portion **13B**. Furthermore, at the same height, the width **W** of the fourth shielding portion **13D** is smaller than the width **W** of the third shielding portion **13C**.

[0108] According to the example illustrated in FIG. **8**, on the outer diameter side **D2** in which the flow velocity and the flow rate of the first reagent **R** are large, the gaps **G1** and **G2** between the shielding portion and the side surfaces **1221** and **1222** of the reagent container can be increased to facilitate the movement of the first reagent **R**, so that the occurrence of entrainment and the occurrence of bubbles associated therewith can be effectively reduced. Furthermore, with a simple configuration in which the width **W** of the shielding portion is reduced on the outer diameter side

D2, the gaps G1 and G2 between the shielding portion and the side surfaces 1221 and 1222 of the reagent container can be increased on the outer diameter side D2.

(Second Modification)

[0109] Next, a modification of the shapes of the end portions 131 and 132 of the shielding portions 13A, 13B, 13C, and 13D will be described focusing on differences from the above-described embodiments. FIG. 9 is a view illustrating the shielding portions 13A, 13B, 13C, and 13D of the reagent container 2042 according to a second modification of the first embodiment.

[0110] In FIG. 5, an example has been described in which the end portions 131 and 132 of the shielding portions 13A, 13B, 13C, and 13D in the rotation direction R1 of the reagent container 2042 have linear shapes inclined with respect to the side surfaces 1221 and 1222 of the reagent container. On the other hand, in the example illustrated in FIG. 9, the end portions 131 and 132 of the shielding portions 13A, 13B, 13C, and 13D have curved shapes inclined with respect to the side surfaces 1221 and 1222 of the reagent container. More specifically, in the example illustrated in FIG. 9, the end portions 131 and 132 of the shielding portions 13A, 13B, 13C, and 13D have curved shapes curved outward.

[0111] Also in the second modification, since the gaps G1 and G2 between the shielding portions 13A, 13B, 13C, and 13D and the side surfaces 1221 and 1222 of the reagent container can be configured to increase from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D, bubbles generated in the first reagent R can be appropriately reduced. Furthermore, the degree of freedom in designing the shielding portions 13A, 13B, 13C, and 13D can be improved.

(Third Modification)

[0112] Next, another modification of the shapes of the end portions 131 and 132 of the shielding portions 13A, 13B, 13C, and 13D will be described focusing on differences from the above-described embodiments. FIG. 10 is a view illustrating the shielding portions 13A, 13B, 13C, and 13D of the reagent container 2042 according to a third modification of the first embodiment.

[0113] In the example illustrated in FIG. 10, the end portions 131 and 132 of the shielding portions 13A, 13B, 13C, and 13D have curved shapes inclined with respect to the side surfaces 1221 and 1222 of the reagent container. Unlike FIG. 9, in the example illustrated in FIG. 10, the end portions 131 and 132 of the shielding portions 13A, 13B, 13C, and 13D have curved shapes curved inward.

[0114] Also in the third modification, since the gaps G1 and G2 between the shielding portions 13A, 13B, 13C, and 13D and the side surfaces 1221 and 1222 of the reagent container can be configured to increase from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D, bubbles generated in the first reagent R can be appropriately reduced. Furthermore, the degree of freedom in designing the shielding portions 13A, 13B, 13C, and 13D can be improved.

(Fourth Modification)

[0115] Next, a modification of the width W of the shielding portions 13A, 13B, 13C, and 13D will be described focusing on differences from the above-described embodiments. FIG. 11 is a view illustrating the shielding portions 13A, 13B, 13C, and 13D of the reagent container 2042 according to a fourth modification of the first embodiment.

[0116] In FIG. 5, an example has been described in which the width W of the shielding portions 13A, 13B, 13C, and 13D is continuously reduced from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D. On the other hand, in the example illustrated in FIG. 11, the width W of the shielding portions 13A, 13B, 13C, and 13D is gradually reduced from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D.

[0117] Also in the fourth modification, since the gaps G1 and G2 between the shielding portions 13A, 13B, 13C, and 13D and the side surfaces 1221 and 1222 of the reagent container can be configured to increase from the upper portion to the lower portion of the shielding portions 13A, 13B, 13C, and 13D, bubbles generated in the first reagent R can be appropriately reduced.

Furthermore, the degree of freedom in designing the shielding portions **13A**, **13B**, **13C**, and **13D** can be improved.

Second Embodiment

[0118] Next, a second embodiment in which the shielding portions **13A**, **13B**, **13C**, and **13D** are provided on the bottom surface **121** will be described focusing on differences from the above-described embodiment. FIG. **12** is a view illustrating the shielding portions **13A**, **13B**, **13C**, and **13D** of the reagent container **2042** according to the second embodiment.

[0119] In the first embodiment, an example in which the shielding portions **13A**, **13B**, **13C**, and **13D** are provided on the inner upper surface **111** of the reagent container **2042** has been described. On the other hand, in the example illustrated in FIG. **12**, the shielding portions **13A**, **13B**, **13C**, and **13D** are provided on the bottom surface **121** of the reagent container **2042** so as to extend in a direction toward the inner upper surface **111** of the reagent container **2042** (that is, the upward direction **D3**). In other respects, the configurations of the shielding portions **13A**, **13B**, **13C**, and **13D** are similar to the configurations illustrated in FIG. **5** of the first embodiment.

[0120] FIG. **13** is a diagram illustrating an example of movement of a reagent in the reagent container **2042** according to the second embodiment. As illustrated in FIG. **13**, also in the second embodiment, since the gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container increase from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**, when the rotation of the first reagent storage **204** is stopped, the first reagent **R** on the downward direction **D4** side first returns to the inner diameter side **D1** (step **S2**). As a result, it is possible to suppress the occurrence of entrainment in the first reagent **R** on the upward direction **D3** side (step **S3**).

[0121] Note that, similarly to the first embodiment, the first to fourth modifications described above may be applied to the shielding portions **13A**, **13B**, **13C**, and **13D** in the second embodiment.

[0122] Also in the second embodiment, similarly to the first embodiment, the gaps **G1** and **G2** between the shielding portions **13A**, **13B**, **13C**, and **13D** and the side surfaces **1221** and **1222** of the reagent container are formed to be increased from the upper portion to the lower portion of the shielding portions **13A**, **13B**, **13C**, and **13D**. As a result, since the first reagent **R** on the downward direction **D4** side can be moved first to suppress the entrainment of the first reagent **R**, bubbles generated in the first reagent **R** can be appropriately reduced. Furthermore, the degree of freedom in designing the shielding portions **13A**, **13B**, **13C**, and **13D** can be improved.

[0123] According to at least one embodiment described above, bubbles generated in the reagent in the reagent container **2042** can be appropriately reduced.

[0124] Note that a term “processor” used in the description of the embodiment means, for example, a central processing unit (CPU), a graphics processing unit (GPU), or a circuitry such as an application-specific integrated circuit (ASIC) or a programmable logic device (for example, a simple programmable logic device (SPLD), a complex programmable logic device (CPLD), or a field-programmable gate array (FPGA)). The processor achieves functions by reading and executing programs stored in the memory **8**. Note that, instead of storing the programs in the memory **8**, the programs may be directly incorporated in the circuitry of the processor. In this case, the processor achieves the functions by reading and executing the programs incorporated in the circuitry. Note that each processor of a respective one of the above embodiments is not limited to a case where each processor is configured as a single processor circuitry, and a plurality of independent circuitries may be combined to be configured as one processor to achieve the functions. Moreover, the plurality of components in the above embodiment may be integrated into one processor to achieve the functions.

[0125] Although some embodiments of the present invention have been described, these embodiments have been presented as examples, and are not intended to limit the scope of the invention. These embodiments can be implemented in various other forms, and various omissions,

substitutions, and changes can be made without departing from the gist of the invention. These embodiments and modifications thereof are included in the scope and gist of the invention and are included in the invention described in the claims and the equivalent scope thereof.

[0126] In relation to the embodiments described above, the following notes are presented as a number of aspects and selected characteristics of the present disclosure:

Note 1:

[0127] A reagent container installed in a reagent storage that rotates in an automatic analyzer, the reagent container including a shielding portion that partially shields an inner diameter side and an outer diameter side in the rotation inside the reagent container, in which a gap between the shielding portion and a side surface of the reagent container is configured to increase from an upper portion toward a lower portion of the shielding portion.

Note 2:

[0128] The shielding portion may be provided on an inner upper surface of the reagent container so as to extend toward a bottom surface of the reagent container.

Note 3:

[0129] The shielding portion may be provided on a bottom surface of the reagent container so as to extend toward an inner upper surface of the reagent container.

Note 4:

[0130] An outlet of a reagent is provided on the inner upper surface, [0131] the bottom surface is inclined so as to be away from the inner upper surface as approaching the outlet, [0132] a plurality of shielding portions is provided at intervals in a rotation radial direction of the reagent storage, and [0133] a shielding portion close to the outlet among the plurality of shielding portions may extend downward more than a shielding portion far from the outlet among the plurality of shielding portions.

Note 5:

[0134] A plurality of shielding portions is provided at intervals in a rotation radial direction of the reagent storage, and [0135] a gap between the shielding portion on the outer diameter side among the plurality of shielding portions and the side surface of the reagent container may be larger than a gap between the shielding portion on the inner diameter side among the plurality of shielding portions and the side surface of the reagent container.

Note 6:

[0136] A width of the shielding portion in a rotation direction of the reagent storage may be reduced from an upper portion to a lower portion of the shielding portion.

Note 7:

[0137] A plurality of shielding portions is provided at intervals in a rotation radial direction of the reagent storage, and [0138] the width of the shielding portion on the outer diameter side among the plurality of shielding portions may be smaller than the width of the shielding portion on the inner diameter side among the plurality of shielding portions.

Note 8:

[0139] The width of the shielding portion may be continuously reduced from an upper portion to a lower portion of the shielding portion.

Note 9:

[0140] An end portion of the shielding portion in a rotation direction of the reagent storage may have a linear shape inclined with respect to the side surface of the reagent container.

Note 10:

[0141] An end portion of the shielding portion in a rotation direction of the reagent storage may have a curved shape inclined with respect to the side surface of the reagent container.

Note 11:

[0142] The width of the shielding portion may be gradually reduced from an upper portion to a lower portion of the shielding portion.

Note 12:

[0143] A reinforcing portion connected to the shielding portion may be further provided.

Note 13:

[0144] An angle formed by an end portion of the shielding portion in the rotation direction with respect to the side surface of the reagent container may be 2° or more.

Note 14:

[0145] The side surface of the reagent container is a side surface having a direction intersecting the rotation direction, and the angle formed by an end portion of the shielding portion in the rotation direction with respect to the side surface of the reagent container may be larger than a second angle formed by an end portion of the shielding portion in a rotation radial direction with respect to a second side surface of the reagent container having a direction intersecting the rotation radial direction of the reagent storage.

Note 15:

[0146] The reagent container according to claim 1, in which [0147] the side surface of the reagent container has a first side surface located on one side in a rotation direction of the reagent storage and a second side surface located on another side in the rotation direction, [0148] a gap between the shielding portion and the side surface of the reagent container has a first gap between one end portion of the shielding portion and the first side surface in the rotation direction and a second gap between another end portion of the shielding portion and the second side surface in the rotation direction, and [0149] the first gap and the second gap are configured to increase from the upper portion toward the lower portion of the shielding portion.

Note 16:

[0150] At the same height, the first gap and the second gap may be the same.

Note 17:

[0151] A lower end portion of the shielding portion may be in contact with a bottom surface of the reagent container.

Note 18:

[0152] A lower end portion of the shielding portion may be away upward from a bottom surface of the reagent container.

Note 19:

[0153] The shielding portion may contain a resin.

Note 20:

[0154] An automatic analyzer including: [0155] a reagent storage that rotates; and [0156] a reagent container installed in the reagent storage, in which [0157] the reagent container includes: [0158] a shielding portion that partially shields an inner diameter side and an outer diameter side in the rotation inside the reagent container, and [0159] a gap between the shielding portion and a side surface of the reagent container is configured to increase from an upper portion toward a lower portion of the shielding portion.

Claims

1. A reagent container installed in a reagent storage that rotates in an automatic analyzer, the reagent container comprising a shielding portion that partially shields an inner diameter side and an outer diameter side in the rotation inside the reagent container, wherein a gap between the shielding portion and a side surface of the reagent container is configured to increase from an upper portion toward a lower portion of the shielding portion.
2. The reagent container according to claim 1, wherein the shielding portion is provided on an inner upper surface of the reagent container so as to extend toward a bottom surface of the reagent container.
3. The reagent container according to claim 1, wherein the shielding portion is provided on a

bottom surface of the reagent container so as to extend toward an inner upper surface of the reagent container.

4. The reagent container according to claim 2, wherein an outlet of a reagent is provided on the inner upper surface, the bottom surface is inclined so as to be away from the inner upper surface as approaching the outlet, a plurality of shielding portions is provided at intervals in a rotation radial direction of the reagent storage, and a shielding portion close to the outlet among the plurality of shielding portions extends downward more than a shielding portion far from the outlet among the plurality of shielding portions.

5. The reagent container according to claim 1, wherein a plurality of shielding portions is provided at intervals in a rotation radial direction of the reagent storage, and a gap between the shielding portion on the outer diameter side among the plurality of shielding portions and the side surface of the reagent container is larger than a gap between the shielding portion on the inner diameter side among the plurality of shielding portions and the side surface of the reagent container.

6. The reagent container according to claim 1, wherein a width of the shielding portion in a rotation direction of the reagent storage is reduced from the upper portion to the lower portion of the shielding portion.

7. The reagent container according to claim 6, wherein the plurality of shielding portions is provided at intervals in a rotation radial direction of the reagent storage, and the width of the shielding portion on the outer diameter side among the plurality of shielding portions is smaller than the width of the shielding portion on the inner diameter side among the plurality of shielding portions.

8. The reagent container according to claim 6, wherein the width of the shielding portion is continuously reduced from the upper portion to the lower portion of the shielding portion.

9. The reagent container according to claim 8, wherein an end portion of the shielding portion in the rotation direction of the reagent storage has a linear shape inclined with respect to the side surface of the reagent container.

10. The reagent container according to claim 8, wherein an end portion of the shielding portion in the rotation direction of the reagent storage has a curved shape inclined with respect to the side surface of the reagent container.

11. The reagent container according to claim 6, wherein the width of the shielding portion is gradually reduced from the upper portion to the lower portion of the shielding portion.

12. The reagent container according to claim 1, further comprising a reinforcing portion connected to the shielding portion.

13. The reagent container according to claim 9, wherein an angle formed by the end portion of the shielding portion in the rotation direction with respect to the side surface of the reagent container is 2° or more.

14. The reagent container according to claim 9, wherein the side surface of the reagent container is a side surface having a direction intersecting the rotation direction, and the angle is larger than a second angle formed by the end portion of the shielding portion in a rotation radial direction with respect to a second side surface of the reagent container having a direction intersecting the rotation radial direction of the reagent storage.

15. The reagent container according to claim 1, wherein the side surface of the reagent container has a first side surface located on one side in a rotation direction of the reagent storage and a second side surface located on another side in the rotation direction, a gap between the shielding portion and the side surface of the reagent container has a first gap between one end portion of the shielding portion and the first side surface in the rotation direction and a second gap between another end portion of the shielding portion and the second side surface in the rotation direction, and the first gap and the second gap are configured to increase from the upper portion toward the lower portion of the shielding portion.

16. The reagent container according to claim 15, wherein the first gap and the second gap are a

same at a same height.

17. The reagent container according to claim 1, wherein a lower end portion of the shielding portion is in contact with a bottom surface of the reagent container.

18. The reagent container according to claim 1, wherein a lower end portion of the shielding portion is away upward from a bottom surface of the reagent container.

19. The reagent container according to claim 1, wherein the shielding portion contains a resin.

20. An automatic analyzer comprising: a reagent storage that rotates; and a reagent container installed in the reagent storage, wherein the reagent container includes: a shielding portion that partially shields an inner diameter side and an outer diameter side in the rotation inside the reagent container, and a gap between the shielding portion and a side surface of the reagent container is configured to increase from an upper portion toward a lower portion of the shielding portion.
