TITLE OF INVENTION

INFORMATION PROCESSING DEVICE, INFORMATION MANAGEMENT METHOD, COMPUTER PROGRAM, AND SPECIMEN COLLECTION KIT

TECHNICAL FIELD

[0001] The technology disclosed in the present specification relates to an information processing device, an information management method, a computer program, and a specimen collection kit.

BACKGROUND ART

[0002] Conventionally, technology is known in which a user, such as a person to be tested, can obtain a diagnosis result regarding the presence or absence of an antibody or an antigen using a mobile terminal or the like. For example, in a first technology, a camera provided in a mobile phone captures an image of a determination part of a test body on which a coloring state is displayed. The mobile phone transmits the obtained image data to a diagnostic server. The diagnostic server detects the presence or absence or concentration of a specific component based on the received image data, and transmits diagnostic data corresponding to the detected presence or absence or concentration of the specific component to the mobile phone (see, for example, Patent Document 1). In a second technology, an antigen test terminal executes an antigen test based on an inserted immunochromatographic test kit, and automatically transmits a test result and a status of the presence or absence of infection to a mobile terminal owned by the person to be tested (see, for example, Patent Document 2).

[0003] Further, a blood collection tool for collecting blood from a punctured part of a human body is known (see, for example, Patent Document 2). A conventional blood collection tool includes a capillary tube and a push-type chamber. The capillary tube has a tip portion with a small diameter and a proximal portion with a large diameter. The chamber communicates with

an intermediate portion between the tip portion and the proximal portion of the capillary tube. When the chamber is pressed in a state where the tip portion of the capillary tube is in contact with blood coming out from the punctured part, the blood is sucked from the tip portion toward the proximal portion of the capillary tube (see, for example, Patent Document 3).

CITATION LIST PATENT LITERATURE

[0004] Patent Literature 1 JP 2010-190867 A

Patent Literature 1 JP 2022-115777 A

Patent Literature 1 JP 2022-161878 A

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005] In the conventional technologies 1 and 2 described above, there is a problem that the user cannot obtain the determination result of the infection status unless the information processing device, such as the mobile terminal owned by the user, and the external device (management server), such as the diagnostic server, are connected online. Further, in the technology 1, there is a problem that the determination result of the infection status of the user is disclosed to a third party regardless of the user's intention.

[0006] Further, the conventional blood collection tool described above is a so-called dropper-type suction tool that utilizes a suction force generated by a restoring force of a chamber. For this reason, the suction force is relatively weak, and there is a possibility that a sufficient amount of blood for a test cannot be collected. Such a problem is not limited to blood collection, but is a common problem in collection and testing for collecting a specimen other than blood. A specimen is what is excreted or collected from a human body, and includes materials obtained by a procedure or surgery, such as urine, feces, sputum, saliva, and scrapings, in addition to blood.

[0007] The present specification discloses technology capable of solving at least one of the

above-described problems.

SOLUTION TO PROBLEM

[0008] The technology disclosed in the present specification can be realized, for example, as the following aspects.

(1) An information processing device disclosed in the present specification is communicatably connected to an external device (management server) via a network. The information processing device comprises an acquisition unit, an operation unit, a notification unit, and a controller. The controller executes: an acquisition process for acquiring, via the acquisition unit, collection information corresponding to a result of collecting a specimen from a user; a determination process for determining an infection status of the user based on the collection information without transmitting the collection information to the external device; a notification process for notifying the user of a determination result of the infection status via the notification unit; a permission receiving process for receiving, via the operation unit, permission information permitting disclosure of the determination result of the infection status; and a transmission process for transmitting determination information regarding the determination result of the infection status to the external device via the network on condition that the permission information is received. According to the present information processing device, the user can obtain the determination result of the infection status offline, and can select whether or not to disclose the determination result. Therefore, by ensuring confidentiality, a mental hurdle for receiving the determination of the infection status is lowered.

[0009] (2) In the above information processing device, the controller may be further configured to execute a selection receiving process for receiving, via the operation unit, selection information for selecting a disclosure target from a plurality of different pieces of user-related information regarding the user, and in the transmission process, the user-related information selected by the selection information may be transmitted to the external device in

addition to the determination information, on condition that the permission information is received. According to this configuration, the user can select a disclosure range of the user-related information regarding the user himself/herself.

[0010] (3) In the above information processing device, when the determination result of the infection status is positive and the selection information includes location information of the user, the controller may be configured to notify the user of hospital information of a hospital where the user can receive a medical examination, in accordance with the location information, in the notification process. According to this configuration, the user can obtain the hospital information of a hospital where the user can receive a medical examination by providing his/her own location information.

[0011] (4) In the above information processing device, when the determination result of the infection status is positive, the controller may be further configured to execute a designation receiving process for receiving, via the operation unit, designation information for designating one from at least two of acquisition of infection caution information, online communication with medical personnel, and face-to-face communication with medical personnel, and in the notification process, information regarding communication corresponding to the designation information may be notified to the user. According to this configuration, the user can obtain information such as a coping method regarding infection by methods having different levels of confidentiality.

[0012] (5) In the above information processing device, the controller may be further configured to execute a timing receiving process for receiving an infection recollection timing via the operation unit, and in the notification process, when the determination result of the infection status is negative, the user may be notified of presence or absence of effectiveness of the determination result of the infection status via the notification unit based on the infection recollection timing. According to this configuration, the user can know a possibility that the result was negative because it was not an appropriate timing for determination.

[0013] (6) In the above information processing device, the acquisition unit has a camera, and the controller may be configured to: in the acquisition process, cause the camera to capture an image of a test area of a test kit, in which a line develops color in accordance with a reaction with the collected specimen, and acquire the image of the test area as the collection information; and in the determination process, convert the image of the test area into a binarized image, detect presence or absence of a line based on a dot count in the binarized image, and determine the infection status based on a detection result of the presence or absence of the line. According to this configuration, the determination of the presence or absence of a line in the test kit can be performed without depending on visual observation by the user.

[0014] (7) A collection tool disclosed in the present specification is a tool for collecting a specimen. The collection tool comprises a syringe having a cylindrical part having an internal space and a receiving part covering an opening at one end of the cylindrical part, and a plunger inserted into the internal space of the cylindrical part. In the receiving part, a through-hole is formed, the through-hole penetrating from an outer surface of the receiving part to the internal space of the cylindrical part. The through-hole includes a first hole opening toward the outer surface of the receiving part, and a second hole located between the first hole and the internal space of the cylindrical part. A first area of a cross-section of the first hole is larger than a second area of a cross-section of the second hole, and the second area of the second hole is smaller than an internal area of a cross-section of the internal space of the cylindrical part.

[0015] In this configuration, the first area of the first hole opening to the outer surface of the receiving part is larger than the second area of the second hole. Therefore, for example, as compared with a configuration in which the first area of the first hole is equal to or smaller than the second area of the second hole, it is easier to put a specimen into the through-hole of the receiving part. Conversely, since the second area of the second hole is smaller than the first area of the first hole, the specimen in the first hole is less likely to move to the internal space of the cylindrical part, and it is easy to grasp the amount of the specimen collected in the first hole.

After the specimen is put into the through-hole, the specimen in the first hole is sucked into the internal space of the cylindrical part via the second hole by a suction force generated by the plunger being pulled in a direction away from the receiving part. Since the second area of the second hole is smaller than the internal area of the internal space of the cylindrical part, it is possible to suppress the specimen moved into the internal space from flowing back to the first hole. Thus, according to this configuration, it is possible to achieve easiness of specimen collection, graspability of a collected amount of the specimen, and suppression of leakage of the collected specimen.

[0016] (8) In the above collection tool, the first hole may open such that a cross-sectional area thereof expands from a side of the second hole toward a side of the outer surface of the receiving part. According to this configuration, for example, as compared with a configuration in which the area of the cross-section of the first hole is constant, it is easier to put the specimen into the through-hole (first hole).

[0017] (9) In the above collection tool, the through-hole may further include a third hole located between the first hole and the outer surface of the receiving part, and an expansion rate of the third hole may be different from an expansion rate of the first hole. According to this configuration, a housing space for a buffer solution is ensured, and a boundary between the first hole and the third hole is easily identified visually.

[0018] (10) The above specimen collection kit may comprise the collection tool and a cartridge having a housing space for housing a test kit. The cartridge has a contact part (connection part) to be connected to the receiving part of the collection tool. In the contact part (connection part), a communication hole is formed, the communication hole communicating with the first hole of the connected receiving part and communicating with the housing space of the cartridge. According to this configuration, the specimen in the cylindrical part can be dropped onto the test kit by connecting the collection tool to the cartridge and pushing in the plunger of the collection tool.

[0019] (11) In the above specimen collection kit, the through-hole may further include a fourth hole located between the first hole and the outer surface of the receiving part. The fourth hole opens such that a cross-sectional area thereof expands from a side of the first hole toward a side of the outer surface of the receiving part. The cartridge has a contact part configured to contact an inner peripheral surface of the fourth hole of the through-hole over an entire circumference thereof. According to this configuration, leakage of the specimen or air can be suppressed by close contact between the inner peripheral surface of the fourth hole and the contact part.

[0020] The technology disclosed in the present specification can be realized in various forms, and can be realized, for example, in forms such as a collection tool, a blood collection tool, a specimen collection kit, a blood collection kit, a receiving member (attachment) provided in a syringe, an information processing device, a reader, an infection determination apparatus, an information management method, an information management program, an infection determination method, and an infection determination program.

BRIEF DESCRIPTION OF DRAWINGS

[0021] FIG. 1 is a perspective view schematically showing an overall configuration of a blood collection kit 1 in a first embodiment.

FIG. 2 is an explanatory view showing a configuration of a vertical cross-section of a blood collection tool 100.

FIG. 3 is an explanatory view showing a configuration of a side surface of an attachment 30.

FIG. 4 is an explanatory view showing a configuration of a vertical cross-section of the attachment 30.

FIG. 5 is an explanatory view showing a configuration of a top surface of the attachment 30.

FIG. 6 is a perspective view showing an external configuration of a cartridge 200.

FIG. 7 is an explanatory view showing a state change of the blood collection tool 100 during blood collection.

FIG. 8 is an explanatory view showing a connection process of the blood collection tool 100 and the cartridge 200.

FIG. 9 is an explanatory view showing a state after blood B has moved from the blood collection tool 100 to the cartridge 200.

FIG. 10 is an explanatory view showing a configuration of an information management system 1A in a second embodiment.

FIG. 11 is a top view showing an external configuration of a cartridge and a reader.

FIG. 12 is a cross-sectional view showing internal configurations of the cartridge and the reader.

FIG. 13 is a top view showing a configuration of a cartridge main body.

FIG. 14 is a perspective view showing a configuration of a cartridge cap.

FIG. 15 is a side view showing the configuration of the cartridge cap.

FIG. 16 is an enlarged cross-sectional view showing a front side portion of the cartridge in FIG. 12.

FIG. 17 is an explanatory view showing a usage process of the cartridge.

FIG. 18 is a flowchart showing an infection determination process.

FIG. 19 is an explanatory view showing a detection process of presence or absence of a line of an immunochromatographic test strip.

FIG. 20 is an explanatory view showing a screen display of a mobile terminal.

DESCRIPTION OF EMBODIMENTS

[0022]

A. First Embodiment:

A-1. Configuration of Blood Collection Kit 1:

FIG. 1 is a perspective view schematically showing an overall configuration of a blood collection kit 1 in the first embodiment. The blood collection kit 1 is an example of a specimen collection kit. The blood collection kit 1 is used for a specimen (sample) test for determining the presence or absence of a specific disease or the like by collecting blood B (see FIG. 7 described later) from a human body and dropping the blood B onto an immunochromatographic test strip. Immunochromatography (immunochromatographic method) is a test method for determining the presence or absence of an antibody or an antigen utilizing an antigen-antibody reaction. The blood collection kit 1 enables an individual to appropriately and safely perform a series of operations from collection of blood B to dropping of the blood B onto the immunochromatographic test strip at home or the like without depending on a professional such as medical personnel.

[0023]

As shown in FIG. 1, the blood collection kit 1 comprises a blood collection tool 100 and a cartridge 200. The blood collection tool 100 is an instrument for collecting blood B coming out from a punctured part of a human body. The blood collection tool 100 is an example of a collection tool, and the blood B is an example of a specimen. The cartridge 200 is a case for housing the immunochromatographic test strip. FIG. 1 shows a state in which the blood collection tool 100 and the cartridge 200 are connected.

[0024]

(Configuration of Blood Collection Tool 100):

FIG. 2 is an explanatory view showing a configuration of a vertical cross-section of the blood collection tool 100. In the present specification, a "vertical cross-section" refers to a cross-section along a longitudinal direction of the blood collection tool 100 (a syringe 10 described later) (the vertical direction of the paper in FIGS. 1 and 2), and a "cross-section" (horizontal cross-section) refers to a cross-section perpendicular to the longitudinal direction. As shown in FIGS. 1 and 2, the blood collection tool 100 comprises the syringe 10 and a plunger 20. The

syringe 10 may also be called an injection cylinder or an outer cylinder. The plunger 20 may also be called a pusher.

[0025]

The syringe 10 has a cylindrical part 11 and an attachment 30. The syringe 10 is preferably formed of, for example, a light-transmitting material (glass, resin, etc.). The attachment 30 is an example of a receiving part. The attachment 30 is provided on one end side of the cylindrical part 11 in the longitudinal direction. Hereinafter, in the syringe 10 (cylindrical part 11), a side of the attachment 30 is referred to as a "tip side," and a side opposite to the attachment 30 is referred to as a "proximal side."

[0026]

The cylindrical part 11 is a cylindrical body extending linearly as a whole. The cylindrical part 11 has a barrel 15 and a luer 16 located on the tip side of the barrel 15 (see FIG. 2). The barrel 15 is a part extending from the proximal end of the cylindrical part 11 toward the tip side (downward direction of the paper in FIGS. 1 and 2), and the luer 16 is a part extending from the tip of the cylindrical part 11 toward the proximal side (upward direction of the paper in FIGS. 1 and 2). An outer diameter of the barrel 15 is larger than an outer diameter of the luer 16.

[0027]

A barrel space 15A, which is an internal space of the barrel 15, extends linearly along the longitudinal direction of the cylindrical part 11. The barrel space 15A is a cylindrical space having the same diameter over the entire length in the longitudinal direction. A luer space 16A, which is an internal space of the luer 16, extends linearly along the longitudinal direction of the cylindrical part 11. The luer space 16A is a cylindrical space having the same diameter over the entire length in the longitudinal direction. The tip of the barrel space 15A and the proximal end of the luer space 16A communicate with each other. An inner diameter of the luer space 16A is smaller than an inner diameter of the barrel space 15A, and a step 17 is formed between the

barrel space 15A and the luer space 16A. The barrel space 15A and the luer space 16A are an example of an internal space.

[0028]

An annular part 18 is provided at a tip portion of the cylindrical part 11. The annular part 18 is arranged so as to surround the periphery of the luer 16 from the tip of the barrel 15. An annular gap 14 is formed between the luer 16 and the annular part 18. On an outer peripheral surface of a proximal end portion of the cylindrical part 11, a flange 12 protruding radially outward is formed. The flange 12 functions as a finger grip for an operator to hook his/her fingers.

[0029]

The attachment 30 is arranged so as to cover an opening on the tip side of the cylindrical part 11. The configuration of the attachment 30 will be described later.

[0030]

The plunger 20 is a rod-like body extending linearly. The plunger 20 is formed of, for example, glass or resin. The plunger 20 is inserted into the barrel space 15A of the cylindrical part 11 so as to be movable in the longitudinal direction of the cylindrical part 11. A gasket 22 is joined to a tip of the plunger 20. The gasket 22 is, for example, an elastic member, and is made of, for example, rubber. An outer diameter of the gasket 22 is substantially the same as the inner diameter of the barrel space 15A, and an outer peripheral surface of the gasket 22 is in close contact with an inner peripheral surface of the cylindrical part 11 constituting the barrel space 15A over the entire circumference. Since the outer diameter of the gasket 22 is larger than the inner diameter of the luer space 16A, movement of the gasket 22 (plunger 20) toward the tip side beyond the step 17 is restricted.

[0031]

A knob part 24 and a flange 26 are provided at a proximal end portion of the plunger 20. The flange 26 is formed so as to protrude radially outward from an outer peripheral surface of the proximal end portion of the plunger 20. As shown in FIG. 2, the flange 26 is configured to come

into contact with the flange 12 when the gasket 22 has moved to a position where it abuts the step 17 of the cylindrical part 11 or a position immediately before that. The knob part 24 is a part protruding from the proximal end portion of the plunger 20 further toward the proximal side than the flange 26. For example, as shown in FIGS. 1 and 2, in a state where the gasket 22 is pushed into the tip side in the barrel space 15A of the cylindrical part 11, the operator can pull out the plunger 20 from the barrel space 15A of the cylindrical part 11 by gripping the knob part 24 with his/her fingers.

[0032]

(Detailed Configuration of Attachment 30):

FIG. 3 is an explanatory view showing a configuration of a side surface of the attachment 30, FIG. 4 is an explanatory view showing a configuration of a vertical cross-section of the attachment 30, and FIG. 5 is an explanatory view showing a configuration of a top surface of the attachment 30. FIG. 4 shows a cross-sectional configuration of the attachment 30 at a position IV-IV in FIG. 3.

[0033]

As shown in FIGS. 3 to 5, the attachment 30 is a cylindrical member as a whole. The attachment 30 is made of, for example, resin. The attachment 30 includes a mounting part 31 and a receiving part (receiving portion) 33 located on a tip side of the mounting part 31. The mounting part 31 and the receiving portion 33 are integrally formed, but may be separate bodies. The mounting part 31 is a part including a proximal end of the attachment 30. The mounting part 31 is cylindrical, and an inner diameter of the mounting part 31 is larger than an outer diameter of the luer 16 of the cylindrical part 11, and an outer diameter of the mounting part 31 is smaller than an inner diameter of the annular part 18 (see FIG. 2). Therefore, the mounting part 31 can be inserted into the gap 14 between the luer 16 and the annular part 18. A male thread 35 is formed on an outer peripheral surface of the mounting part 31 (see FIGS. 3 and 4), and a female thread (not shown) that screw-engages with the male thread 35 is formed on an inner peripheral

surface of the annular part 18. By screw-engaging the male thread 35 of the mounting part 31 with the female thread of the annular part 18, the attachment 30 can be mounted on the tip portion of the cylindrical part 11. The attachment 30 may be detachable or non-detachable from the cylindrical part 11.

[0034]

The receiving portion 33 is a part including a tip of the attachment 30. The receiving portion 33 is cylindrical, and a through-hole 34 penetrating in a central axis direction of the attachment 30 (the longitudinal direction of the syringe 10) is formed (see FIG. 4). A proximal end of the through-hole 34 communicates with a space 32 on an inner peripheral side of the mounting part 31, and a tip of the through-hole 34 opens to a tip surface 36 (an example of an outer surface) of the attachment 30.

[0035]

The through-hole 34 includes a first hole 34A, a second hole 34B, a third hole 34C, and a fourth hole 34D (see FIG. 4).

[0036]

The first hole 34A is a recess opening radially toward the tip surface 36 of the attachment 30. The second hole 34B is located on a proximal end side of the first hole 34A. A proximal end of the first hole 34A communicates with a tip of the second hole 34B. A first area of a cross-section of the first hole 34A (an opening area at the tip of the first hole 34A) is larger than a second area of a cross-section of the second hole 34B. The second area of the second hole 34B is smaller than an internal area of a cross-section of the luer space 16A of the cylindrical part 11. That is, a diameter of the second hole 34B (for example, a diameter of 1.5 mm or less) is smaller than a diameter of the first hole 34A and smaller than a diameter of the luer space 16A (see FIG. 2).

[0037]

The first hole 34A opens such that a cross-sectional area thereof expands from a side of the

second hole 34B toward a side of the tip surface 36 of the attachment 30. That is, a shape of the first hole 34A is a conical shape opening radially toward the tip surface 36. The diameter of the second hole 34B is substantially the same over the entire length of the second hole 34B.

[0038]

The third hole 34C is located further on the tip side than the first hole 34A. A proximal end of the third hole 34C communicates with the tip of the first hole 34A. A diameter of the third hole 34C is equal to or larger than an opening diameter at the tip of the first hole 34A. The diameter of the third hole 34C is substantially the same over the entire length of the third hole 34C. That is, an expansion rate of the third hole 34C is smaller than an expansion rate of the first hole 34A. The expansion rate is a degree to which an opening area (diameter) of each hole expands toward the tip surface 36. It is preferable that there is no step between the first hole 34A and the third hole 34C.

[0039]

The fourth hole 34D is located between the third hole 34C and the tip surface 36 of the attachment 30. A tip of the fourth hole 34D faces the tip surface 36, and a proximal end of the fourth hole 34D communicates with the third hole 34C. The fourth hole 34D opens such that a cross-sectional area thereof expands toward the tip surface 36. That is, an inner peripheral surface 40 constituting the fourth hole 34D is a tapered surface opening radially toward the tip surface 36. The fourth hole 34D is located outside the first hole 34A (the third hole 34C) and is arranged so as to surround the entire circumference of the first hole 34A (the third hole 34C) as viewed in an axial direction of the attachment 30 (the longitudinal direction of the syringe 10).

[0040]

As shown in FIGS. 3 and 5, the attachment 30 has a plurality of (for example, four) protruding parts 42. Each protruding part 42 protrudes radially outward from an outer peripheral surface of the tip portion of the attachment 30. The plurality of protruding parts 42 are arranged at equal intervals in a circumferential direction of the central axis of the attachment 30.

[0041]

(Configuration of Cartridge 200):

FIG. 6 is a perspective view showing an external configuration of the cartridge 200.

The cartridge 200 has a rectangular plate shape as a whole. The cartridge 200 has a base 210 and a cover 220. On a top surface of the base 210, a rectangular housing space 211 is formed. The housing space 211 is a space for housing an immunochromatographic test strip (not shown).

[0042]

The cover 220 is a rectangular plate-like member, and is preferably formed of, for example, a light-transmitting material (glass, resin, etc.). The cover 220 is arranged so as to cover the housing space 211 of the base 210. The cover 220 is arranged so as to cover the entire immunochromatographic test strip housed in the housing space 211.

[0043]

The cover 220 has a connection part 221. In the connection part 221, a communication hole 224 is formed. The communication hole 224 communicates with the through-hole 34 of the connected attachment 30 and communicates with the housing space 211 of the cartridge 200. The communication hole 224 is arranged so as to be located immediately above a specimen pad of the immunochromatographic test strip housed in the housing space 211.

[0044]

The connection part 221 has a plurality of (for example, four) engagement parts 226. Each engagement part 226 protrudes radially inward of the communication hole 224. The plurality of engagement parts 226 are arranged at equal intervals in a circumferential direction of the communication hole 224. Each protruding part 42 of the attachment 30 is inserted between two adjacent engagement parts 226 to a deeper side (lower side in FIG. 6) of the communication hole 224 of the cover 220 than the engagement parts 226. Next, by rotating the attachment 30, each protruding part 42 moves below each engagement part 226. Thus, the attachment 30 is connected to the cover 220 and prevented from coming off.

[0045]

The connection part 221 has a contact part 228. The contact part 228 contacts the inner peripheral surface 40 of the attachment 30 connected to the connection part 221 over the entire circumference. The contact part 228 is an annular part surrounding the entire circumference of the communication hole 224, and has a tapered surface whose diameter decreases toward the upper side (the side facing the attachment 30).

[0046]

A camera window 222 is formed in the cover 220. The camera window 222 is arranged so as to be located immediately above a membrane (a part where a test line and a control line appear) of the immunochromatographic test strip housed in the housing space 211. The camera window 222 is thinner than other parts of the cover 220 and has high light transmittance. For example, each line appearing on the immunochromatographic test strip can be clearly captured by an external camera.

[0047]

A-2. Usage Method of Blood Collection Kit 1:

(Collection of Blood B):

FIG. 7 is an explanatory view showing a state change of the blood collection tool 100 during blood collection. First, the blood collection tool 100 is put into a pushed-in state. The pushed-in state is a state in which the plunger 20 is pushed into the barrel space 15A such that the gasket 22 is located at the tip portion of the barrel space 15A of the syringe 10. Next, for example, a fingertip is punctured with a lancet (not shown) to cause bleeding. Next, as shown in the right diagram of FIG. 7, the attachment 30 of the blood collection tool 100 in the pushed-in state is directed upward, and the bleeding fingertip is placed against the opening of the through-hole 34 of the attachment 30 to drop blood B into the through-hole 34. The diameter of the second hole 34B is set to a size (for example, 1 mm or more and 1.5 mm or less) such that the blood B does not pass through the second hole 34B by its own weight due to surface tension or the like.

For this reason, as shown in the center diagram of FIG. 7, the collected blood B accumulates in the first hole 34A of the attachment 30. The capacity of the first hole 34A is an amount (for example, 45 μL or more and 55 μL or less) that can be normally tested by the immunochromatographic test strip.

[0048]

Next, when a buffer solution C is dropped onto the blood B accumulated in the first hole 34A using a dropper 230, the dropped buffer solution C accumulates in the third hole 34C. The buffer solution C is for reducing the viscosity of a specimen and allowing the specimen to pass over the membrane without stagnation, and is a buffer solution C (for example, saline). Next, as shown in the left diagram of FIG. 7, a strong suction force is generated by pulling the plunger 20 in a direction away from the attachment 30 (downward direction of the paper in FIG. 7). By this suction force, the blood B in the first hole 34A and the buffer solution C in the third hole 34C pass through the second hole 34B and are mixed while moving into the internal space (the barrel space 15A and the luer space 16A) of the cylindrical part 11, becoming a mixed liquid M. Thus, the collection of the blood B is completed. The volume of the first hole 34A (through-hole 34) is larger than the volume of the barrel space 15A of the cylindrical part 11. Therefore, the entire mixed liquid M in the through-hole 34 can be drawn into the barrel space 15A.

[0049]

(Dropping of Blood B onto Immunochromatographic Test Strip):

FIG. 8 is an explanatory view showing a connection process of the blood collection tool 100 and the cartridge 200, and FIG. 9 is an explanatory view showing a state after blood B has moved from the blood collection tool 100 to the cartridge 200. As shown in the upper diagram of FIG. 8, the attachment 30 of the blood collection tool 100 after blood collection is directed downward and connected to the connection part 221 of the cartridge 200. At this time, the mixed liquid M housed in the internal space of the cylindrical part 11 does not pass through the second hole 34B by its own weight. That is, it is possible to suppress the mixed liquid M from falling

from the blood collection tool 100.

[0050]

When the tip portion of the attachment 30 is inserted into the communication hole 224 of the connection part 221 and the attachment 30 is rotated, as shown in the lower diagram of FIG. 8, the protruding parts 42 of the attachment 30 and the engagement parts 226 of the connection part 221 engage with each other. Thus, the blood collection tool 100 is connected while being prevented from coming off from the connection part 221 (cartridge 200). At this time, the inner peripheral surface 40 of the attachment 30 and the contact part 228 of the connection part 221 are in close contact with each other over the entire circumference. Therefore, the through-hole 34 of the attachment 30 and the communication hole 224 of the connection part 221 communicate with each other in a sealed state.

[0051]

Next, as shown in FIG. 9, when the plunger 20 is pushed into the barrel space 15A, the mixed liquid M passes through the second hole 34B and is dropped onto the specimen pad of the immunochromatographic test strip via the communication hole 224. An immunochromatographic test result can be obtained by inserting the cartridge 200 housing the immunochromatographic test strip onto which the mixed liquid M has been dropped into a known determination device (not shown).

[0052]

A-3. Effects of Present Embodiment:

As described above, in the present embodiment, the first area of the cross-section of the first hole 34A is larger than the second area of the cross-section of the second hole 34B (see FIG. 4). Therefore, for example, as compared with a configuration in which the first area of the first hole 34A is equal to or smaller than the second area of the second hole 34B, it is easier to put a specimen (blood B) into the through-hole 34 of the attachment 30. Conversely, since the second area of the second hole 34B is smaller than the first area of the first hole 34A, the specimen in

the first hole 34A is less likely to move to the internal space (barrel space 15A) of the syringe 10, and it is easy to grasp the amount of the specimen collected in the first hole 34A.

[0053]

After the specimen is put into the through-hole 34, the specimen in the first hole 34A is sucked into the internal space (barrel space 15A) of the syringe 10 via the second hole 34B by a suction force generated by the plunger 20 being pulled in a direction away from the attachment 30. Since the second area of the second hole 34B is smaller than the area of the internal space (barrel space 15A) (see FIG. 2), it is possible to suppress the specimen moved into the internal space from flowing back to the first hole 34A.

[0054]

Thus, according to the present embodiment, it is possible to achieve easiness of specimen collection, graspability of a collected amount of the specimen, and suppression of leakage of the collected specimen.

[0055]

In the present embodiment, the first hole 34A opens such that a cross-sectional area thereof expands from a side of the second hole 34B toward a side of the tip surface 36 of the attachment 30 (see FIG. 4). Thus, for example, as compared with a configuration in which the area of the cross-section of the first hole 34A is constant, it is easier to put the specimen into the through-hole 34 (first hole 34A).

[0056]

The third hole 34C is located further on the tip side than the first hole 34A, and a housing space for the buffer solution C is ensured. The expansion rate of the third hole 34C is different from the expansion rate of the first hole 34A. Therefore, a boundary between the first hole 34A and the third hole 34C is easily identified visually using a displacement position of the expansion rates of the two as a mark. Since the expansion rate of the third hole 34C is smaller than the expansion rate of the first hole 34A, it is easy to grasp the presence or absence of the buffer

solution C dropped into the third hole 34C.

[0057]

B. Second Embodiment:

B-1. Configuration of Information Management System 1A:

FIG. 10 is an explanatory view showing a configuration of an information management system 1A in the present embodiment. The information management system 1A comprises a plurality of terminal apparatuses 11A (a first terminal apparatus 11A1, a second terminal apparatus 11A2) possessed by each of a plurality of medical institutions 10A (a first medical institution 10A1, a second medical institution 10A2), a terminal apparatus 51 possessed by a public institution 50, an external device (management server) 400, and a plurality of user terminal apparatuses 500. Each apparatus and system is connected to each other via a network NW. The medical institution 10A is a facility such as, for example, a hospital, a clinic, a medical office, a home-visit nursing station, a long-term care support office, or a long-term care service office. The public institution 50 is a facility such as, for example, a social welfare corporation, a medical corporation, a health center, or a municipal office. Although two medical institutions 10A are shown in FIG. 10, the number of medical institutions 10A included in the information management system 1A may be one or three or more. Similarly, although two user terminal apparatuses 500 are shown in FIG. 10, the number of user terminal apparatuses 500 included in the information management system 1A may be one or three or more. Although one public institution 50 is shown in FIG. 10, the number of public institutions 50 included in the information management system 1A may be two or more. The user terminal apparatus 500 is an example of an information processing device.

[0058]

The terminal apparatus 11A possessed by the medical institution 10A is a computer that supports the work of each doctor, each staff member, etc. by enabling them to record medical information such as examination results and test results created by them or to view the

information when necessary. As the terminal apparatus 11A, for example, a personal computer, a tablet-type terminal, a smartphone, or the like is used.

[0059]

The terminal apparatus 11A comprises a controller 120, a storage unit 130, and a communication unit 140. The storage unit 130 is configured by, for example, a hard disk drive (hereinafter referred to as "HDD"), a ROM, a RAM, a cloud where prevention of leakage of confidential information is guaranteed, or the like, and stores various data such as medical information of users (patients, etc.) and various programs for controlling the terminal apparatus 11A. The communication unit 140 is an interface that performs communication with an external apparatus by a wireless communication method or a wired communication method. The controller 120 is configured by, for example, a central processing unit (hereinafter referred to as "CPU") or the like, and controls each part of the terminal apparatus 11A in accordance with a program read from the storage unit 130.

[0060]

The terminal apparatus 51 possessed by the public institution 50 is a computer that supports the work of each staff member, etc. by enabling them to record medical information such as examination results and test results created by them or to view the information when necessary. As the terminal apparatus 51, for example, a personal computer, a tablet-type terminal, a smartphone, or the like is used.

[0061]

The terminal apparatus 51 comprises a controller 52, a storage unit 54, and a communication unit 56. The storage unit 54 is configured by, for example, an HDD, a ROM, a RAM, a cloud where prevention of leakage of confidential information is guaranteed, or the like, and stores various data such as medical information of users and various programs for controlling the terminal apparatus 51. The communication unit 56 is an interface that performs communication with an external apparatus by a wireless communication method or a wired communication

method. The controller 52 is configured by, for example, a CPU or the like, and controls each part of the terminal apparatus 51 in accordance with a program read from the storage unit 54.

[0062]

The external device (management server) 400 is an apparatus for managing personal information of users and information regarding diagnosis results of infection transmitted from each user terminal apparatus 500. The external device 400 comprises a controller 420, a storage unit 430, a communication unit 440, an operation unit 450, and a display unit 460. The storage unit 430 is configured by, for example, an HDD, a ROM, a RAM, a cloud where prevention of leakage of confidential information is guaranteed, or the like, and stores various data such as medical information of users and various programs for controlling the external device 400. The communication unit 440 is an interface that performs communication with an external apparatus by a wireless communication method or a wired communication method. The operation unit 450 is configured by, for example, a keyboard, a mouse, or the like, and receives an operation of an administrator. The display unit 460 is configured by, for example, a liquid crystal display or the like. The controller 420 is configured by, for example, a CPU or the like, and controls each part of the external device 400 in accordance with a program read from the storage unit 430.

[0063]

The user terminal apparatus 500 is an apparatus used by a user, and is, for example, a personal computer, a tablet-type terminal, a smartphone, or the like. The user terminal apparatus 500 is arranged, for example, in a user's home, a user's workplace, each medical institution 10A, or a public institution 50. The user terminal apparatus 500 comprises a controller 520, a storage unit 530, a communication unit 540, an operation unit 550, and a display unit 560. The storage unit 530 is configured by, for example, an HDD, a ROM, a RAM, a cloud where prevention of leakage of confidential information is guaranteed, or the like, and stores various data and various programs (including an infection determination process program described later) for

controlling the user terminal apparatus 500. The communication unit 540 is an interface that performs communication with an external apparatus by a wireless communication method or a wired communication method. In the present embodiment, a reader 300 is communicatably connected to the user terminal apparatus 500 via the communication unit 540. The operation unit 550 is configured by, for example, a keyboard, a mouse, or the like, and receives an operation of the user. The display unit 560 is configured by, for example, a liquid crystal display or the like (see FIG. 20 described later). The controller 520 is configured by, for example, a CPU or the like, and controls each part of the user terminal apparatus 500 in accordance with a program read from the storage unit 530. The controller 520 is an example of a controller, and the display unit 560 is an example of a notification unit.

[0064]

B-2. Configurations of Cartridge and Reader:

FIG. 11 is a top view showing an external configuration of a cartridge 200A and a reader 300, and FIG. 12 is a cross-sectional view showing internal configurations of the cartridge 200A and the reader 300. FIG. 12 shows a cross-sectional configuration of the cartridge 200A and the reader 300 at a position XII-XII in FIG. 11. The cartridge 200A houses an immunochromatographic test strip P (see FIG. 19 described later). The reader 300 captures an image of each line appearing on the immunochromatographic test strip P housed in the cartridge 200A (see FIG. 19 described later), generates image data of the lines, and transmits the image data to the user terminal apparatus 500.

[0065]

As shown in FIGS. 11 and 12, the reader 300 has a housing 311, a camera 313, a control board 314, a battery 315, a communication port 316, a first indicator lamp 312a, and a second indicator lamp 312b. The housing 311 is formed of, for example, a resin material, bioplastic, metal, or the like.

[0066]

The housing 311 is a rectangular box body as a whole. In the housing 311, a cartridge housing space 318 and an instrument housing space S1 are ensured. The cartridge housing space 318 is a space extending linearly along a longitudinal direction of the housing 311. In one end surface of the housing 311 in the longitudinal direction (a surface on a positive Y-axis direction side), an insertion opening 318A is formed. The cartridge housing space 318 communicates with the insertion opening 318A. The cartridge 200A is housed in the cartridge housing space 318 via the insertion opening 318A. In the housing 311, a communication passage 317 is formed, the communication passage 317 allowing the cartridge housing space 318 and the instrument housing space S1 to communicate with each other. The communication passage 317 is a passage penetrating in a vertical direction (Z-axis direction). The communication passage 317 is arranged such that a camera window 222A, which will be described later, of the cartridge 200A housed in the cartridge housing space 318 is located immediately below the communication passage 317.

[0067]

In the instrument housing space S1, the camera 313, the control board 314, and the battery 315 are housed. The camera 313 is arranged above the communication passage 317. The camera 313 captures an image immediately below the communication passage 317 and outputs image data corresponding to the captured image. The camera 313 is arranged at a position where it can capture an image of the camera window 222A (the membrane of the immunochromatographic test strip P) of the cartridge 200A housed at a normal reference position in the cartridge housing space 318 via the communication passage 317. The battery 315 supplies power to the camera 313 and the control board 314. The reader 300 may be configured to be supplied with power from an external power source (for example, the user terminal apparatus 500) without the battery 315. The communication port 316 is communicatably connected to the user terminal apparatus 500 via a wire such as, for example, a USB (Universal Serial Bus) cable. The reader 300 may be configured to be communicatably

connected to the user terminal apparatus 500 by wireless communication.

[0068]

The control board 314 controls each instrument that the reader 300 has. The first indicator lamp 312a and the second indicator lamp 312b are arranged on an outer surface (top surface) of the housing 311. The first indicator lamp 312a and the second indicator lamp 312b light up in various lighting patterns in accordance with an operating state of the reader 300 or a determination result of an infection status. Specifically, the control board 314 controls lighting operations of the first indicator lamp 312a and the second indicator lamp 312b in a plurality of light emission patterns that are distinguishable from each other in accordance with at least two determination results among the following (a) to (d).

[0069]

(a) Determination Result Regarding Arrangement Position of Cartridge 200A:

The determination result regarding the arrangement position is a determination result as to whether or not the cartridge 200A is arranged at the reference position (a position where the camera 313 can normally capture an image of the membrane of the immunochromatographic test strip P housed in the cartridge 200A) in the cartridge housing space 318. The control board 314 determines that the cartridge 200A is arranged at the reference position on condition that, for example, a control part Pc or a test part Pt is detected in a captured image based on image data output by the camera 313.

(b) Determination Result Regarding Immunochromatographic Test Strip P Housed in Cartridge 200A:

The determination result regarding the immunochromatographic test strip P is a determination result as to whether or not the immunochromatographic test strip P housed in the cartridge 200A matches a test item designated by the user. The control board 314 detects a type of the test item targeted by the immunochromatographic test strip P currently housed in the cartridge 200A based on, for example, image data output by the camera 313. The control board 314 detects the

type of the test item based on an identification code (for example, a barcode or the like) displayed on the immunochromatographic test strip P or a color of a specific portion (conjugate pad or the like) of the immunochromatographic test strip P. The control board 314 determines that a normal immunochromatographic test strip P is housed in the cartridge 200A on condition that the detected test item matches the type of the test item designated by the user on the user terminal apparatus 500.

(c) Determination Result Regarding Normal Implementation of Test by Immunochromatographic Test Strip P:

The determination result regarding normal implementation of the test is a determination result as to whether or not the test by the immunochromatographic test strip P was normally implemented. The control board 314 determines that the test by the immunochromatographic test strip P was normally implemented on condition that, for example, a control line on the immunochromatographic test strip P is detected based on image data output by the camera 313.

(d) Determination Result Regarding Infection Status:

The determination result regarding the infection status is a determination result as to whether a test result for a test item is positive or negative. For example, based on image data output by the camera 313, the control board 314 determines a positive result on condition that both a control line and a test line on the immunochromatographic test strip P are detected, determines a negative result when the control line is detected and the test line is not detected, and determines that determination is impossible when the control line is not detected.

[0070]

A determination notification unit that notifies the above determination results (a) to (d) to the outside is not limited to a light emission device that emits light in a plurality of light emission patterns that are distinguishable from each other in accordance with the determination results, but may be a display device that displays characters or the like in accordance with the determination results, a sound producing device that produces a sound in accordance with the

determination results, a transmission device that transmits determination result data corresponding to the determination results to an external apparatus (500, etc.), or the like.

[0071]

The cartridge 200A includes a cartridge main body 202A and a cartridge cap 230A. FIG. 13 is a top view showing a configuration of the cartridge main body 202A. FIG. 14 is a perspective view showing a configuration of the cartridge cap 230A (excluding a cap sheet 231 described later), and FIG. 15 is a side view showing the configuration of the cartridge cap 230A. FIG. 16 is an enlarged cross-sectional view showing a front side portion H of the cartridge in FIG. 12.

[0072]

As shown in FIG. 13, the cartridge main body 202A has a rectangular plate shape as a whole. The cartridge main body 202A has a base 210A and a cover 220A. On a top surface of the base 210A, a rectangular housing space S2 is formed. The housing space S2 is a space for housing the immunochromatographic test strip P.

[0073]

The cover 220A is a rectangular plate-like member, and is preferably formed of, for example, a light-transmitting material (glass, resin, etc.). The cover 220A is arranged so as to cover the housing space S2 of the base 210A. The cover 220A is arranged so as to cover the entire immunochromatographic test strip P housed in the housing space S2.

[0074]

The cover 220A has a connection part 221A. In the connection part 221A, a communication hole 224A is formed. The communication hole 224A communicates with the housing space S2 of the cartridge main body 202A. The communication hole 224A is a hole penetrating the cover 220A in a direction (vertical direction) orthogonal to the base 210A, and the communication hole 224A is arranged so as to be located immediately above the specimen pad of the immunochromatographic test strip P housed in the housing space S2. The communication hole 224A includes a first communication hole 224B, a second communication hole 224C, and a

third communication hole 224D. The first communication hole 224B is a hole opening on a side opposite to the housing space S2 (base 210A) in the connection part 221A. The first communication hole 224B is a cylindrical hole having substantially the same diameter over the entire length in a direction along the central axis (vertical direction) of the communication hole 224A. The second communication hole 224C is located immediately below the first communication hole 224B and is a conical hole whose diameter decreases as it approaches the base 210A. The third communication hole 224D is located immediately below the second communication hole 224C and is a hole having substantially the same diameter as a minimum diameter of the second communication hole 224C. The connection part 221A is an example of a receiving part, the second communication hole 224C is an example of a first hole, the third communication hole 224D is an example of a second hole, and the first communication hole 224B is an example of a third hole.

[0075]

In one end portion of the base 210A, a cutout 210C is formed. In one end portion of the cover 220A, a protruding part 222B is formed. The protruding part 222B has a shape that can be inserted into the cutout 210C. For this reason, for example, it is suppressed that the cover 220A is arranged in a reverse direction with respect to the base 210A. Among the tip portions of the cartridge main body 202A (base 210A) to be inserted into the cartridge housing space 318, shapes of two corners are different from each other. Specifically, the shape of a corner on one side (positive X-axis direction side) is angular, and the shape of a corner 210B on the other side (negative X-axis direction side) is flatly cut. Among the housing 311, an inner wall surface forming the cartridge housing space 318 has a shape corresponding to the shape of each corner. For this reason, for example, when the cartridge main body 202A is inserted into the cartridge housing space 318 in an orientation inverted in the vertical direction, the cartridge main body 202A does not reach the reference position.

[0076]

As shown in FIGS. 14 and 15, the cartridge cap 230A includes a cap sheet 231, a dish part 233, and a leg part 238. The cartridge cap 230A is formed of a resin material, bioplastic, a rubber material, or the like. The cartridge cap 230A is preferably formed of a material having elasticity. The leg part 238 is an example of a press-fit part.

[0077]

The dish part 233 has a substantially flat plate shape and has a protruding portion 233A protruding in one direction (positive Y-axis direction). In a top surface of the dish part 233, a housing hole 232 in which a buffer solution C is housed is formed. The housing hole 232 includes a first housing hole 234 and a second housing hole 236. The first housing hole 234 faces a bottom surface 234A of the housing hole 232. The first housing hole 234 is a hole defined by a radial inner peripheral surface 234B whose diameter increases as it moves away from the bottom surface 234A. The first housing hole 234 has a first protruding hole 234D protruding toward the protruding portion 233A side. The first protruding hole 234D has a shape whose width decreases toward a tip in the protruding direction.

[0078]

The second housing hole 236 is located immediately above the first housing hole 234 and communicates with the first housing hole 234. The second housing hole 236 is a hole defined by a radial inner peripheral surface 236B whose diameter increases as it moves away from the bottom surface 234A. Note that an inclination angle of the inner peripheral surface 236B with respect to the bottom surface 234A is gentler than an inclination angle of the inner peripheral surface 234B with respect to the bottom surface 234A. The second housing hole 236 has a second protruding hole 236D protruding in the one direction (positive Y-axis direction). The second protruding hole 236D has a shape whose width decreases toward a tip in the protruding direction. Note that a protruding angle of the second protruding hole 236D (an angle between two sides forming the protruding portion) is smaller than a protruding angle of the first protruding hole 234D.

[0079]

The leg part 238 protrudes downward from a bottom surface of the dish part 233. The leg part 238 is substantially cylindrical. On an outer peripheral surface of the leg part 238, a convex part 238A protruding radially outward is formed over the entire circumference. When the leg part 238 is inserted into the communication hole 224A, the convex part 238A is compressively deformed, so that the inside of the communication hole 224A is put into a sealed state. A tip surface 238B of the leg part 238 is a tapered surface whose diameter decreases as it moves away from the dish part 233. An inclination angle of the tip surface 238B with respect to the base 210A is substantially the same as an inclination angle of the second communication hole 224C with respect to the base 210A.

[0080]

The cover 220A has a pair of holding parts 224E, 224E (see FIG. 16). Each holding part 224E is formed so as to protrude downward from a surface (bottom surface) of the cover 220A facing the base 210A. The pair of holding parts 224E, 224E are arranged at positions sandwiching the third communication hole 224D in a longitudinal direction (Y-axis direction) of the cartridge main body 202A (immunochromatographic test strip P) as viewed in the central axis direction (Z-axis direction) of the communication hole 224A. The pair of holding parts 224E, 224E suppress lifting of the immunochromatographic test strip P while ensuring a gap between the bottom surface of the cover 220A and the immunochromatographic test strip P immediately below the third communication hole 224D in the housing space S2. Note that the pair of holding parts 224E, 224E are arranged at positions sandwiching the third communication hole 224D in a short-side direction (X-axis direction) of the cartridge main body 202A (immunochromatographic test strip P).

[0081]

The cover 220A has a pair of pressing parts 224F, 224F (see FIG. 13). Each pressing part 224F is formed so as to protrude downward from a surface (bottom surface) of the cover 220A facing

the base 210A. The pair of pressing parts 224F, 224F are arranged at positions sandwiching the third communication hole 224D in the short-side direction (X-axis direction) of the cartridge main body 202A (immunochromatographic test strip P) as viewed in the central axis direction (Z-axis direction) of the communication hole 224A. The pair of pressing parts 224F, 224F press both side portions of the immunochromatographic test strip P in the short-side direction while ensuring a gap between the bottom surface of the cover 220A and the immunochromatographic test strip P immediately below the third communication hole 224D in the housing space S2. Thus, the blood B dropped from the third communication hole 224D can be suppressed from leaking from on the immunochromatographic test strip P and can be guided to the membrane.

[0082]

The cap sheet 231 is a sheet material and seals the housing hole 232 of the cartridge cap 230A. The cap sheet 231 has the same outer shape as the outer shape of the dish part 233 of the cartridge cap 230A. A peripheral portion of the cap sheet 231 and a portion around the housing hole 232 in the dish part 233 are peelably adhered. Thus, the buffer solution C is housed in the housing hole 232 in a sealed state (see FIG. 16). The cap sheet 231 is, for example, an aluminum sheet.

[0083]

B-3. Usage Method of Cartridge 200A:

FIG. 17 is an explanatory view showing a usage process of the cartridge 200A. First, the user removes the leg part 238 of the cartridge cap 230A from the communication hole 224A of the cartridge main body 202A to open the communication hole 224A (see FIG. 16). Next, the user punctures a fingertip with, for example, a lancet (not shown) to cause bleeding. Next, as shown in the upper diagram of FIG. 17, the user arranges the cartridge main body 202A such that the communication hole 224A opens upward, and places the bleeding fingertip against the opening of the communication hole 224A to drop blood B into the communication hole 224A. The diameter of the third communication hole 224D is set to a size (for example, 1 mm or more and

1.5 mm or less) such that the blood B does not pass through the third communication hole 224D by its own weight due to surface tension or the like. For this reason, as shown in the center diagram of FIG. 17, the collected blood B accumulates in the second communication hole 224C. The capacity of the second communication hole 224C is an amount (for example, 45 μL or more and 55 μL or less) that can be normally tested by the immunochromatographic test strip.

[0084]

Next, the user peels off the cap sheet 231 from the dish part 233 and drops the buffer solution C housed in the housing hole 232 of the dish part 233 onto the blood B accumulated in the second communication hole 224C. At this time, the user arranges a tip of the dish part 233 immediately above the opening of the communication hole 224A and tilts the dish part 233 so as to move the leg part 238 side upward. Thus, the buffer solution C is smoothly dropped from the housing hole 232 into the communication hole 224A via the first protruding hole 234D and the second protruding hole 236D. The dropped buffer solution C accumulates in the first communication hole 224B. Next, as shown in the lower diagram of FIG. 17, the user pushes the leg part 238 of the dish part 233 into the communication hole 224A. Then, the blood B in the second communication hole 224C and the buffer solution C in the first communication hole 224B pass through the third communication hole 224D while being mixed, become a mixed liquid M, and are dropped onto the specimen pad of the immunochromatographic test strip P.

[0085]

B-4. Infection Determination Process:

FIG. 18 is a flowchart showing an infection determination process. The user communicatably connects the reader 300 to the user terminal apparatus 500 and inserts the cartridge 200A housing the immunochromatographic test strip P after blood collection into the insertion opening 318A of the reader 300. Next, when the user performs a predetermined operation through the operation unit 550 of the user terminal apparatus 500, the controller 520 reads out the infection determination process program from the storage unit 530 and executes the

infection determination process shown in FIG. 18. The infection determination process is a process for determining an infection status of the user based on image data generated by the reader 300 capturing an image of the membrane of the immunochromatographic test strip P (hereinafter referred to as "membrane image data").

[0086]

As shown in FIG. 18, the controller 520 acquires specimen data (membrane image data) (S110). Specifically, the controller 520 transmits an image capture instruction to the reader 300. Based on the image capture instruction received from the user terminal apparatus 500, the control board 314 of the reader 300 controls the camera 313 to capture an image of a part including the membrane of the immunochromatographic test strip P housed in the cartridge 200A and generates membrane image data. The control board 314 transmits the generated membrane image data to the user terminal apparatus 500 via the communication port 316. The controller 520 acquires the membrane image data via the communication unit 540. The communication unit 540 is an example of an acquisition unit, the process of S110 is an example of an acquisition process and an acquisition step, and the membrane image data is an example of collection information corresponding to a result of collecting a specimen from a user.

[0087]

The controller 520 does not transmit the membrane image data acquired from the reader 300 to the external device 400. The controller 520 executes a determination process for determining an infection status of the user based on the acquired membrane image data. Hereinafter, a specific description will be given. In the present embodiment, the infection status includes presence or absence of infection (antigen or antibody) for a test item and a reference value indicating a level of infection (degree, amount of antigen or antibody).

[0088]

The controller 520 executes an image conversion process for the acquired membrane image data (S120). Specifically, the controller 520 first converts the membrane image data (for

example, color image data or grayscale image data) into binarized image data. Next, the controller 520 divides the binarized image data into predetermined scan frame F units, detects presence or absence of a line based on a dot count in each scan frame F, and determines an infection status based on a detection result of the presence or absence of the line (S130). S130 is an example of a determination process and a determination step.

[0089]

FIG. 19 is an explanatory view showing a detection process of presence or absence of a line of the immunochromatographic test strip P. FIG. 19 shows a membrane image E captured by the camera 313 of the reader 300. The membrane image E includes a control part Pc and a test part Pt of the immunochromatographic test strip P. The control part Pc is a part where a control line (C) appears, and the test part Pt is a part where a test line (T) appears. The controller 520 executes a frame detection process for each of a control area Gc including the control part Pc and a test area Gt including the test part Pt in the membrane image E.

[0090]

The frame detection process is a process for sequentially moving a predetermined scan frame F along a longitudinal direction of P in a target area and detecting presence or absence of a line based on a dot count in the scan frame F at each scan position in the target area. In the present embodiment, both the control area Gc and the test area Gt are rectangular. A width of the scan frame F (length in a short-side direction of the immunochromatographic test strip P) is substantially the same as a width of each target area (control area Gc, test area Gt). A height of the scan frame F (length in a longitudinal direction of the immunochromatographic test strip P) is shorter than a height of each target area (for example, 1/5 or less). The scan frame F moves along the longitudinal direction of the immunochromatographic test strip P so as to pass through each of the control area Gc and the test area Gt. Note that in the frame detection process, the controller 520 may count the number of dots in the entire membrane image E and detect the presence or absence of a line based on the dot count. However, as in the present embodiment,

if the presence or absence of a line is detected targeting some areas (the control area Gc, the test area Gt) including each part (the control part Pc, the test part Pt) of the immunochromatographic test strip P in the captured image (membrane image E), detection accuracy of the line is improved. Furthermore, as in the present embodiment, if the presence or absence of a line is detected based on the dot count in the scan frame F at each scan position using the scan frame F whose height is shorter than that of the target area for each target area, the detection accuracy of the line is further improved.

[0091]

The controller 520 counts the number of detected dots (hereinafter referred to as "dot detection count") at each scan position in each target area, and determines that a line is present at the scan position on condition that the dot detection count is equal to or greater than a reference value. The controller 520 determines an infection status as follows based on a detection result of a line.

(a) Negative: when the controller 520 determines that a line is present in the control area Gc and determines that no line is present in the test area Gt

(b) Positive: when the controller 520 determines that a line is present in the control area Gc and determines that a line is present in the test area Gt

(c) Test error: when the controller 520 determines that no line is present in the control area Gc

[0092]

The controller 520 notifies a determination result (S140). Specifically, the controller 520 transmits the determination result to the reader 300 via the communication unit 540. The control board 314 of the reader 300 causes the first indicator lamp 312a and the second indicator lamp 312b to emit light in a light emission pattern in accordance with the received determination result. Thus, the user can grasp his/her own infection status (presence or absence of infection of a disease or the like of a test item) by looking at the light emission pattern of the light emission device (the first indicator lamp 312a, the second indicator lamp 312b) that the reader 300 has. The controller 520 causes the display unit 560 to display an infection result. Thus, the

user can grasp his/her own infection status by looking at the display content of the display unit 560 that the user terminal apparatus 500 has. S140 is an example of a notification process and a notification step.

[0093]

FIG. 20 is an explanatory view showing a screen display of the display unit 560 of the user terminal apparatus 500. When the controller 520 determines that the determination result is positive (S150: Y), it displays a positive determination result screen of FIG. 20(A) on the display unit 560. The positive determination result screen includes a determination result column 562, a disclosure level selection column 564, and a feedback column 565.

[0094]

The determination result column 562 is a column for displaying the determination result of the infection status. When the determination result is positive (S150: Y), the determination result column 562 shows a display indicating "positive" and a display prompting the user to go to a hospital to receive a medical examination by a doctor (for example, "Examination required"). In the determination result column 562, the above reference value is further shown. The reference value is an approximate amount of an antigen or an antibody of a test item. In the line detection process, the controller 520 calculates the total number of dots detected in the test area Gt (or the total number of dots detected in the scan frame F at a scan position where a line was detected), determines a reference value correlated with the total number of dots, and causes the determination result column 562 to display the determined reference value.

[0095]

The controller 520 receives permission information permitting disclosure of the determination result of the infection status and selection information for selecting a disclosure target from a plurality of types of user-related information via the disclosure level selection column 564 (S160). The process of S160 is an example of a permission receiving process (permission receiving step) and a selection receiving process (selection receiving step).

[0096]

Specifically, the disclosure level selection column 564 is a column that causes the user to select a disclosure level of the determination result and user-related information regarding the user. The user-related information includes, for example, attribute information and infection factor information. The attribute information is information regarding a user's attribute, and types of attribute information include personal information such as, for example, information regarding a user's body (sex, age, infection history, occupation, symptoms, disease) and a user's location information (location of home or workplace (GPS)). The infection factor information is information regarding a factor of a user's infection, and types of infection factor information include, for example, an infection recollection timing, an infection recollection place, and an infection recollection behavior. Examples of options displayed in the disclosure level selection column 564 are as follows.

(a) Presence or absence of permission to disclose determination result

(b) Presence or absence of permission to disclose attribute information (may include presence or absence of permission to disclose each of the plurality of types of attribute information described above)

(c) Presence or absence of permission to disclose infection factor information (may include presence or absence of permission to disclose each of the plurality of types of infection factor information described above)

The user operates the operation unit 550 to select an arbitrary option from the plurality of options shown in the disclosure level selection column 564. The controller 520 receives the permission information and the selection information based on a result of selection by the user. Note that the controller 520 may display the options (b) and (c) in the disclosure level selection column 564 on condition that permission to disclose the determination result is selected in (a).

[0097]

The controller 520 transmits determination information and user-related information

corresponding to the option selected in the disclosure level selection column 564 to the external device 400 (S170). Specifically, when the user selects no permission to disclose the determination result, the controller 520 does not transmit the determination information to the external device 400. Thus, the user can go to a hospital and receive a medical examination while ensuring confidentiality of the determination result on the user terminal apparatus 500.

[0098]

When the user selects presence of permission to disclose the determination result, the controller 520 transmits determination information regarding the positive determination result to the external device 400. This process is an example of a transmission process (transmission step). When the user selects presence of permission to disclose the determination result, the controller 520 may transmit the membrane image data (may be data before binarization or data after binarization) to the external device 400. Based on the received membrane image data, the external device 400 may perform a determination process of an infection status having higher determination accuracy than the infection determination process on the user terminal apparatus 500, and transmit a determination result of the process to the user terminal apparatus 500. The user terminal apparatus 500 may cause, for example, the display unit 560 to display the determination result by the external device 400. Thus, the user can grasp a high-accuracy determination result (online) by the external device 400 in addition to the determination result by the simple determination (offline) by the user terminal apparatus 500.

[0099]

The controller 520 transmits the types of user-related information selected in the disclosure level selection column 564 to the external device 400. On condition that the user has selected presence of permission to disclose the determination result, the controller 520 transmits the user-related information to the external device 400 in addition to the determination information. Note that the controller 520 may transmit the user-related information to the external device 400 regardless of the presence or absence of permission to disclose the determination result by

the user.

[0100]

The controller 520 causes the feedback column 565 to display feedback information corresponding to the types of user-related information selected in the disclosure level selection column 564 (when a plurality of types of user-related information are selected, a combination pattern of the plurality of types of user-related information) (S180), and ends the present infection determination process. The feedback information is, for example, as follows.

(a) When information regarding a user's body is selected: advice by a medical worker (doctor, etc.) in accordance with the information regarding the body (for example, coping methods and precautions in accordance with age, sex, and infection history, information regarding an infected disease, etc.) and contact information of a specialist (phone number, e-mail address, etc.)

(b) When a user's location information is selected: hospital information of a specialist in an infected disease (for example, hospital information of a hospital where the user can receive a medical examination in accordance with the user's location (hospital information near the user's location, etc.))

(c) When infection factor information is selected: advice by a medical worker in accordance with an infection factor (for example, coping methods and precautions in accordance with an elapsed period from an infection recollection timing, etc.)

(d) Information regarding communication with medical personnel (medical workers) (for example, options for a plurality of types of communication means, such as online communication with medical personnel, face-to-face communication with medical personnel, e-mail communication with medical personnel, and phone communication with medical personnel, and information regarding each communication means (for example, usage method, contact information, etc.))

Note that the feedback information may be information that is stored in the storage unit 530 of

the user terminal apparatus 500 in advance and is provided offline, or may be information provided online from the external device 400.

[0101]

When the determination result is negative (S150: N), the controller 520 displays a negative determination result screen of FIG. 20(B) on the display unit 560. The negative determination result screen includes the determination result column 562, an infection recollection timing column 566, and the feedback column 565. When the determination result is negative (S150: N), the determination result column 562 shows a display indicating "negative" and the reference value.

[0102]

The infection recollection timing column 566 is a column in which the user enters an infection recollection timing (for example, year, month, and day, or date and time). The infection recollection timing is, for example, a timing when the user performed an act that could be a factor of infection or a timing when a symptom (fever, etc.) associated with infection developed. The controller 520 determines whether or not the infection recollection timing has been entered in the infection recollection timing column 566 (S190). The process of S190 is an example of a timing receiving process. When determining that the infection recollection timing has been entered (S190: Y), the controller 520 determines presence or absence of effectiveness of the determination result of the infection status based on the infection recollection timing (S200). For example, if a period from the infection recollection timing to a date of execution of the infection determination process by the user terminal apparatus 500 (hereinafter referred to as "infection elapsed period") is within a proper test period of a test item (for example, influenza) (for example, after 12 hours from development), the controller 520 determines that the determination result of the infection status (negative) is effective, and if the infection elapsed period is outside the proper test period (for example, before 12 hours from development), the controller 520 determines that the determination result of the infection status (negative) is

ineffective.

[0103]

The controller 520 displays feedback information in accordance with a determination result of determination suitability on the display unit 560 (S210), and ends the present infection determination process. For example, when determining that the determination result of the infection status (negative) is effective, the controller 520 shows a display in the feedback column 565 indicating that the determination result of the infection status (negative) is effective. When determining that the determination result of the infection status (negative) is ineffective, the controller 520 shows information regarding a proper test timing (for example, a date and time when the proper test period has elapsed from development) in the feedback column 565. Note that an alert setting may be displayed in the feedback column 565. The alert setting is a setting for notifying the user of the fact when the infection elapsed period has come within the proper test period (for example, an alert display on the display unit 560). The user can enable an alert function by turning the alert setting to "ON."

[0104]

Before the infection determination process, based on captured image data (identification information of a test item shown on the immunochromatographic test strip P) from the reader 300, the controller 520 may specify the test item of the immunochromatographic test strip P housed in the reader 300 and determine whether or not the specified test item matches a test item designated by the user through the operation unit 550. Information regarding the test item designated by the user may be displayed on the display unit 560 (the determination result display screen of FIG. 20, etc.).

[0105]

The external device 400 may transmit the determination information and the user-related information received from each user terminal apparatus 500 to the terminal apparatus 11A of each medical institution 10A or the terminal apparatus 51 of the public institution 50. In each

medical institution 10A, for example, the received determination information and user-related information can be utilized for medical examination of a user who has visited the medical institution. The public institution 50 can, for example, manage the received determination information and user-related information as big data and utilize the big data for specification of an infected area, infection prediction, and the like based on the big data.

[0106]

C. Modified Examples:

The technology disclosed in the present specification is not limited to the embodiments described above, but can be modified into various forms within a range not departing from the gist thereof, and for example, the following modifications are also possible.

[0107]

The configurations of the blood collection kit 1, the blood collection tool 100, and the reader 300 in the first embodiment described above are merely an example and can be variously modified. For example, in the first embodiment, the cylindrical part 11 and the attachment 30 were joined by screw engagement, but may be joined by, for example, press-fitting, adhesion, or the like. In the first embodiment, the attachment 30, which is a separate body from the cylindrical part 11, was illustrated as a receiving part, but the receiving part may be integrally formed with the cylindrical part 11.

[0108]

In the first embodiment, the through-hole 34 of the attachment 30 extended along the central axis direction of the cylindrical part 11 (syringe 10), but may extend in, for example, a direction inclined with respect to the central direction. A shape of the through-hole 34 in a vertical cross-section is not limited to a linear shape, but may be, for example, a curved shape or a crank shape. A shape of the through-hole 34 in a horizontal cross-section is not limited to a circular shape, but may be, for example, a polygonal shape or an elliptical shape.

[0109]

The shape of the first hole 34A in the vertical cross-section is not limited to a radial shape, but may be, for example, a rectangular shape or a tapered shape whose diameter decreases toward a tip. A diameter of the second hole 34B may be radial such that the diameter increases toward a tip, or may be a tapered shape such that the diameter decreases toward a tip. An expansion rate of the third hole 34C may be the same as the expansion rate of the third hole 34C or may be larger than the expansion rate of the third hole 34C. In the above embodiment, a maximum opening area (opening diameter) of the first hole 34A is larger than an area (inner diameter) of the cross-section of the internal space (barrel space 15A) of the syringe 10, but may be equal to or smaller than the area (inner diameter) of the cross-section of the internal space (barrel space 15A).

[0110]

In each of the above embodiments, the material forming each member is merely an example and may be formed of other materials.

[0111]

In the first embodiment, a blood collection tool (blood collection kit) for collecting blood B was illustrated as a collection tool (specimen collection kit), but the collection tool (specimen collection kit) includes a collection tool (specimen collection kit) for collecting a specimen other than blood B. Samples include, for example, urine, feces, sputum, saliva, and liquid materials obtained by surgery, in addition to blood B. Test items include infectious diseases such as influenza and coronavirus infection, and sexually transmitted diseases (syphilis, human immunodeficiency virus, etc.).

[0112]

The test (determination of the infection status) used in the present invention is, for example, a visual judgment type rapid diagnostic method. The visual judgment type rapid diagnostic method is a test method for visually determining the presence or absence of a disease or the like by using a mechanism that reacts with an antigen or an antibody in a specimen. Examples of

the visual judgment type rapid diagnostic method include LFA (Lateral Flow Assay) and RDT (Rapid Diagnostic Test). LFA is a rapid diagnostic method (immunochromatography) in which a specimen (liquid specimen) is caused to flow by capillary action and the presence or absence of a specific substance can be visually determined. Examples of LFA include a COVID-19 antigen test, a pregnancy test, a rapid influenza diagnosis, and detection of allergens and pathogens in food. RDT is, for example, a test using a nucleic acid amplification method (also referred to as Isothermal Amplification) that amplifies nucleic acids (DNA or RNA) without a heating cycle, and specific examples thereof include a LAMP method (Loop-mediated isothermal amplification), an RPA method (Recombinase Polymerase Amplification), and a NASBA method (Nucleic Acid Sequence-Based Amplification).

[0113]

The test kit is not limited to an immunochromatographic test strip, and may be any test kit used for the test used in the present invention described above. The test kit is, for example, a test kit having a test area where predetermined identification information (a mark such as a line, a color change, or the like) appears in accordance with a reaction with a collected specimen. Examples of the test kit include a simple PCR test kit, a novel coronavirus nucleic acid test kit, and a rapid influenza diagnostic kit.

[0114]

In the second embodiment described above, the user terminal apparatus 500 such as a smartphone is illustrated as the information processing device, but the present invention is not limited thereto, and a dedicated device (infection determination apparatus) in which the reader 300 is provided with a communication function may be used. The notification unit is not limited to the display unit 560, and may be a transmission device that transmits notification information to an external device, a sound producing device, or the like. The camera is not limited to the camera 313 of the reader 300, and may be a camera of the user terminal apparatus 500.

[0115]

In the second embodiment described above, an inclination angle of the inner peripheral surface 236B with respect to the bottom surface 234A of the cartridge cap 230A may be equal to or greater than an inclination angle of the inner peripheral surface 234B with respect to the bottom surface 234A.

[0116]

In the second embodiment described above, the infection determination process is merely an example. The control board 314 of the reader 300 may execute at least a part of the infection determination process shown in FIG. 18. In the second embodiment described above, the immunochromatographic test strip was the immunochromatographic test strip P having one control part Pc and one test part Pt, but the present invention is not limited thereto, and may be an immunochromatographic test strip having a plurality of at least one of the control part Pc and the test part Pt. For example, when the immunochromatographic test strip has a plurality of test parts Pt, the controller 520 of the user terminal apparatus 500 may set a plurality of test areas Gt corresponding to the plurality of test parts Pt (corresponding to a plurality of different test items), respectively, and detect the presence or absence of a test line for each test area Gt. By using one immunochromatographic test strip and executing the infection determination process once, it is possible to determine the infection status regarding a plurality of types of test items (antigens or antibodies).

[0117]

When the test kit is used, a test waiting time (for example, about 10 to 30 minutes) may be required from when a specimen is dropped onto the test kit until a test result is reflected. Therefore, in the second embodiment described above, the controller 520 may start the infection determination process (acquisition process for acquiring (capturing) image data) on condition that, for example, the test waiting time has elapsed from the time when the cartridge 200A was inserted into the reader 300 ("test waiting process" in S110 of FIG. 18). The controller 520 may detect that the cartridge 200A has been inserted into the reader 300 on condition that, for

example, an input operation (such as an operation of a determination start instruction) is performed by the user via the operation unit 550, or that the control board 314 of the reader 300 detects the cartridge 200A (or a test kit such as the immunochromatographic test strip P) based on the image data from the camera 313. The controller 520 may change the test waiting time to a time corresponding to a test item detected from the test kit, based on correspondence information between a plurality of test items and test waiting times determined for the plurality of test items, respectively.

REFERENCE SIGNS LIST

[0118]

1: Blood collection kit, 1A: Information management system, 10: Syringe, 10A: Medical institution, 11: Cylindrical part, 11A: Terminal apparatus, 14: Gap, 15: Barrel, 15A: Barrel space, 16: Luer, 16A: Luer space, 17: Step, 18: Annular part, 20: Plunger, 22: Gasket, 24: Knob part, 30: Attachment, 31: Mounting part, 32: Space

33: Receiving part, 34: Through-hole, 34A: First hole, 34B: Second hole, 34C: Third hole, 34D: Fourth hole, 35: Male thread, 36: Tip surface, 40: Inner peripheral surface, 42: Protruding part, 50: Public institution, 100: Blood collection tool, 200, 200A: Cartridge, 202A: Cartridge main body, 210, 210A: Base, 211: Housing space, 220, 220A: Cover, 221, 221A: Connection part, 222, 222A: Camera window, 222B: Protruding part, 224, 224A: Communication hole, 224B: First communication hole, 224C: Second communication hole, 224D: Third communication hole, 224E: Holding part, 224F: Pressing part, 226: Engagement part, 228: Contact part, 230: Dropper, 230A: Cartridge cap, 231: Cap sheet, 232: Housing hole

233: Dish part, 233A: Protruding portion, 234: First housing hole, 234D: First protruding hole, 236: Second housing hole, 236D: Second protruding hole, 238: Leg part, 238A: Convex part, 300: Reader, 311: Housing, 312a: First indicator lamp, 312b: Second indicator lamp, 313: Camera, 314: Control board, 315: Battery, 316: Communication port, 317: Communication

passage, 318: Cartridge housing space, 318A: Insertion opening, 400: Management server, 500: User terminal apparatus, 520: Controller, 530: Storage unit, 540: Communication unit , 550: Operation unit, 560: Display unit

CLAIMS

[Claim 1] An information processing device configured to be communicatably connected to an external device via a network, the information processing device comprising:

an acquisition unit;

an operation unit;

a notification unit; and

a controller,

wherein the controller is configured to:

execute an acquisition process for acquiring, via the acquisition unit, collection information corresponding to a result of collecting a specimen from a user;

execute a determination process for determining an infection status of the user based on the collection information without transmitting the collection information to the external device;

execute a notification process for notifying the user of a determination result of the infection status via the notification unit;

execute a permission receiving process for receiving, via the operation unit, permission information permitting disclosure of the determination result of the infection status; and

execute a transmission process for transmitting determination information regarding the determination result of the infection status to the external device via the network on condition that the permission information is received.

[Claim 2] The information processing device according to claim 1,

wherein the controller is further configured to execute a selection receiving process for receiving, via the operation unit, selection information for selecting a disclosure target from a plurality of different pieces of user-related information regarding the user, and

in the transmission process, the controller transmits the user-related information

selected by the selection information to the external device in addition to the determination information, on condition that the permission information is received.

[Claim 3] The information processing device according to claim 2,

wherein the controller is configured to, in the notification process, notify the user of information on hospitals available for consultation according to location information of the user, when the determination result of the infection status is positive and the selection information includes the location information.

[Claim 4] The information processing device according to claim 1,

wherein the controller is further configured to execute a designation receiving process for receiving, via the operation unit, designation information designating at least one from among acquisition of infection caution information, online communication with a medical professional, and face-to-face communication with a medical professional, when the determination result of the infection status is positive, and

in the notification process, the controller notifies the user of information regarding communication according to the designation information.

[Claim 5] The information processing device according to claim 1 or 2,

wherein the controller is further configured to execute a time receiving process for receiving, via the operation unit, an expected time of infection, and

in the notification process, the controller notifies the user of whether the determination result of the infection status is valid via the notification unit based on the expected time of infection, when the determination result of the infection status is negative.

[Claim 6] The information processing device according to claim 1,

wherein the acquisition unit includes a camera,

in the acquisition process, the controller causes the camera to capture an image of a test area of a test kit, the test area developing a color in a line according to a reaction with the collected specimen, and acquires the image of the test area as the collection information, and

in the determination process, the controller converts the image of the test area into a binarized image, detects presence or absence of a line based on a number of dots in the binarized image, and determines the infection status based on a detection result of the presence or absence of the line.

[Claim 7] An information management method comprising:

acquiring, by an information processing device, collection information corresponding to a result of collecting a specimen from a user;

determining, by the information processing device, an infection status of the user based on the collection information without transmitting the collection information to an external device;

notifying, from the information processing device, the user of a determination result of the infection status;

receiving, by the information processing device, permission information permitting disclosure of the determination result of the infection status; and

transmitting determination information regarding the determination result of the infection status from the information processing device to the external device via a network on condition that the permission information is received.

[Claim 8] A computer program causing an information processing device to execute:

a process for acquiring collection information corresponding to a result of collecting a specimen from a user;

a process for determining an infection status of the user based on the collection information;

a process for notifying a determination result of the infection status;

a process for receiving permission information permitting disclosure of the determination result of the infection status; and

a process for transmitting determination information regarding the determination result of the infection status to an external device via a network on condition that the permission information is received.

[Claim 9] A specimen collection kit for collecting a specimen, the specimen collection kit comprising:

a cartridge having a housing space for housing a test kit; and

a receiving part provided on the cartridge,

wherein a through-hole is formed in the receiving part, the through-hole penetrating from an outer surface of the receiving part to the housing space,

the through-hole includes a first hole opening toward the outer surface of the receiving part, and a second hole located between the first hole and the housing space,

a first area of a cross-section of the first hole is larger than a second area of a cross-section of the second hole, and

the second area of the second hole is smaller than an internal area of a cross-section of the housing space.

[Claim 10] The specimen collection kit according to claim 9,

wherein the first hole opens such that a cross-sectional area thereof expands from a side of the second hole toward a side of the outer surface of the receiving part.

[Claim 11] The specimen collection kit according to claim 10,

wherein the through-hole further includes a third hole located between the first hole and the outer surface of the receiving part, and

an expansion rate of the third hole is different from an expansion rate of the first hole.

[Claim 12] The specimen collection kit according to claim 9,

wherein the through-hole further includes a fourth hole located between the first hole and the outer surface of the receiving part,

the fourth hole opens such that a cross-sectional area thereof expands from a side of the first hole toward a side of the outer surface of the receiving part, and

the cartridge has a contact part configured to contact an inner peripheral surface of the fourth hole of the through-hole over an entire circumference thereof.

[Claim 13] The specimen collection kit according to claim 9,

further comprising a cartridge cap having a press-fit part configured to be press-fitted into the through-hole.

[Claim 14] The specimen collection kit according to claim 13,

wherein the cartridge cap has a housing hole for housing a buffer solution.