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Claims

1. A diagnostic strip for reacting with a target for diagnosis, the diagnostic strip comprising: a connector configured to be connected to a power providing unit and provide a driving power to the diagnostic strip; an entry path configured to transfer a body fluid including the target; a reaction unit configured to react with the target and whose electrical characteristic is changed by the reaction; and a display unit configured to receive the driving power and whose display state is changed according to the changed electrical characteristic of the reaction unit.
2. The diagnostic strip of claim 1, wherein the connector is any one of a male connector which is inserted into the power providing unit and a female connector into which the connector connected to the power providing unit is inserted.
3. The diagnostic strip of claim 1, wherein the connector is any one of a connector conforming to a universal serial bus (USB) standard and a lightning connector.
4. The diagnostic strip of claim 1, wherein the entry path includes at least one of a capillary for transferring the body fluid to the reaction unit and an exposure unit for exposing the reaction unit so that the body fluid is dropped thereon.
5. The diagnostic strip of claim 1, further comprising an environmental sensor unit configured to detect environmental influence on the reaction between the target and the reaction unit.
6. The diagnostic strip of claim 5, wherein the environmental sensor unit includes at least one of a hydrogen-ion concentration (pH) sensor, a temperature sensor, and a humidity sensor.
7. The diagnostic strip of claim 1, wherein the reaction unit includes a material whose electrical characteristic is changed by an enzyme reaction with the target for detection.
8. The diagnostic strip of claim 7, wherein the reaction unit includes any one of a glucose oxidase whose electrical characteristic is changed by an enzyme reaction with glucose and a cholesterol oxidase whose electrical characteristic is changed by an enzyme reaction with cholesterol.
9. The diagnostic strip of claim 1, wherein the reaction unit includes a material whose electrical characteristic is changed by an antigen-antibody reaction with the target for detection.
10. The diagnostic strip of claim 9, wherein the reaction unit includes any one of an anti-influenza A antibody which reacts with an avian influenza (AI) virus, an anti-epithelial cell adhesion molecule (EpiCAM) antibody, an anti-prostate-specific antigen (PSA) antibody, an anti-human epidermal growth factor receptor 2 (HER2) antibody, an anti-carcinoembryonic antigen (CEA) antibody, and an anti-cancer antigen (CA) antibody which react with cancer cells, and an anti-apolipoprotein B antibody which reacts with lipids in blood.
11. The diagnostic strip of claim 1, wherein the reaction unit includes a probe which is complementarily bound with the target for detection and whose electrical characteristic is changed.
12. The diagnostic strip of claim 11, wherein the reaction unit includes the probe having an aptamer which binds to protein, which is the target for detection, and a nucleotide marker, and nucleotides having a sequence complementary to the target for detection.
13. The diagnostic strip of claim 1, wherein the diagnostic strip detects the target included in animals, human bodies, and food.

14. The diagnostic strip of claim 1, wherein the display unit includes: a first display whose display state is changed according to the changed electrical characteristic of the reaction unit; and a second display whose display state is changed according to a detection result of the environmental sensor.

15. The diagnostic strip of claim 1, wherein the display unit includes at least one of an electronic (e)-ink and an electrochromic device.

16. The diagnostic strip of claim 1, wherein the display unit displays a change in the electrical characteristic with any one of a barcode, a quick response (QR) code, and a display bar.

17-30. (canceled)

Description

TECHNICAL FIELD

[0001] The present invention relates to a diagnostic strip and a diagnostic system using the same.

BACKGROUND ART

[0002] Since existing test strips are only strip products, a collected body fluid such as blood is applied to a test strip, and a separate measuring instrument analyzes the composition of blood by using the test strip. Existing test strips only serve as carriers which provide a body fluid such as blood applied thereto to a separate measuring instrument, or existing test strips only provide inexact analysis results. Therefore, in some cases, such as when a body fluid is contaminated with an external material before carried and provided to a measuring instrument, it is not possible to ensure accuracy of measurement.

DISCLOSURE

Technical Problem

[0003] The present invention is directed to providing a strip and a diagnostic system for quantitatively testing a body fluid by using a portable terminal immediately after collecting the body fluid and checking test results.

Technical Solution

[0004] One aspect of the present invention provides a diagnostic strip for reacting with a target for diagnosis, the diagnostic strip including: a connector configured to be connected to a power providing unit and provide a driving power to the diagnostic strip; an entry path configured to transfer a body fluid including the target; a reaction unit configured to react with the target and whose electrical characteristic is changed by the reaction; and a display unit configured to receive the driving power and whose display state is changed according to the changed electrical characteristic of the reaction unit.

[0005] Another aspect of the present invention provides a diagnostic system including: a diagnostic strip including a reaction unit whose electrical characteristic is changed by a reaction to a target included in a body fluid, a display unit configured to display a code whose display state is changed to correspond to the changed electrical characteristic, and a connector configured to be electrically connected to a power providing unit and receive a driving power; and the power providing unit configured to be electrically connected to the diagnostic strip through the connector and provide the driving power to the diagnostic strip.

Advantageous Effects

[0006] According to the diagnostic strip and the diagnostic system, a body fluid is put in an entry path, and electric power is provided by a power providing unit such that a detection result can be immediately

correspond to resistance ratios between the resistors included in the resistor array and the equivalent resistors of the variable code display unit 310. For example, Ra1, Ra2, Ra3, Ra4, and Ra5 included in the resistor array may be respectively 0.5.OMEGA., 1.OMEGA., 1.5.OMEGA., 2.OMEGA., and 2.5.OMEGA., Rd1 to Rd5 are all 1.OMEGA., voltages provided to the display devices modeled as Rd1 to Rd5 may be respectively V1, V2, . . . , and V5, and the display devices modeled as Rd1 to Rd5 may be turned on at a voltage of 1.3 V or above.

[0057] When a voltage provided to the display unit 300 according to a change in resistance made by a reaction between the target in the body fluid and the reactive material is 3 V, the both-end voltages V1 to V5 of Rd1 to Rd5 which are obtained through voltage dividing are approximately 2 V, 1.5 V, 1.2 V, 1 V, and 0.86 V, respectively. Since both V1 and V2 are equal to or high than the turn-on voltage, it is possible to see that the display devices modeled as Rd1 and Rd2 are turned on and the other display devices are turned off.

[0058] As another example, when the voltage provided to the display unit 300 is 6 V, the both-end voltages V1 to V5 of Rd1 to Rd5 which are obtained through voltage dividing are approximately 4 V, 3 V, 2.4 V, 2 V, and 1.71 V, respectively. Since all the both-end voltages V1 to V5 are equal to or high than the turn-on voltage, the display devices modeled as Rd1 to Rd5 may be turned on.

[0059] Therefore, the code displayed by the variable code display unit 310 may be changed by a voltage formed according to a change in resistance made by a reaction between the target and the reactive material, and the display unit 300 may display codes accordingly corresponding to a target concentration in the body fluid, whether the target exists in the body fluid, and the like.

[0060] The portable terminal 20 may read the codes displayed by the display unit 300 and display results of reading on the screen. Referring to FIG. 6, when it is intended to detect a glucose level in blood, the display unit 300 displays a code corresponding to a glucose level in blood, and the portable terminal 20 reads the code and displays a result of reading on the screen. According to an exemplary embodiment, the portable terminal may provide results of reading to the server so that personalized measurement results may be stored.

[0061] According to another exemplary embodiment of the diagnostic strip 10, the diagnostic strip 10 may further include an overview display unit which schematically displays a reaction result between the target and the reaction unit to a user. FIG. 9 is a diagram schematically showing the diagnostic strip 10 including the display unit 300 and an overview display unit 500. Referring to FIG. 9, as shown in an example in FIG. 9A, the display unit 300 and the overview display unit 500 may be disposed separately on a surface of the diagnostic strip 10. Ten pixels may be disposed horizontally in a line, and respective lines may be disposed vertically pixel by pixel. As shown in the example in the drawing, two lines in each of which 10 pixels are horizontally disposed are vertically disposed, and three pixels display a code in the uppermost line such that a code displayed by the variable code unit corresponds to 23. Therefore, it is possible to simply find a result of measuring by reading the code.

[0062] As shown in another example in FIG. 9B, the overview display unit 500 may be displayed to overlap the display unit 300. As an example, the overview display unit 500 may have 10 pixels horizontally disposed in a line and have respective lines vertically disposed in a neat pile, wherein a value corresponding to one pixel is 5. As shown in the example of the drawing, two lines in each of which 10 pixels are horizontally disposed are vertically disposed, and three pixels display a code in the uppermost line, such that a code displayed by the variable code unit corresponds to 23. Since a value corresponding to one pixel is 5, it is possible to see that the code corresponds to 115 by reading the code accordingly.

[0063] Like the variable code display unit 310, the overview display unit 500 may be implemented with a light emitting device, such as an LED, an OLED, etc., a variable color device, an electrochromic device, an e-ink, and the like whose display states are changed to correspond to an electrical characteristic which is changed by a reaction between the reaction unit and the target.

Second Embodiment

[0064] Hereinafter, an exemplary embodiment of a diagnostic strip and a diagnostic system using the diagnostic strip will be described. For brief and clear description, descriptions which are identical or similar to the above description may be omitted. FIG. 10 is a perspective view showing an overview of a diagnostic

