

the group consisting of: an icon to review biochip cartridge data; an icon for status of a biochip cartridge assay; an icon depicting the time remaining in a biochip cartridge assay; an icon to generate a data report of biochip cartridge data; an icon to print a data report of biochip cartridge data; an icon to email a data report of biochip cartridge data; an icon to export a data report of biochip cartridge data to another computer device; and an icon to display a virtual keyboard.

[0015] In a further aspect, the apparatus further comprises a lighting component associated with each biochip cartridge bays. The lighting component indicates the status of the bay, which status can independently and optionally be selected from the group consisting of empty, cartridge present, cartridge assay underway, cartridge assay complete, and error.

[0016] In an additional aspect, the apparatus further comprises a barcode reader and/or one or more USB ports. In some cases a barcode scanner is attached via a USB port.

[0017] In a further aspect, each biochip cartridge bay is independently controlled.

[0018] In an additional aspect, each biochip cartridge is ejected upon completion of the assay protocol.

[0019] In a further aspect, the touch screen display further comprises a row of function icons. These function icons can independently and optionally be selected from the group consisting of: a function icon to display a virtual keyboard, a preventative maintenance icon; a dashboard icon, a print icon; an email icon, and an icon to export data to a remote device. The preventative maintenance icon can be a dashboard icon, which, when pressed will display a plurality of graphs each selected from the group consisting of [number of assays run], [number of assays for one or more bays], [number and/or type of assays run for each bay], [time since last maintenance for each bay] and [number of errors per bay]. The graphs can be selected from bar graphs and pie chart graphs.

[0020] In an additional aspect, each bay comprises at least a first off resistive chip heater and/or a second off chip Peltier heater. In some cases, each bay comprises three resistive heaters configured to facilitate PCR reactions on the chip. In some cases, the Peltier heater services the detection electrodes.

[0021] In a further aspect, the memory of the apparatus stores user profiles, which can optionally include the retention of the preferred height of the virtual keyboard display.

[0022] In an additional aspect, the invention provides biochip cartridges comprising: a housing comprising a plurality of physical force contacts; a first bottom substrate comprising printed circuit board (PCB) comprising: a plurality of detection electrodes comprising capture binding ligands; a plurality of electrowetting electrodes; interconnects for the detection and electrowetting electrodes; a second top substrate comprising plastic comprising: a plurality of reactant wells, optionally containing reagent well inlet ports; at least one sample inlet port; wherein the first and second substrate form at least one chamber (which can be varying heights in different locations due to the top plate configuration).

[0023] In a further aspect, the detection electrodes each comprise a capture binding ligand (including nucleic acids and proteins).

[0024] In an additional aspect, the detection electrodes further comprise a self-assembled monolayer (SAM).

[0025] In a further aspect, one of the reagent wells/locations contains a solution binding ligand comprising at least

one electron transfer moiety (ETM), which can be a metal-locene, including ferrocenes, which includes ferrocene derivative.

[0026] In an additional aspect, the target analytes are target nucleic acids and at least one of the reagent wells comprises a set of PCR primers for a plurality of the target nucleic acids.

[0027] In a further aspect, the first substrate comprises at least a first identification tag such as an EPROM, an EEPROM, an RFID, a barcode, a 2D barcode, etc., that identifies the biochip and/or the assay on the biochip.

[0028] In an additional aspect, the housing comprises a location to add a patient barcode. The housing can be asymmetrically configured such that it can only be inserted into the bays in one direction.

[0029] In a further aspect, the inlet port has an associated sealable lid, which can be reversibly or irreversibly sealable.

[0030] In an additional aspect, the invention provides methods of diagnosis based on detecting at least one target analyte of a plurality of target analytes comprising: providing an apparatus according to any claim herein, providing a patient sample; providing a biochip cartridge according to any of the cartridge claims herein; adding the patient sample to the inlet port; sealing said inlet port; adding a patient barcode to said housing; scanning said patient barcode into said apparatus; inserting said cartridge into one of said bays; initiating the appropriate assay; and generating a report showing the diagnosis.

[0031] As described herein, in one aspect the invention provides an apparatus for processing a fluid module including a collapsible vessel supported on a planar substrate by applying a force compressing the vessel against the substrate, said apparatus comprising: a first actuator component configured to be movable in a first direction that is generally parallel to the plane of the substrate; a second actuator component configured to be movable in a second direction having a component that is generally normal to the plane of the substrate; and a motion conversion mechanism coupling the first actuator component with the second actuator component and constructed and arranged to convert movement of the first actuator component in the first direction into movement of the second actuator component in the second direction.

[0032] In one aspect, the first actuator component comprises an actuator plate configured to be movable in the first direction and including a cam follower element; the second actuator component comprises a platen configured to be movable in the second direction; and the motion conversion mechanism comprises a cam body having a cam surface, said cam body being coupled to said platen and being configured such that the cam follower element of the actuator plate engages the cam surface of the cam body as the actuator plate moves in the first direction thereby causing movement of the cam body that results in movement of the platen in the second direction.

[0033] In an additional aspect, the cam follower element of the actuator plate comprises a roller configured to rotate about an axis of rotation that is parallel to the actuator plate and normal to the first direction; and the motion conversion mechanism further comprises a chassis, and the cam body is pivotally attached at one portion thereof to the chassis and at another portion thereof to the platen.

[0034] In a further aspect, the cam surface of the cam body comprises an initial flat portion and a convexly-curved portion, and movement of the roller from the initial flat portion to