

**[0054]** In a further aspect, the invention provides a fluid container comprising: a first vessel; a second vessel disposed within the first vessel; a substrate on which the first and second vessels are supported and having a cavity formed therein adjacent said second vessel; a fixed spike formed within the cavity; and a fluid exit port extending from the cavity, wherein said first and second vessels are configured such that external pressure applied to the first vessel will collapse the second vessel and cause the second vessel to contact and be pierced by the fixed spike, thereby allowing fluid to flow from the first vessel through the cavity and the fluid exit port.

**[0055]** In an additional aspect, the invention provides a fluid container comprising: a collapsible vessel configured to be collapsed upon application of sufficient external pressure to displace fluid from the vessel; a housing surrounding at least a portion of the collapsible vessel; and a floating compression plate movably disposed within said housing, wherein said housing includes an opening configured to permit an external actuator to contact the floating compression plate within the housing and press the compression plate into the collapsible vessel to collapse the vessel and displace the fluid contents therefrom.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0056]** FIG. 1A is a top plan view of a liquid reagent module, according to one of the embodiments of the present invention.

**[0057]** FIG. 1B is a side view of the liquid reagent module shown in FIG. 1A.

**[0058]** FIG. 2 is a perspective view of a blister compressing actuator mechanism embodying aspects of the present invention.

**[0059]** FIG. 3A is a partial, cross-sectional perspective view of the articulated blister actuator platen assembly in an initial, unactuated state.

**[0060]** FIG. 3B is a partial, cross-sectional side view of the articulated blister actuator platen assembly in the initial unactuated state.

**[0061]** FIG. 4A is a partial, cross-sectional perspective view of the articulated blister actuator platen assembly as the platen is about to be actuated.

**[0062]** FIG. 4B is a partial, cross-sectional side view of the articulated blister actuator platen assembly as the platen is about to be actuated.

**[0063]** FIG. 5A is a partial, cross-sectional perspective view of the articulated blister actuator platen assembly with the platen in a fully actuated state.

**[0064]** FIG. 5B is a partial, cross-sectional side view of the articulated blister actuator platen assembly with the platen in a fully actuated state.

**[0065]** FIG. 6A is a partial, cross-sectional perspective view of the articulated blister actuator platen assembly with the platen returned to the unactuated state.

**[0066]** FIG. 6B is a partial, cross-sectional side view of the articulated blister actuator platen assembly with the platen returned to the unactuated state.

**[0067]** FIG. 7A is a perspective view of an alternative embodiment of a blister compressing actuator mechanism in an unactuated state.

**[0068]** FIG. 7B is a perspective view of the blister compressing actuator mechanism of FIG. 7A in the fully actuated state.

**[0069]** FIG. 8A is a partial, cross-sectional side view of a collapsible fluid vessel configured to facilitate opening of the vessel.

**[0070]** FIG. 8B is an enlarged partial, cross-sectional side view of a vessel opening feature of the collapsible fluid vessel.

**[0071]** FIGS. 9A-9D are side views showing an apparatus for opening a collapsible vessel configured to facilitate opening of the vessel in various states.

**[0072]** FIG. 10 is a side view of an alternative embodiment of an apparatus for opening a collapsible vessel configured to facilitate opening of the vessel.

**[0073]** FIG. 11 is a bar graph showing exemplary burst forces for fluid-containing blisters of varying volumes.

**[0074]** FIG. 12 is a load versus time plot of the compression load versus time during a blister compression.

**[0075]** FIG. 13A is a partial, cross-sectional side view of an alternative apparatus for opening a collapsible vessel configured to facilitate opening of the vessel.

**[0076]** FIG. 13B is a perspective view of a cantilever lance used in the embodiment of FIG. 13A.

**[0077]** FIG. 14 is a partial, cross-sectional side view of an alternative apparatus for opening a collapsible vessel configured to facilitate opening of the vessel.

**[0078]** FIG. 15A is a partial, cross-sectional side view of an alternative apparatus for opening a collapsible vessel configured to facilitate opening of the vessel.

**[0079]** FIG. 15B is a perspective view of a lancing pin used in the apparatus of FIG. 15A.

**[0080]** FIG. 16A is a partial, cross-sectional side view of an alternative apparatus for opening a collapsible vessel configured to facilitate opening of the vessel.

**[0081]** FIG. 16B is a perspective view of a lancing pin used in the apparatus of FIG. 16A.

**[0082]** FIG. 17 is an exploded, cross-sectional, perspective view of an apparatus for protecting and interfacing with a collapsible vessel.

**[0083]** FIG. 18 is a cross-sectional, side view of the apparatus for protecting and interfacing with a collapsible vessel in an unactuated state.

**[0084]** FIG. 19 is a cross-sectional, perspective view of the apparatus for protecting and interfacing with a collapsible vessel in fully actuated state.

**[0085]** FIG. 20 depicts one embodiment of the cartridge as it would be viewed by the lab technician running the assay, with appropriate annotations.

**[0086]** FIG. 21 shows the PCB layout of one biochip first substrate of the invention, depicting the four general "zones" of this embodiment, on an overlay of FIGS. 21 and 22. The sample preparation zone is connected to the housing inlet port to allow the introduction of sample. The sample preparation zone optionally includes lysis buffer for the lysis of cells and/or viruses in the patient sample, or the lysis buffer can be contained in the LRM, described herein. Magnetic beads are optionally included (again in the LRM), optionally coated such that the target analytes adsorb to the beads. For example, in the case of nucleic acids, the beads are coated such that the negatively charged nucleic acids adsorb, and then can be optionally washed (e.g. by holding the beads in place using a magnetic actuator as described herein and flowing wash buffer past this holding zone) and optionally eluted (again, generally by holding the beads in place and flowing a high salt concentration buffer past the beads). Optionally, the washed beads can just be flowed into the system to be included in