sealing cover layer **1407** (having patterned conductive layer **1423** (which forms a patterned electrode array analogous to the electrode array **963**, shown in **FIG. 9**) and patterned dielectric overlayers **1421,1422**) to lower cartridge body part **1410** through intervening gasket layer **1405** (preferably, made from double sided adhesive tape). The detection chamber's depth, length and width are defined by cutouts **1447** and **1448** within the gasket layer. Cutouts **1406,1408**, **1412,1413** in the gasket layer expose regions of dielectric layers **1421** and **1422** to sample conduit branches **1440** and **1441** and elongated reagent conduit **1470**. Advantageously, dry reagent pills comprised within these reagents are located on these regions. This choice of pill locations allows dry reagent pills and/or immobilized reagents within the detection chambers to be dispensed on a single substrate. Preferably, as shown in **FIG. 14**, sample conduit branches **1440** and **1441** have segments that are adjacent and/or substantially parallel to detection chambers **1445** and **1446** and a U-turn segment to allow connection to the detection chambers. This arrangement provides for conduit lengths that are long enough to allow for the introduction of a sample to the conduit and mixing of the sample with a pill in the conduit prior to introduction of the sample to the detection chamber. These lengths are achieved without adding to the length of the cartridge. Advantageously, this arrangement also allows the patterned electrode layer to be used to conduct capacitive or conductometric measurements of fluid within the sample conduits as described above. Similarly, elongated reagent conduit **1470** has entrance and return segments, connected via a U-turn segment, that are parallel to detection chambers **1445** and **1446**. Lower cartridge body component **1410** further includes electrical access regions **1432** and **1433** that, together with cutouts **1417** and **1418** in gasket layer **1405** allow electrical contact to be made with conductive layer **1423**.

[**0242**] Cover layer **1402** mates to lower cartridge body component **1410** to define conduit segments **1805** (readily seen in **FIG. 18***a*) that (by connecting two z-transitions) act as bridge segments connecting the fluidic networks defined by cover layers **1403** and **1407**. Optionally, pill zones formed on cover layer **1402** on surfaces of bridge segments comprised within the sample or reagent conduits may be used to introduce dry reagents to the sample or liquid reagents. Cover layer **1401** mates to upper cartridge body component **1411** and seals reagent chambers **1425** and **1426**, preventing the release of fluid from ampoules within the chambers. Cover layer **1401** also seals top side conduit segments including double z-transition connecting segments such as segments **1810** and **1815** readily seen in **FIG. 18***a*.

[**0243**] **FIG. 15***a* shows a top view of upper body component **1411**. **FIGS. 16***a* and **16***b* show top and bottom views of lower body component **1410**. As shown in **FIG. 15***a*, the upper cartridge component **1411** preferably includes reagent chambers **1425,1426** that are configured to hold reagent ampoules. Filters **1515,1516** are preferably integrally molded into the upper cartridge component to ensure that substantially all of the glass fragments from the ruptured glass ampoules are not permitted to enter the fluidic network and possibly obstruct/block fluid flow. Alternatively, the filters may be separate components that are incorporated into the sample and/or assay reagent chambers during the manufacturing/assembly process; e.g., inserts that may preferably be snapped into place (see, e.g., inserts **2020** and **2021** in **FIG. 20**).

[**0244**] The two piece cartridge design also advantageously simplifies the employment of additional anti-foaming measures in the waste chambers. A vertical web, or partial wall, can be included in the upper portions of the waste chambers **1610,1611** located in the upper cartridge component **1600**, another embodiment of upper cartridge component **1411**. Preferably the anti-foaming web is arranged between the waste chamber vent and the waste chamber input. The height of the anti-foaming web preferably extends the full depth of the upper portion of the waste chamber but may be less than the full depth as well. Alternatively, the anti-foaming web can extend beyond the depth of the upper portion of the waste chamber so that it protrudes into the lower portion of the waste chamber. Preferably the height of the anti-foaming web is selected to achieve optimum anti-foaming.

[**0245**] As discussed above, the input conduits of the waste chambers are preferably arranged so as to enter the waste chambers in a manner that allows the waste fluid to run down the wall of the waste chamber to minimize or eliminate foaming. As illustrated in **FIG. 16***a*, the input conduits **1615,1616** intersect one of the walls of the waste chambers. Additionally, the vents are configured and arranged to access the waste chambers at a point that will be above the anticipated fluid level. Locating the waste chamber vents at or near the top of the waste chamber also helps to ensure that any foaming that may occur within the chamber does not result in fluid entering the vent line and possibly contaminating the cartridge reader instrument.

[**0246**] **FIG. 32** shows a schematic of the fluidic network of cartridge **3200**, a preferred embodiment of the invention configured to extract analyte from a matrix, preferably from an applicator stick, most preferably from a swab. **FIG. 33** shows an exploded view of a preferred design of cartridge **3200**. Cartridge **3200** illustrates two preferred features of cartridges of the invention: a sample chamber for extracting analyte from a matrix and the use of a "reverse flow" wash. Cartridge **3200** has reagent chamber **3210** linked to vent port **3212** and extraction reagent conduit **3214** (preferably, comprising a Z-transition). Reagent chamber **3210** holds a liquid reagent suitable for extracting the analyte. Preferably, reagent chamber holds an ampoule of nitrous acid or, more preferably, an ampoule of an acid (preferably, acetic acid) and a dry nitrate salt outside of the ampoule so that rupturing the ampoule leads to the formation of nitrous acid. Nitrous acid is a particularly useful extraction reagent for extracting cell wall antigens from gram positive bacteria and may also be used to extract markers from other organsims in mucus containing samples such as upper respiratory samples (see, e.g., the extraction methods and reagents disclosed in U.S. Provisional Patent Application 60/436,591, filed Dec, 26, 2002, entitled Methods Compositions and Kits for Biomarker Extraction, hereby incorporated by reference).

[**0247**] Cartridge **3200** has elongated sample chamber **3220** (a sample chamber configured for extracting samples such as those described above in connection with **FIGS. 28-30**) connected to extraction reagent conduit **3214** and sample conduit **3224** so as to allow the flow of extraction reagent through the sample (preferably, through swab head **3205**). Preferably, as shown in **FIG. 33**, sample chamber **3220** is angled or curved along its elongated dimension so as to aid in breaking a scored swab inserted into the sample compartment. Sample conduit **3224** is connected to bubble