included to effect this actuation along with a controlling algorithm for initiating sealing at the appropriate step in the analysis cycle.

[0176] The instrument also has an electrical connector of the type described in jointly owned It is used to make electrical connection to the sensor **128** in the housing **100**. Where it is desirable to perform the detection step at a controlled temperature, e.g. 37° C., the connector also incorporates heating and thermistor elements, which contact the back side of the silicon chip that provides the substrate for the sensor. These elements are of the same type as described for the amplification chamber. The instrument has amperometric circuitry for controlling the potential of the sensor and measuring current. The instrument also has an embedded algorithm for controlling the entire analysis sequence performed by the instrument on the single-use device to make a nucleic acid determination and display a result on a display screen on the instrument. Where the electroactive species generated or consumed in proportion to the captured target is more appropriately detected by means of potentiometry or conductimetry, alternative circuitry well known in the art is incorporated into the instrument.

[0177] In an alternative embodiment, the single-use device is composed of two separate parts as shown in FIGS. **19** and **20**. FIG. **19** illustrates a separate extraction device **470** and a combined amplification and detection device **471**. The elements in a combined form have the same features as those shown for the integrated device in FIG. **6**, with the exception of features related to transferring extracted material from one to the other. Element **470** comprises an entry port **413**, conduit **411**, wash fluid **417** and waste chambers **418**, a separation region **421**, a terminal portion of the conduit **601** and an egress port **502** which mates with ingress port **502**. It also has mating features **520** and **521** which match one or more opening **500** in **471**. Element **471** has an amplification chamber **410**, conduit **409**, chambers **408**, **409** and sensors **419**, **420**, exit conduit **405** and sealing feature **406**. FIG. **20** is similar to FIG. **19**, with the difference that it comprises a combined extraction and amplification component **472** and a separated detection component **473**. The mating features are appropriately located between the two.

[0178] FIG. **18** shows an additional embodiment where a filter region **421** is integrated into a device that performs extraction, amplification and detection. Other elements are as for FIG. **19**. FIG. **17**(*a*) shows an optical detection-based single-use cartridge where an optical sensor is integrated into the device that is interrogated by a reflectance method. Light is generated by element **401** and interacts with sensor **403** and is captured by detector **400**. FIG. **17**(*b*) shows an optical single-use cartridge where the sensing region is a cuvette feature **404**, permitting detection with a light source **402** and detector **400** integrated into the instrument.

[0179] It has been found that where the sample is a buccal swab, the extraction component element, either magnetic or filter based, is unnecessary and the sample may be directly inserted into the amplification chamber. FIG. **28**(*a*) and FIG. **28**(*b*) show two views (top and bottom) of a buccal sample device for direct application of a buccal sample to a per chamber. This extraction and amplification device attaches to the detection cartridge, by means of the mating features described above (not shown).

[0180] The general dimensions of the housing **100** are about 6 cm in length, 3 cm in width and 0.3 cm in height. The conduits and other features are preferably rendered in a device base **143** and a device cover **144** which are held together by an intervening double-sided adhesive tape **145**, see FIG. **6**. Where the base and cover are injection molded in plastic, typically ABS or polycarbonate, conduits and recesses to accommodate silicon chips, fluid containing pouched and the like are molded features. In this embodiment the adhesive tape acts as a sealing gasket to confine liquids to the desired conduits and chambers. Detailed discussion of the use of molded cover and base elements along with the use of adhesive tape gaskets is found in jointly owned U.S. Pat. No. 5,096,669 and pending US 20030170881 which are incorporated here by reference.

DETAILED DESCRIPTION OF DETECTION

[0181] The preferred method of detection in the single-use cartridge is electrochemical, however other sensing methods including fluorescence, luminescence, colorimetric, thermometric, fiber optics, optical wave guides, surface acoustic wave, evanescent wave, plasmon resonance and the like can be used.

[0182] The preferred sensor **128** comprises an amperometric electrode **300**, which is operated with a counter-reference electrode **301** and is shown in FIG. **6**. The amperometric electrode **300** comprises a 100 um diameter gold layer microfabricated onto a silicon chip **302**. The silicon chip is treated in the first step of manufacture to produce an insulating layer of silicon dioxide on the surface, as is well known in the art. The electrode is connected by means of a conducting line **303** to a connector pad **304** which makes contact with the electrical connector of the instrument. The conducting line is typically coated with an insulating layer of polyimide **305**. Directly over the electrode **300** or at an adjacent location **306** on the chip are adhered polymer particles **307** that have a ligand **308** complimentary to and capable of capturing the amplified target. The counter-reference electrode may be microfabricated on the same silicon chip or one place adjacently in the second conduit **125**. It comprises a silver-silver chloride layer, of 200 um diameter attached by a contact line **309** to a contact pad **310** that makes contact with the instrument connector. Again the line **309** is preferably coated with an insulating layer of polyimide. A detailed description of amperometric sensor microfabrication is found in jointly owned U.S. Pat. No. 5,200,051 which is incorporated here by reference.

[0183] A conductivity sensor comprising two conductive bars **311** and **312** are present on chip **302**, or an adjacent chip **350**, connected to contact pads **313** and **314** by lines **315** and **316** respectively, see FIG. **6**. The conductivity sensor can be used by the instrument to distinguish if liquid or air is in contact with the sensor and thus determine the position of a solution in the second conduit with respect to the sensor **300**. This solution may be one containing the amplified target or the detection reagent. Optionally a conductivity sensor may be incorporated into or adjacent to both the extraction chamber and the amplification chamber to determine the position of a fluid. A detailed description of conductivity sensor microfabrication and use is found in jointly owned U.S. Pat. No. 5,447,440 and U.S. Pat. No. 6,750,053 which are incorporated here by reference.

[0184] In an alternative embodiment of the single-use device **100** a transparent glass window is substituted for the silicon chip **302** and the sensing region of the device forms a cuvette, FIG. **17**. The amplified target capture reagent is immobilized on the glass and in this case the detection reagent