APPARATUS AND METHOD FOR DETECTING AN ANALYTE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application 60/705,088, filed Aug. 2, 2005, which is incorporated herein by reference.

BACKGROUND

[0002] Many industries, such as the medical and food service industries, often require the testing of a sample of material in order to determine whether a certain biological bacterium or other organism is present. The presence of such an organism may be indicative of a problem. For example, the presence of the organism may indicate the presence of infection in a person or the presence of a contaminant in food or on a food preparation surface.

[0003] In existing methods of testing the sample of material, a sample collection device, such as a swab, which includes a porous medium on the end of a shaft, may be used to gather the sample of material. Specifically, the porous medium of the swab may be placed in contact with a sample source, such as a nose, ear, or throat of a person, or a food preparation surface, and a sample may then adhere to the porous medium. Thereafter, the sample collection device may be transferred to a different location, such as a laboratory, where the collected sample is transferred from the sample collection device to a slide or other external laboratory apparatus in order to run an assay to analyze whether the particular organism of interest is present. The particular organism of interest may be referred to as an "analyte".

[0004] In addition to a delay in time, the transfer of the sample collection device from the sample source to the off-site location may cause the collected sample to become contaminated or dry out, which may decrease the reliability of the analyte detection. The present invention addresses these and/or other problems and provides advantages not previously recognized.

BRIEF SUMMARY

[0005] The application discloses, in one aspect, an apparatus to process a sample of biological material. The apparatus comprises a central housing segment comprising a capture medium adapted to isolate an analyte from the sample of biological material, a first housing segment configured to receive a sample collection assembly having a first fluid reservoir and the apparatus including a flow path from the first housing segment to the central housing segment, and a second housing segment comprising a testing device and the apparatus including a flow path between the central housing segment and the second housing segment. The apparatus further comprises a third housing segment configured to retain at least a portion of the first fluid after it is released from the first fluid reservoir and the apparatus including a flow path between the central housing segment and the third housing segment, a fourth housing segment comprising a second fluid reservoir and the apparatus including a flow path between the fourth housing segment and the central housing segment, and a valve assembly configured to regulate flow in at least one of the flow paths between the first, second, third and fourth housing segments and the central housing segment.

[0006] In another aspect, a method is disclosed of processing a sample of biological material. The method comprises eluting a sample of biological material from a sample collection device into a first housing segment using a first fluid, directing the first fluid along a first flow path from the first housing segment to a central housing segment to capture an analyte in a central cavity, collecting the first fluid from the central cavity in a third housing segment, actuating a valve to close a flow path from the central housing segment to the third housing segment and open a flow path from the central cavity to a second housing segment, and introducing a second fluid from a fourth housing segment into the central housing segment to release the analyte from a capture medium, and provide fluid flow from the central housing segment into the second housing segment for testing.

[0007] The above summary is not intended to describe each disclosed embodiment or every implementation of the present invention. The figures and the detailed description which follow more particularly exemplify illustrative embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present invention will be further explained with reference to the drawing figures listed below, where like structure is referenced by like numerals throughout the several views.

[0009] FIG. **1** is a perspective view of an exemplary embodiment of an apparatus of the present invention, which includes a frame, a valve, and a plurality of housing segments disposed about the valve.

[0010] FIG. **2**A illustrates an example of an open flow path (or pathway) between a central housing segment (shown in FIG. **3**) and another housing segment.

[0011] FIG. **2**B illustrates the flow path of FIG. **2**A, which has now been closed off with a rib of a valve.

[0012] FIG. **2**C illustrates the flow path of FIG. **2**A, which is now partially closed with a rib of the valve.

[0013] FIG. **3** is a side view of the apparatus of FIG. **1**, where the valve has been removed to show a central housing segment and the pathways connecting the central housing segment to each housing segment shown in FIG. **1**.

[0014] FIG. **4**A is a schematic view of the apparatus of FIG. **1**, where the valve is in a sample preparation orientation.

[0015] FIG. **4**B is a schematic view of the apparatus of FIG. **1**, where the valve is in a testing orientation.

[0016] FIG. **5** is a perspective view of the inventive apparatus, where the valve is in the sample preparation orientation.

[0017] FIGS. **6**A, **6**B and **6**C are orthogonal views of the inventive apparatus of FIG. **5**.

[0018] FIG. **6**A is a top view, with interior portions of the valve and frame thereunder shown in phantom.

[0019] FIG. **6**B is a bottom end view (from the bottom of FIG. **6**A).

[0020] FIG. **6**C is a side view (from the right side of FIG. **6**A).

[0021] While the above-identified figures set forth an exemplary embodiment of the present invention, other embodiments are also within the invention. In all cases, this disclosure presents the invention by way of representation and not limitation. It should be understood that numerous