unit of the conduit cartridge. The fluid separation conduit cartridge **502** may include one or more connectors on a major surface, e.g. the back surface of the conduit cartridge **502** shown in FIG. **16**, such that the conduit cartridge can interface with a manifold and sit flush with the surface of the system. For example, the conduit cartridge may have outwardly projecting connectors that plug into a manifold, having receiving sockets, positioned on the analytical system. When the conduit cartridge is plugged into the manifold, the conduit cartridge snaps into position on the analytical system, e.g. becomes seated in a slot on the surface of the analytical system. Thus, the conduit cartridge is in fluid communication with the analytical system and is retained by the system such that vibrations will not dislodge the conduit cartridge from the system, i.e. the conduit cartridge remains in fluid communication with the system even in the presence of vibrations or other physical disturbances. Numerous other devices, e.g. cams, pulleys, springs, pressure plates and the like may be used to retain the conduit cartridge against the manifold of the system such that a fluid tight seal is preserved.

[**0083**] Although the present invention has been described above in terms of specific embodiments, it is anticipated that other uses, alterations and modifications thereof will become apparent to those skilled in the art given the benefit of this disclosure. Such alterations are intended to include the interchanging of one or more of the components of any of the embodiments with the components of any of the other embodiments disclosed here. It is intended that the following claims be read as covering such alterations and modifications as fall within the true spirit and scope of the invention. It is intended that the articles "a" and "an", as used below in the claims, cover both the singular and plural forms of the nouns which the articles modify.

What is claimed is:

1. A microfluidic substrate assembly comprising:

a multi-layer laminated substrate defining at least one fluid inlet port and at least one microscale fluid flow channel within the multi-layer substrate in fluid communication with the inlet port for transport of fluid; and

at least one operative component mounted aboard the multi-layer laminated substrate in communication with the microscale fluid flow channel.

2. The microfluidic substrate assembly of claim 1 in which the operative component mounted aboard the multi-layer laminated substrate is in fluid communication with the at least one microscale fluid flow channel.

3. The microfluidic substrate assembly of claim 2 in which the operative component mounted aboard the multi-layer laminated substrate is operative as a fluid reservoir.

4. The microfluidic substrate assembly of claim 1 in which the operative component mounted aboard the multi-layer laminated substrate is operative as a light sensor across a microscale fluid flow channel within the multi-layer substrate.

5. The microfluidic substrate assembly of claim 1 in which the operative component mounted aboard the multi-layer laminated substrate is operative as an ultrasonic actuator or transducer across a microscale fluid flow channel within the multi-layer substrate.

6. The microfluidic substrate assembly of claim 1 in which the operative component mounted aboard the multi-layer laminated substrate is operative to generate fluid pressure in a microchannel of the substrate.

7. The microfluidic substrate assembly of claim 6 in which the operative component mounted aboard the multi-layer laminated substrate is a thermal actuator.

8. The microfluidic substrate assembly of claim 6 in which the operative component is a micromachined pump, diaphragm pump, syringe pump or volume occlusion pump.

9. The microfluidic substrate assembly of claim 1 in which the operative component mounted aboard the multi-layer laminated substrate is operative to induce flow in a microchannel of the multi-layer laminated substrate endosmotically or by electrochemical evolution of gases.

10. The microfluidic substrate assembly of claim 1 in which the multi-layer laminated substrate further comprises at least one fluid outlet port in fluid communication with the fluid inlet port within the multi-layer substrate.

11. The microfluidic substrate assembly of claim 1 in which the operative component mounted aboard the multi-layer laminated substrate is at least one electronic memory unit mounted to the substrate assembly and operatively connected to the microfluidic substrate assembly.

12. The microfluidic substrate assembly of claim 11 further comprising at least one operative component mounted aboard the multi-layer laminated substrate in communication with the microscale fluid flow channel and operative to generate an electronic signal corresponding to a detected characteristic of fluid in the microscale fluid flow channel, wherein the at least one electronic memory unit is connected to the operative component to receive and record the electronic signal.

13. A microfluidic substrate assembly comprising a generally planar multi-layer laminated substrate defining

at least one fluid inlet port and at least one microscale fluid flow channel at each of more than one level within the multi-layer laminated substrate for transport of fluid, and

at least one microchannel via extending between levels within the multi-layer laminated substrate for fluid communication between microscale fluid flow channels of different levels.

14. The microfluidic substrate assembly of claim 13 in which the at least one microchannel has a configuration which is straight, curvo-linear, serpentine or spiral.

15. A microfluidic substrate assembly comprising a multi-layer laminated substrate defining at least one fluid inlet port and at least one microscale fluid flow channel in fluid communication with the inlet port for transport of fluid, wherein at least one layer of the multi-layer laminated substrate is formed of plastic and the substrate assembly is operative and fluid tight at fluid pressure in the microscale fluid flow channel in excess of about 100 psi.

16. The microfluidic substrate assembly of claim 15 in which the multi-layer laminated substrate is operative and fluid tight at fluid pressure in the microscale fluid flow channel in excess of about 1000 psi.

17. The microfluidic substrate assembly of claim 15 in which the multi-layer laminated substrate further comprises rigid plates sandwiching the plastic layer between them.

18. The microfluidic substrate assembly of claim 17 in which multiple layers of the multi-layer laminated substrate are formed of plastic and are welded one to another, the rigid plates sandwiching the multiple plastic layer between them.