CLAIMS

1. An apparatus, comprising:

a shape memory alloy actuator assembly, comprising:

a housing comprising a pair of lateral sides each having a first end and a second end and a transverse section coupling the lateral sides;

a printed circuit board coupled to the first end of the housing;

an end plate coupled to the second end of the housing;

a plurality of shape memory alloy actuators positioned between the printed circuit board and the end plate, each shape memory alloy actuator comprising:

a pair of wire mounts coupled to opposing sides of the printed circuit board;

an actuator rod positioned between the lateral walls of the housing and including a wire guide; and

a shape memory alloy wire coupled to the wire mounts and positioned around the wire guide,

wherein applying a voltage to the shape memory alloy wire retracts the shape memory alloy wire and causes the corresponding actuator rod to move between a first position and a second position.

2. The apparatus of claim 1, further comprising an enclosure surrounding the housing and defining one or more vents positioned to enable air flow across the shape memory alloy wires.

3. The apparatus of claim 2, wherein the vents are elongate openings extending relative to one or more of the shape memory alloy wires.

4. The apparatus of claim 2, wherein the enclosure has open sides.

5. The apparatus of claim 1, further comprising an enclosure surrounding the shape memory alloy wires.

6. The apparatus of claim 5, wherein the enclosure has a first enclosure assembly and a second enclosure assembly, each of the first enclosure assembly and the second enclosure assembly has an enclosure body coupled to the housing and an inlet port assembly.

7. The apparatus of claim 6, wherein the inlet port assembly has an inlet port and a diffuser.

8. The apparatus of claim 7, wherein the inlet port assembly further comprises a pressure homogenizer and a nozzle array, the pressure homogenizer positioned between the nozzle array and the diffuser and the diffuser positioned between the pressure homogenizer and the inlet port.

9. The apparatus of claim 8, wherein axes of nozzles of the nozzle array are substantially parallel to an axis of the inlet port.

10. The apparatus of claim 1, further comprising an air flow assembly to flow air or gas across the shape memory alloy wires.

11. The apparatus of claim 10, wherein the air flow assembly comprises a fan.

12. An apparatus, comprising:

a system including a flow cell receptacle and a valve drive assembly including a shape memory alloy actuator including a pair of shape memory alloy wires; and

a flow cell disposable within the flow cell receptacle and having a membrane valve,

wherein the system actuates the membrane valve, via the shape memory alloy actuator, by causing a voltage to be applied to a first one of the shape memory alloy wires and the system not applying the voltage to a second one of the shape memory alloy wires.

13. The apparatus of claim 12, wherein the system comprises a counter that counts a number of instances that the system causes the voltage to be applied to the first one of the shape memory alloy wires and wherein the system causes the voltage to be applied to the second one of the shape memory alloy wires and to not be applied to the first one of the shape memory alloy wires when the number of instances satisfies a reference number.

14. The apparatus of claim 12, wherein the system tests operability of the first one of the shape memory alloy wires and causes the voltage to be applied to the second one of the shape memory alloy wires and to not be applied to the first one of the shape memory alloy wires when the system identifies the first one of the shape memory alloy wires being inoperable.

15. An apparatus, comprising:

a shape memory alloy actuator assembly, comprising:

a housing comprising a pair of lateral sides each having a first end and a second end and a transverse section coupling the lateral sides;

a printed circuit board coupled to the first end of the housing;

a plurality of shape memory alloy actuators positioned between the printed circuit board and the second end, each shape memory alloy actuator comprising:

a pair of wire mounts coupled to opposing sides of the printed circuit board;

an actuator rod positioned between the lateral walls of the housing and including a wire guide, the actuator rod comprising a side port and an end face having a vacuum port and a plunger portion, the side port being fluidically coupled to the vacuum port; and

a shape memory alloy wire coupled to the wire mounts and positioned around the wire guide; and

an actuator manifold assembly coupled to the printed circuit board, the actuator manifold assembly comprising:

a body having an outlet port and a plurality of inlet ports; and

a plurality of pneumatic lines, each pneumatic line coupled between the side port of one of the actuator rods and one of the inlet ports of the actuator manifold assembly;

wherein applying a voltage to the shape memory alloy wire retracts the shape memory alloy wire and causes the corresponding actuator rod to move between a first position and a second position.

16. The apparatus of claim 15, further comprising a flow cell assembly comprising:

a flow cell inlet;

a flow cell outlet;

a flow cell; and

a manifold assembly, the manifold assembly, comprising:

a common fluidic line, the flow cell being coupled to the common fluidic line;

a plurality of reagent fluidic lines; and

a plurality of membrane valves selectively fluidically coupling the common fluidic line and a corresponding one of the plurality of reagent fluidic lines, each membrane valve comprising a body and a membrane coupled to a surface of the body, the body including a valve seat and defining a chamber fluidically coupled to the corresponding reagent fluidic line and covered by a portion of the membrane.

17. The apparatus of claim 16, wherein opening the membrane valves includes the vacuum port of the corresponding shape memory actuator sealingly engaging the portion of the membrane and moving between the first position and the second position.

18. The apparatus of claim 16, wherein the chamber and the portion of the membrane have a width greater than a width of the valve seat.

19. The apparatus of claim 16, wherein the chamber and the portion of the membrane are squircle shaped.

20. The apparatus of claim 16, wherein the chamber and the portion of the membrane are tear-drop shaped.