Claims

1. A fluid handling cassette comprising:

a first plate;

a midplate positioned next to the first plate, the mid-plate comprising:

a perimeter wall around a pump or valve projecting from a first side of the midplate;

wherein the first plate contacts the perimeter wall on the first side of the midplate, and wherein the midplate is opaque, the first plate permits transmission of laser wavelengths, and the perimeter wall is laser welded to the first plate.

2. The fluid handling cassette of claim 1 further comprising:

an actuation port located on an edge of the midplate, an axis of the port being parallel to a face of the cassette;

a diaphragm located on the midplate within the perimeter wall, the diaphragm and the perimeter wall together with the first plate defining an actuation chamber; and

an actuation channel comprising a pair of channel walls extending from the perimeter wall to the actuation port and fluidly connecting the actuation port to the actuation chamber;

wherein the pair of channel walls are sealed to the first plate with a laser weld.

3. The fluid handling cassette of claim 1, further comprising:

two fluid ports each defined by an aperture through the mid-plate within the perimeter wall;

a second plate; and

two fluid channels each defined by channel walls projecting from a second side of the midplate, wherein each fluid channel is in fluid communication with one of the fluid ports; and

wherein the second plate transmits laser wave lengths and is laser welded to the fluid channels.

4. The fluid handling cassette of claim 1 further comprising:

an actuation port located on an edge of the midplate, an axis of the actuation port parallel to a face of the cassette.

5. A fluid-handling cassette assembly comprising:

a middle cassette interposed between a first outer cassette and a second outer cassette, each said cassette comprising:

a first plate;

a second plate; and

a midplate positioned next to the first plate, the midplate comprising:

a perimeter wall around a pump station or valve station projecting from a first side of the midplate; and

a plurality of fluid channels projecting from a second side of the midplate;

a fluid-handling pod positioned in an inter-cassette space between the middle cassette and the first or second outer cassette; said pod having a fluid connection to a fluid channel in the middle, first or second outer cassette via a fluid conduit penetrating the second plate of the middle, first or second outer cassette;

wherein the first plate is laser welded to the perimeter walls on the first side of the midplate, and the second plate is laser welded to the channel walls on the second side of the midplate.

6. A fluid-handling cassette assembly of claim 5, wherein the midplate is opaque, while the first and second plates permit transmission of laser wavelengths.

7. A fluid-handling cassette assembly of claim 5, the midplate further comprising:

an actuation channel; and

an actuation port located at an edge of the midplate, an axis of the actuation port oriented parallel to a face of the cassette containing the midplate,

wherein the actuation port is fluidly connected to the pump station or valve station via the actuation channel.

8. A fluid handling cassette comprising:

a midplate comprising:

an actuation port attached to a first edge of the midplate and extending beyond the first edge;

a perimeter wall around a pump station or valve station with a break in the wall, the perimeter wall projecting from a first side of the midplate; and

an actuation channel formed from two channel walls projecting from the first side of the midplate, the actuation channel extending from the break in the perimeter wall to the actuation port;

a diaphragm located on the midplate within the perimeter wall, the diaphragm including a bead on an outer edge of the diaphragm; and

a first plate with a first side facing the midplate and comprising:

a first side contacting the perimeter wall and channel walls;

a retaining wall projecting from the first side to a distance sufficient to compress the bead against the midplate, the retaining wall located and sized to fit within the perimeter wall;

wherein the first plate and diaphragm define an actuation chamber.

9. The fluid handling cassette of claim 8 wherein the retaining wall fits within the perimeter wall creating an annular gap, the annular gap being in fluid communication with the actuation channel, the retaining wall including one or more fenestrations to provide a fluid path between the actuation chamber and the annular gap.

10. The fluid handling cassette of claim 9, wherein the retaining wall further comprises a curved surface within the wall that is shaped to support the diaphragm.

11. The fluid handling cassette of claim 10, wherein the retaining wall further comprises a groove that extends from one fenestration across the diaphragm to an opposite side of the retaining wall.

12. The fluid handling cassette of claim 8 wherein the midplate is formed of an opaque material and the first plate is transparent or translucent.

13. The fluid handling cassette of claim 8, wherein the first plate permits transmission of laser wavelengths and the midplate is opaque.

14. The fluid handling cassette of claim 8, wherein the first plate is laser welded to the perimeter wall or channel walls.

15. The fluid handling cassette of claim 8, further comprising a second plate; and wherein the midplate further comprises:

two fluid ports each defined by an aperture through the mid-plate within the perimeter wall; and

two fluid channels each defined by channel walls projecting from a second side of the midplate, wherein each fluid channel is in fluid communication with the one of the fluid ports; and

wherein the second plate transmits laser wave lengths and is laser welded to the fluid channels.