Claims

1. A fluid handling cassette comprising:

a midplate positioned between a first plate and a second plate, the midplate comprising a first side with a plurality of channel walls projecting from the first side, and a second side with a plurality of channel walls projecting from the second side, wherein the first plate contacts the channel walls on the first side of the midplate and the second plate contacts the channel walls on the second side of the midplate;

a plurality of edges each of which is perpendicular and coinciding with an outer edge of the midplate;

a pump station with a pump actuation chamber defined by a pump diaphragm and the first side of the mid-plate, said pump diaphragm seated against the first side of the midplate; and

a pump actuation channel defined by at least two channel walls of the plurality of channel walls on the first side of the midplate and fluidly connecting the pump actuation chamber with a cassette pump actuation port positioned at a first edge of the plurality of edges and located between the midplate and the first plate.

2. The fluid handling cassette of claim 1, wherein the plurality of channel walls on the second side of the mid-plate define one or more fluid channels.

3. The fluid handling cassette of claim 1, wherein the cassette pump actuation port is an integral part of the midplate.

4. The fluid handling cassette of claim 2, wherein the pump station further comprises a first and a second pump port fluidly connecting a pumping chamber to a respective first and second fluid channels, the pumping chamber defined by the pump diaphragm and the first side of the midplate

5. The fluid handling cassette of claim 2, comprising a pump port in the pump station fluidly connecting a fluid channel on the second side of the mid-plate, with a pumping chamber defined by the pump diaphragm and the first side of the mid-plate.

6. The fluid handling cassette of claim 2, comprising an aperture in the midplate at the pump station, said aperture allowing the pump diaphragm to move from the first plate to the second plate when actuated by positive or negative pressure delivered through the pump actuation channel.

7. The fluid handling cassette of claim 5, comprising a fluid channel on the second side of the midplate fluidly connected the pumping chamber to a cassette fluid port located at the first edge of the cassette and between the midplate and the second plate.

8. The fluid handling cassette of claim 5, comprising a fluid channel on the second side of the mid-plate fluidly connected the pumping chamber to a cassette fluid port located at a second edge of the cassette and between the midplate and the second plate.

9. A fluid handling cassette comprising:

a mid-plate positioned between a first plate and a second plate, the midplate comprising a plurality of channel walls projecting from a first side and, a second side with a plurality of channel walls projecting from the second side, wherein the first plate contacts the channel walls on the first side of the midplate and the second plate contacts the channel walls on the second side of the midplate;

a plurality of edges, each of which is perpendicular and coinciding with an outer edge of the midplate;

a valve station comprising a valve actuation chamber defined by a valve diaphragm and the first side of the midplate, said valve diaphragm seated against the first side of the midplate; and

a valve actuation channel defined by at least two channel walls of the plurality of channel walls on the first side of the midplate and fluidly connecting the valve actuation chamber with a cassette valve actuation port positioned at a first edge of the plurality of edges and located between the mid-plate and the first plate.

10. The fluid handling cassette of claim 9, wherein the plurality of channel walls on the second side of the midplate define one or more fluid channels.

11. The fluid handling cassette of claim 10, wherein the valve station further comprises a first and second valve fluid port fluidly connecting a respective first and second fluid channel on the second side of the midplate to a valve fluid chamber defined by the valve diaphragm and the first side of the midplate.

12. The fluid handling cassette of claim 11, wherein one or both valve fluid ports comprise a raised valve seat to seal the valve diaphragm over the first or second valve fluid port when positive pressure is applied to the valve diaphragm via the valve actuation channel.

13. The fluid handling cassette of claim 11, wherein the first fluid channel is fluidically isolated from the second fluid channel other than through the first and second valve fluid ports.

14. The fluid handling cassette of claim 11, comprising a fluid channel positioned on the second side of the midplate, which fluidly connects a valve fluid chamber defined by the valve diaphragm and the first side of the midplate to a cassette fluid port located at the first edge and between the mid-plate and the second plate.

15. The fluid handling cassette of claim 11, comprising a fluid channel positioned on the second side of the midplate, which fluidly connects a valve fluid chamber defined by the valve diaphragm and the first side of the mid-plate to a cassette fluid port located at a second edge of the plurality of edges and located between the midplate and the second plate.

16. The fluid handling cassette of claim 1, wherein the first plate is bonded to the channel walls on the first side of the midplate.

17. The fluid handling cassette of claim 16, wherein the first plate is bonded to the channel walls on the first side of the midplate with ultrasonic weld.

18. The fluid handling cassette of claim 1, wherein the first plate is laser welded to the channel walls of the midplate on the first side.

19. The fluid handling cassette of claim 1, wherein the first plate and the second plate permit transmission of laser wavelengths while the midplate is opaque, and wherein the first plate and second plate are laser welded to the midplate.