CLAIMS

What is claimed is:

1. An apparatus, comprising:

a reagent cartridge configured to be received within a cartridge receptacle of a system, the reagent cartridge comprising:

a plurality of reagent reservoirs;

a plurality of dedicated fluidic lines, each of the reagent reservoirs being coupled to a corresponding dedicated fluidic line;

a common fluidic line to be coupled to a flow cell and each of the dedicated fluidic lines;

a plurality of valves, each valve to control fluid flow between one of the dedicated fluidic lines and the common fluidic line;

a body including a surface forming depressions, each depression having a fluid inlet formed as an aperture through the surface, and a fluid outlet formed as an aperture through the surface and being fluidly coupled to at least one other depression; and

a deformable material coupled to the surface of the body and including portions, each portion covering one of the depressions to define chambers,

wherein the portions of the deformable material are movable relative to the depressions between a first position outside of a dimensional envelope of the body and a second position within the dimensional envelope of the body,

wherein the surface of the body includes a mating surface to which the deformable material is coupled, wherein a distance between the inlet and the mating surface is less than a distance between the outlet and the mating surface,

wherein the chambers are coupled via a fluidic line having a first fluidic-line portion and a second fluidic-line portion, the first fluidic-line portion being coupled to the outlet of a first one of the chambers and extending from the outlet toward the mating surface and the second fluidic-line portion being coupled to the first fluidic-line portion and to the inlet of a second one of the chambers.

2. The apparatus of claim 1, further comprising a flow cell and wherein the reagent cartridge carries the flow cell and wherein the chambers are positioned downstream of the flow cell.

3. The apparatus of claim 1, further comprising a flow cell and wherein the reagent cartridge carries the flow cell and wherein the chambers are positioned upstream of the flow cell.

4. The apparatus of any of the preceding claims, wherein the inlets are vertically offset relative to respective ones of the outlets.

5. The apparatus of any of the preceding claims, wherein the depressions are concave and include apexes, the inlets being positioned adjacent the mating surface on a first side of the respective chambers and the outlets being positioned adjacent the apexes of the chambers on a second side of the respective chambers.

6. The apparatus of any of the preceding claims, wherein the deformable material includes a first surface and a second surface, the portions of the deformable material include first portions and second portions, the first surface of the deformable material including the first portions and the second portions, the second portions of the first surface coupled to the mating surface of the body, the first portions of the first surface and the second portions of the first surface being substantially coplanar.

7. The apparatus of claim 6, wherein the first surface and the second surface are substantially parallel relative to one another.

8. The apparatus of claim 6, wherein the deformable material comprises female portions defined by the second surface of the deformable material and positioned adjacent the second portion of the first surface of the deformable material.

9. The apparatus of any of the preceding claims, wherein the deformable material includes concave portions that cover the respective depressions.

10. The apparatus of claim 9, wherein the concave portions comprise membrane switches.

11. The apparatus of claim 9, wherein the deformable material includes a first surface and a second surface, the first surface coupled to the body, the second surface including female portions positioned adjacent the depressions of the body.

12. An apparatus, comprising:

a system, including:

a cartridge receptacle having an opening;

a pump drive assembly; and

a controller coupled to the pump drive assembly;

a fluidic cartridge receivable within the cartridge receptacle and carrying a flow cell, the fluidic cartridge, comprising:

a reservoir;

chambers defined by a body of the fluidic cartridge, each chamber having a fluid inlet and a fluid outlet;

a deformable material covering the chambers; and

fluidic lines that fluidly couple the reservoir, the flow cell, and the chambers,

wherein the body includes a mating surface to which the deformable material is coupled, wherein a distance between the inlet and the mating surface is less than a distance between the outlet and the mating surface,

wherein at least one of the fluidic lines couples the chambers and comprises a first fluidic-line portion and a second fluidic-line portion, the first fluidic-line portion being coupled to the outlet of a first one of the chambers and extending from the outlet toward the mating surface and the second fluidic-line portion being coupled to the first fluidic-line portion at an angle to the first fluidic line portion and to the inlet of a second one of the chambers; and wherein the pump drive assembly, the chambers, and the deformable material form a linear peristaltic pump, and wherein the controller is adapted to cause the pump drive assembly to interface with the deformable material to cause the linear peristaltic pump to pump fluid through one or more of the fluidic lines.

13. The apparatus of claim 12, wherein the controller is adapted to cause the pump drive assembly to interface with the deformable material to cause the linear peristaltic pump to create a pulsatile flow of fluid through the one or more of the fluidic lines.

14. The apparatus of any of claims 12 or 13, wherein the controller is adapted to cause the pump drive assembly to interface with the deformable material covering a first one of the chambers but not to interface with the deformable material covering a second one of the chambers.

15. The apparatus of any of claims 12, 13, or 14, wherein the pump drive assembly comprises a guide comprising guide bores, rods disposed within the respective guide bores, and an actuator adapted to selectively actuate the rods between a retracted position and an extended position, the rods comprising distal ends that are adapted to depress the deformable material of the linear peristaltic pump in the extended position.

16. The apparatus of claim 15, wherein the rods comprise cam followers, further comprising springs disposed within the respective ones of the guide bores to urge the cam followers toward the retracted position, and wherein the actuator comprises a cam shaft and a motor adapted to rotate the cam shaft, the cam shaft adapted to interface with the cam followers to actuate the cam followers.

17. The apparatus of claim 15, wherein the actuator comprises rocker arms, a first cam shaft including first lobes, and a second cam shaft including second lobes, a first portion of each of the rocker arms pivotably coupled to one of the rods, a second portion of the rocker arms engaging the second lobes of the second cam shaft, the second cam shaft rotatable to change a relative location between the rocker arms and the first cam shaft.

18. The apparatus of claim 15, wherein the actuator comprises piezoelectric actuators, the piezoelectric actuators coupled to the respective rods to actuate the rods.

19. The apparatus of claim 15, wherein the actuator comprises a pneumatic actuator, the pneumatic actuator comprising single-acting cylinders having a spring return, the cylinders coupled to respective ones of the rods.

20. The apparatus of any of claims 15 to 19, wherein the deformable material comprises female portions that cover the chambers and the distal ends of the rods comprise male portions, the male portions to be received within respective ones of the female portions to couple the rods to the deformable material.

21. The apparatus of any of claims 15 to 19, wherein the deformable material comprises female portions that cover the chambers and receive first magnets, the distal ends of the rods carry second magnets, the first magnets are attracted to respective ones of the second magnets to couple the rods to the deformable material.

22. The apparatus of claim 12, wherein the fluidic cartridge comprises a manifold, the manifold comprising apertures that are coupled adjacent respective ones of the chambers, wherein the pump drive assembly comprises a pressure source, the pressure source adapted to be fluidly coupled to the apertures of the manifold to change a pressure within the apertures and to cause the linear peristaltic pump to pump fluid from the reservoir to the flow cell.

23. The apparatus of claim 22, wherein the manifold comprises valves to control fluid flow through the respective apertures and wherein the system comprises a valve drive assembly, the controller coupled to the valve drive assembly, wherein the controller is adapted to cause the valve drive assembly to interface with the valves to cause the valves to selectively fluidly couple the apertures and the pressure source.

24. The apparatus of any of claims 12 to 14, wherein the pump drive assembly comprises a manifold and a pressure source, the manifold comprising apertures that are adapted to be coupled adjacent respective ones of the chambers, the pressure source adapted to be fluidly coupled to the apertures of the manifold to change a pressure within the apertures and to cause the linear peristaltic pump to pump fluid from the reservoir to the flow cell.

25. An apparatus, comprising:

a body comprising a surface having a mating surface and defining chambers, adjacent chambers being fluidically coupled by a corresponding fluidic line, each chamber has an inlet and an outlet formed as apertures through the surface, each inlet being vertically offset relative to a corresponding outlet; and

a deformable material coupled to the mating surface and covering the chambers,

wherein a distance between the inlet and the mating surface is less than a distance between the outlet and the mating surface, and

wherein the deformable material and the chambers form a linear peristaltic pump, wherein the deformable material covering each of the chambers is movable between a first position and a second position, in the first position, the deformable material sealingly engaging the inlet of a corresponding chamber, in the second position, the deformable material sealingly engaging the outlet of a corresponding chamber, and

wherein the fluidic line comprises a first fluidic-line portion and a second fluidic-line portion, the first fluidic-line portion being coupled to the outlet of a first one of the chambers and extending from the outlet toward the mating surface and the second fluidic-line portion being coupled to the first fluidic-line portion and to the inlet of a second one of the chambers.

26. The apparatus of claim 25, wherein the chambers are responsive to an interface of a pump drive assembly with the deformable material.

27. The apparatus of any of claims 25 or 26, wherein the chambers are concave and include apexes, the inlets being positioned adjacent the mating surface on a first side of the respective chambers and the outlets being positioned adjacent the apexes of the chambers on a second side of the respective chambers.

28. An apparatus, comprising:

a reagent cartridge, the reagent cartridge comprising:

a plurality of reagent reservoirs;

a plurality of dedicated fluidic lines, each of the reagent reservoirs being coupled to a corresponding dedicated fluidic line;

a flow cell;

a common fluidic line coupled to the flow cell and each of the dedicated fluidic lines;

a plurality of valves, each valve to control fluid flow between one of the dedicated fluidic lines and the common fluidic line;

a body including a surface forming depressions along each of the dedicated fluidic lines, each depression having a fluid inlet formed as an aperture through the surface and a fluid outlet formed as an aperture through the surface and being fluidly coupled to at least one other depression; and

a deformable material coupled to the surface of the body and including portions, each portion covering one of the depressions to define chambers,

wherein the portions of the deformable material are movable relative to the depressions between a first position outside of a dimensional envelope of the body and a second position within the dimensional envelope of the body,

wherein the surface of the body includes a mating surface to which the deformable material is coupled, wherein a distance between the inlet and the mating surface is less than a distance between the outlet and the mating surface,

wherein the chambers are coupled via a fluidic line having a first fluidic-line portion and a second fluidic-line portion, the first fluidic-line portion being coupled to the outlet of a first one of the chambers and extending from the outlet toward the mating surface and the second fluidic-line portion being coupled to the first fluidic-line portion and to the inlet of a second one of the chambers.

29. The apparatus of claim 28, wherein the reagent cartridge is receivable within a cartridge receptacle of a system.

30. The apparatus of any of claims 28 or 29, wherein the body comprises the plurality of reagent reservoirs.

31. The apparatus of any of claims 28 or 30, wherein the reagent cartridge comprises a flow cell receptacle, the flow cell disposable within the flow cell receptacle.

32. The apparatus of claim 28, wherein the fluid is a reagent and the reagent reservoir contains the reagent.

33. A method, comprising:

actuating one or more portions of a deformable material of a fluidic cartridge between a first position and a second position, each portion covering a depression to define a chamber and forming a portion of a linear peristaltic pump; and

generating a pulsatile flow through the fluidic cartridge in response to the actuation

wherein the fluidic cartridge comprises:

a plurality of reagent reservoirs;

a plurality of dedicated fluidic lines, each of the reagent reservoirs being coupled to a corresponding dedicated fluidic line;

a common fluidic line to be coupled to a flow cell and each of the dedicated fluidic lines;

a plurality of valves, each valve to control fluid flow between one of the dedicated fluidic lines and the common fluidic line;

a body including a surface forming depressions, each depression having a fluid inlet formed as an aperture through the surface, and a fluid outlet formed as an aperture through the surface and being fluidly coupled to at least one other depression; and

a deformable material coupled to the surface of the body and including portions, each portion covering one of the depressions to define chambers,

wherein the portions of the deformable material are movable relative to the depressions between a first position outside of a dimensional envelope of the body and a second position within the dimensional envelope of the body,

wherein the surface of the body includes a mating surface to which the deformable material is coupled, wherein a distance between the inlet and the mating surface is less than a distance between the outlet and the mating surface,

wherein the chambers are coupled via a fluidic line having a first fluidic-line portion and a second fluidic-line portion, the first fluidic-line portion being coupled to the outlet of a first one of the chambers and extending from the outlet toward the mating surface and the second fluidic-line portion being coupled to the first fluidic-line portion and to the inlet of a second one of the chambers.

34. The method of claim 33, wherein actuating each portion of the deformable material to the first position includes covering the inlet of the depression with the portion of the deformable material, and wherein actuating each portion of the deformable material to the second position includes covering the outlet of the depression with the portion of the deformable material.