Claims

1. A reagent fluid dispensing device, comprising:
a chamber for receiving a reagent fluid, the chamber having a first opening and a second opening;
a first fluid conduit connected to the first opening of the chamber;
a reservoir dimensionalized for storing a predetermined volume of the reagent fluid, and having a first opening and a second opening, wherein the first opening of the reservoir is connected to the first fluid conduit to form a passive valve and wherein the first fluid conduit extends upwardly away from the reservoir so that the reagent fluid flows from the reservoir to the first fluid conduit in an or partially in an upward direction against gravity;
a pneumatic conduit connected to the second opening of the chamber, wherein the pneumatic conduit extends upwardly away from the chamber and is connectable to a first pneumatic system, such that a first pneumatic pressure is applicable to the chamber by the first pneumatic system through the pneumatic conduit so that the predetermined volume of the reagent fluid is transferred from the reservoir to the chamber through the first fluid conduit; and
a second fluid conduit connected to the second opening of the reservoir to allow flow of the reagent fluid to the reservoir, wherein the second fluid conduit is connectable to a second pneumatic system, such that a second pneumatic pressure is applicable to the second fluid conduit so that the reagent fluid in the second fluid conduit by the second pneumatic system is flushed from the second fluid conduit while the predetermined volume of the reagent fluid is present in the reservoir.

2. The reagent fluid dispensing device of claim 1, wherein the second pneumatic pressure is applicable to the reagent fluid through the second fluid conduit so that the reagent fluid is transferred from the reservoir to the chamber through the first fluid conduit.

3. The reagent fluid dispensing device of claim 1, wherein the resultant of the first pneumatic pressure to the chamber through the pneumatic conduit and the second pneumatic pressure to the reagent fluid through the second fluid conduit is greater than the pressure required to transfer the reagent fluid through the passive valve.

4. The reagent fluid dispensing device of claim 1, wherein the passive valve has a cross-sectional area that is the same as or smaller than the cross-sectional area of the first fluid conduit.

5. The reagent fluid dispensing device of claim 4, wherein the ratio of the cross-sectional area of the passive valve to the cross-sectional area of the first fluid conduit is between about 1:1 and about 1:2500.

6. The reagent fluid dispensing device of claim 1, wherein the reservoir has a cross-sectional area that is greater than that the cross-sectional area of the passive valve, wherein the ratio of the cross-sectional area of the passive valve to the cross-sectional area of the reservoir is between about 1:4 and about 1:4000.

7. The reagent fluid dispensing device of claim 1, wherein the reservoir has a volume of between about 1 μl and about 50 μl.

8. The reagent fluid dispensing device of claim 1, wherein at least one of the first opening and the second opening of the chamber is at a level above a liquid level in the chamber.

9. The reagent fluid dispensing device of claim 1, wherein the chamber has wax formed on at least a portion of the interior wall of the chamber.

10. The reagent fluid dispensing device of claim 1, wherein at least a portion of the inner surface of the reagent fluid dispensing device is hydrophobic.

11. A micro-fluidic device comprising a plurality of reagent fluid dispensing devices arranged in fluid communication with each other, each reagent fluid dispensing device comprising:
a chamber for receiving a reagent fluid, the chamber having a first opening and a second opening;
a first fluid conduit connected to the first opening of the chamber;
a reservoir dimensionalized for storing a predetermined volume of the reagent fluid, and having a first opening and a second opening, wherein the first opening of the reservoir is connected to the first fluid conduit to form a passive valve, wherein the first fluid conduit extends upwardly away from the reservoir so that the reagent fluid flows from the reservoir to the first fluid conduit in an or partially in an upward direction against gravity;
a pneumatic conduit connected to the second opening of the chamber, wherein the pneumatic conduit extends upwardly away from the chamber and is connectable to a first pneumatic system, such that a first pneumatic pressure is applicable to the chamber by the first pneumatic

system through the pneumatic conduit so that the predetermined volume of the reagent fluid is transferred from the reservoir to the chamber through the first fluid conduit; and

a second fluid conduit connected to the second opening of the reservoir to allow flow of the reagent fluid to the reservoir, wherein the second fluid conduit is connectable to a second pneumatic system, such that a second pneumatic pressure is applicable to the second fluid conduit by the second pneumatic system so that the reagent fluid in the second fluid conduit is flushed from the second fluid conduit while the predetermined volume of the reagent fluid is present in the reservoir.

12. A method of dispensing a reagent fluid, the method comprising:

providing a reagent fluid dispensing device, comprising

a chamber for receiving a reagent fluid, the chamber having a first opening and a second opening,

a first fluid conduit connected to the first opening of the chamber,

a reservoir dimensionalized for storing a predetermined volume of the reagent fluid, and having a first opening and a second opening, wherein the first opening of the reservoir is connected to the first fluid conduit to form a passive valve, wherein the first fluid conduit extends upwardly away from the reservoir so that the reagent fluid flows from the reservoir to the first fluid conduit in an or partially in an upward direction against gravity,

a pneumatic conduit connected to the second opening of the chamber, wherein the pneumatic conduit extends upwardly away from the chamber and is connectable to a first pneumatic system, such that a first pneumatic pressure is applicable to the chamber by the first pneumatic system through the pneumatic conduit so that the predetermined volume of the reagent fluid from the reservoir is transferred to the chamber through the first fluid conduit; and

a second fluid conduit connected to the second opening of the reservoir to allow flow of the reagent fluid to the reservoir, wherein the second fluid conduit is connectable to a second pneumatic system, such that a second pneumatic pressure is applicable to the second fluid conduit by the second pneumatic system so the reagent fluid in the second fluid conduit is flushed from the second fluid conduit while the predetermined volume of the reagent fluid is present in the reservoir;

providing a reagent fluid in the reservoir; and

applying pneumatic pressure to the chamber through the pneumatic conduit to transfer the predetermined volume of the reagent fluid from the reservoir to the chamber through the first fluid conduit.

13. The method of claim 12, wherein providing the reagent fluid in the reservoir comprises allowing the reagent fluid to flow through the second fluid conduit to the reservoir.

14. The method of claim 13, further comprising flushing the second fluid conduit while the predetermined volume of the reagent fluid is contained substantially within the reservoir.

15. The method of claim 12, further comprising applying pneumatic pressure to the reagent fluid through the second fluid conduit to transfer the reagent fluid from the reservoir to the chamber through the first fluid conduit.

16. The method of claim 12, further comprising applying wax on at least a portion of the interior wall of the chamber.

17. The method of claim 16, wherein the wax is melted to form a layer of wax in the chamber prior to dispensing the reagent fluid in the chamber.