CLAIMS

1. A thermal cycler apparatus, comprising:

a peltier device;

an elastomeric adhesive on the peltier device;

a well block coupled to the peltier device; and

a heat sink coupled to the peltier device;

wherein at least one of the well block and the heat sink are coupled to the peltier device via the adhesive.

2. The thermal cycler apparatus of claim 1, wherein the well block is clamped to the heat sink.

3. The thermal cycler apparatus of claim 1, wherein the well block is not clamped to the heat sink.

4. The thermal cycler apparatus of claim 1, wherein the adhesive is located between the well block and the peltier plate.

5. The thermal cycler apparatus of claim 1, wherein the adhesive is located between the peltier plate and the heat sink.

6. The thermal cycler apparatus of claim 1, wherein the adhesive is located between the well block and the peltier, and wherein the adhesive is also located between the peltier and the heat sink.

7. The thermal cycler apparatus of claim 1, wherein the peltier device is coupled to the heat sink by the adhesive.

8. The thermal cycler apparatus of claim 1, wherein the peltier device is coupled to the heat sink by solder.

9. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the well block comprises a plurality of wells, wherein each well comprises a generally cylindrical portion located below a conical portion and a flat bottom portion, and wherein the flat bottom portion is perpendicular to the generally cylindrical portion.

10. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the elastomeric adhesive comprises a silicon-based compound.

11. The thermal cycler apparatus of ~~any of the preceding claims~~ claim 1, wherein the elastomeric adhesive retains the peltier device adjacent to at least one of the well block and the heat sink when the apparatus is turned upside down.

12. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the elastomeric adhesive is capable of cycling between a temperature at least as high as 95°C and at least as low as 60°C at least about 5,000 times, at least about 10,000 times, at least about 100,000 times, or at least about 200,000 times and still retain the heat sink when the apparatus is turned upside down.

13. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the elastomeric adhesive has elastomeric property of at least about 15%, between about 15% and about 1,000%, elongation, between about 35% and about 700%, between about 70% and about 500%, or between about 100% and about 200%.

14. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the elastomeric adhesive has an unprimed adhesion lap shear of between about 1 kgf/cm^2 and about 75 kgf/cm^2, over about 10 kgf/cm^2, between about 10 kgf/cm^2 and about 45 kgf/cm^2.

15. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the elastomeric adhesive has a viscosity of between about 1,000 centipoise and about 200,000 centipoise, between about 10,000 centipoise and about 150,000 centipoise, between about 20,000 centipoise and about 80,000 centipoise, or between about 30,000 centipoise and about 40,000 centipoise.

16. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the elastomeric adhesive has a thermal conductivity at 25°C/77°F of between about 0.7 Watt/meter-K and about 2.5 Watt/meter-K.

17. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein thermal cycler apparatus is provided in a housing, the housing further provided with an optics system.

18. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, wherein the thermal cycler apparatus is provided with a computing device for controlling the thermal cycler apparatus.

19. The thermal cycler apparatus of ~~any of the preceding claims~~claim 1, further provided with a robotics unit configured for loading samples into the thermal cycler apparatus.

20. A thermal cycler apparatus, comprising:

a well block comprising a plurality of wells, wherein each well comprises a generally cylindrical portion located below a conical portion and a flat bottom portion, ~~and~~ wherein the flat bottom portion is perpendicular to the cylindrical portion, and

wherein each individual well in the well block is configured to receive a sample well therein, wherein the sample well extends through the conical portion and into the cylindrical portion of the well;

a peltier device coupled to the well block; and,

a heat sink coupled to the peltier device.

21. The thermal cycler apparatus of claim 20, wherein the conical portion forms an angle of about 16° with the cylindrical portion.

22. The thermal cycler apparatus of claim 20, wherein a wall of the generally cylindrical portion forms an angle with the flat bottom portion, the angle being between 90° and 95°.

23. The thermal cycler apparatus of ~~claims 20-22~~ claim 20, wherein the flat bottom portion contacts the peltier device.

24. The thermal cycler apparatus of ~~claims 20-23~~claim 20, wherein the wells are each configured such that a conical sample well placed in each well cannot contact the flat bottom portion of the well.

25. The thermal cycler apparatus of ~~claims 20-24~~claim 20, wherein the wells are each configured such when a conical sample well, comprising a conical portion, is placed in each well, the conical portion of the sample well contacts the conical portion of the well.

26. The thermal cycler apparatus of ~~claims 20-25~~claim 20, wherein each flat bottom portion is coupled to a base plate.

27. The thermal cycler apparatus of claim 20, further comprising a plurality of peltier devices, wherein a predetermined number of wells are coupled to each peltier device to form a predetermined number of thermal zones in the well block.

28. The thermal cycler apparatus of ~~claims 20-27~~claim 20, further comprising a first base plate coupled to a first pair of wells that are adjacent to each other, via the flat bottom portions of the wells, such that heat transferred to the first base plate is then transferred to the first pair of wells.

29. The thermal cycler apparatus of claim~~s~~ 28, further comprising a second base plate coupled to a second pair of wells that are adjacent to each other, via the flat bottom portions of the wells, wherein the first and second base plates are paired on the peltier device such that heat is transferred from the peltier device via the first and second base plates to a set of four wells comprising the first and second pair of wells.

30. The thermal cycler apparatus of claim 29, wherein the first base plate and the second base plate are separated from each other by a space through which wires extending from the peltier plate may extend.

31. ~~A~~The thermal cycler apparatus of claim 1, wherein the peltier device is coupled to the well block by solder. ~~comprising:~~

~~a well block; and,~~

~~a peltier device, wherein the well block is soldered directly to the peltier device; and,~~

~~a heat sink coupled to the peltier device.~~

32. A thermal cycler apparatus, comprising:

a heat sink;

a plurality of peltier devices over the heat sink;

a pair of first and second base plates over each peltier device;

a well block comprising a plurality of 4-well zones,

wherein each 4-well zone comprises a first pair of wells and a second pair of wells;

wherein each first pair of wells and each second pair of wells are respectively over the first base plate and the second base plate such that one peltier device provides for heat transfer for one 4-well zone.

33. The thermal cycler apparatus of claim 32, wherein the plurality of peltier devices comprises at least 24 individually driven peltiers.

34. The thermal cycler apparatus of claim 33, wherein each of the individually driven peltiers has a heat directing element that is connected to a printed circuit, wherein the printed circuit is connected to a resistance temperature detector.

~~35. A method for cycling a sample, comprising:~~

~~obtaining a sample plate with top surface and a plurality of sample wells;~~

~~obtaining a thermal cycler apparatus comprising a well block, wherein the well block comprises a plurality of wells;~~

~~placing the sample wells in the wells of the well block; and~~

~~placing a volume of a sample in at least one of the sample wells such that the sample is about level with the top surface of the sample plate.~~

~~36. The method of claim 35,~~

~~wherein each sample well has an average depth ranging from about 0.5 inches to about 0.6 inches; and~~

~~wherein the well block comprises a plurality of wells, wherein each well has an average depth of about 0.3 inches.~~

~~37~~35. A thermal cycler apparatus, comprising:

a heat sink;

a plurality of peltier devices thermally coupled to the heat sink;

a well block comprising a plurality of zones, each zone thermally coupled to its respective peltier device and each zone comprising one or more wells;

wherein each peltier device is individually driven to provide temperature uniformity to the wells.

~~38~~36. The thermal cycler apparatus of claim ~~37~~35, wherein each zone comprises 4 wells.

~~39~~37. A method of manufacturing a well block assembly comprising:

providing a well block having a top surface with a plurality of wells extending therefrom, the wells arranged in rows, each well having a bottom surface,

attaching a precursor base plate sheet to the bottom surface of the wells, and

removing portions of the precursor base plate sheet to form channels between rows of wells,

wherein each channel is configured to allow wires from the plurality of peltiers to extend therethrough.

~~40~~38. The well block assembly of claim ~~39~~37, wherein the bottom surface of the wells is a flat bottom.

~~41~~39. The well block assembly of claim ~~39~~37, wherein the portions of the precursor base plate sheet are removed by a method selected from the group consisting of machining, punching, stamping, and dicing.