Claims:

1. A fluid phase change thermal management cooling method for removing heat from a source of heat, the method comprising the steps of:

A. filling a cooling chamber with volume V1 of a fluid phase change thermal management cooling apparatus with a fluid in its liquid phase;

B. increasing the volume of the cooling chamber to volume V2 to vapourise a portion of the fluid from its liquid phase to its vapour phase such that there is substantially only the fluid in its liquid phase and fluid in its vapour phase within the volume V2;

C. allowing a dwell time that provides for at least some of the fluid in its liquid phase that has contact with a heated surface of the cooling chamber to be vaporised; and

D. repeating the steps A to C where timing of the steps and dwell time between steps is selected to control heat build-up within selected limits.

2. A fluid phase change thermal management method for removing heat from an article, the method including the steps of providing a coolant fluid in a closed path in a cooling chamber, increasing a volume within the closed path from V1 to V2 using a pressure control means to vapourise a portion of the coolant fluid from its liquid phase to its vapour phase such that there is substantially only the fluid in its liquid phase and fluid in its vapour phase within the volume V2 allowing at least partial vaporisation of the coolant fluid in its liquid phase to its vapour phase, the coolant vapour so produced then flowing to a condensation zone and then activating the pressure control means to reduce the volume of the cooling chamber from V2 to V1 and thereby cause at least a partial increase in the pressure in the closed path so as to force out or condense any remaining coolant that is in the gaseous phase thereby filling all spaces within the cooling chamber with coolant in its liquid phase and the pressure control means operates to alternate between increasing partially the pressure in the closed path and decreasing at least partially the pressure in the closed path, thus causing at least a portion of the coolant to transform from its vapour phase to a liquid phase in a condensation zone of the cooling chamber.

3. The fluid phase change thermal management method of claim 2, wherein the pressure control means is a pressure pump.

4. The fluid phase change thermal management method of claim 3, wherein the pressure control means includes piston pump with a main piston pump housing in fluid communication with the cooling chamber.

5. The fluid phase change thermal management method of claim 4, wherein the main piston pump housing is fluidly connected to the cooling chamber by a conduit.

6. The fluid phase change thermal management method of claim 5, wherein the conduit is a flexible conduit.

7. The fluid phase change thermal management method of claim 4, wherein the piston pump is movably operated by an actuating device, for example a linear actuating device.

8. The fluid phase change thermal management method of claim 4, wherein a biasing means is operatively attached to the pressure control means to apply a downward force (pressure P1) to the coolant fluid.

9. The fluid phase change thermal management method claim 2, wherein operation of the pressure control means increases the volume of the cooling chamber to lower the pressure on the coolant fluid to P2.

10. The fluid phase change thermal management method of claims 1 or 2, wherein the cooling chamber forms a closed system.

11. The fluid phase change thermal management method of any one of above claims 1-10, wherein the coolant is selected from at least one of the group of coolants selected from water, hydro carbon based coolant or mixtures thereof, or specialised fluids that are safe to use in electronic circuits.

12. The fluid phase change thermal management method of any one of above claims 1-11, wherein the pressure control means is connectable to an external power source.

13. The fluid phase change thermal management method of any one of above claims 2-12, wherein the condensation zone includes a condenser suitable to condense the coolant vapour.

14. The fluid phase change thermal management method of claim 13, wherein the condenser is separate to the cooling chamber and in fluid connection thereto.

15. The fluid phase change thermal management method of any one of the above claims 2-14, wherein the article is selected from the group consisting of: computer chip, motherboard, CPU or other associated computer electronic article, heat generating engine, moulding apparatus.

16. A fluid phase change thermal management apparatus including:

a pressure control means;

a condenser;

a cooling chamber in fluid communication with the pressure control means and the condenser;

liquid coolant filling substantially the cooling chamber;

the pressure control means operable to effect a change in pressure on the liquid coolant fluid within the cooling chamber from a first pressure P1 to a second pressure P2 and cause a portion of the liquid coolant to vapourise.

17. The fluid phase change thermal management apparatus of claim 16, wherein the pressure control means is a pressure pump.

18. The fluid phase change thermal management apparatus of claim 17, wherein the pressure pump is a piston pump.

19. The fluid phase change thermal management apparatus of claim 18, wherein the piston pump has a piston head that is movably operated by an actuating device, for example a linear actuating device.

20. The fluid phase change thermal management apparatus of claim 16 used with the method of any one of claims 1-15