Claims

1. A refrigerator having:

a) a payload container within which items can be placed for temperature-controlled storage;

b) a reservoir within which water is contained in use, the reservoir having:

i) a cooling region in thermal communication with the payload container and~~, the reservoir including~~

ii) a headspace disposed entirely above the payload container and the cooling region and in fluid communication therewith~~containing water that is, in use, higher than the payload container~~; and

c) cooling means disposed in~~that can cool water within~~ the headspace for cooling water therein;

wherein the arrangement is such that, in use, water at a temperature of maximum density is permitted to sink from the headspace into the cooling region thereby to cool the payload container towards said temperature.

2. A refrigerator having:

a) a payload container within which items can be placed for temperature-controlled storage;

b) a reservoir within which water is contained in use, the reservoir having:

i) a cooling region in thermal communication with the payload container; and

ii) a headspace disposed entirely above the payload container and the cooling region and in fluid communication therewith;

wherein the headspace is configured to permit cooling means comprising an ice pack or a body of water ice to be disposed therein for cooling water within the headspace; and

wherein the arrangement is such that, in use, water at a temperature of maximum density is permitted to sink from the headspace into the cooling region thereby to cool the payload container towards said temperature.

32. A refrigerator according to claim 1 or claim 2 in which the cooling means includes a refrigeration unit.

43. A refrigerator according to claim 32 further comprising a power supply that can act as a source of power for the refrigeration unit.

54. A refrigerator according to claim 43 in which the power supply includes means for converting sunlight into electrical power.

65. A refrigerator according to claim 54 in which the means for converting sunlight into electrical power includes a plurality of photovoltaic cells.

76. A refrigerator according to any one of claims 43 to 65 in which the power supply derives power from an external power source.

87. A refrigerator according to claim 43 in which the external power source is mains voltage.

98. A refrigerator according to any one of claims 32 to 87 in which the refrigeration unit includes an electrically-powered compressor.

109. A refrigerator according to any one of claims 32 to 87 in which the refrigeration unit includes a Stirling cooler.

1110. A refrigerator according to claim 109 in which the Stirling cooler operates in solar direct drive mode.

1211. A refrigerator according to any precedingone of claims 2 to 10 further comprising a sensor disposed to detect the formation of ice in the reservoir.

1312. A refrigerator according to claim 1211 in which the sensor is operative to cause operation of the refrigeration unit to be interrupted upon detection of the formation of ice.

1413. A refrigerator according to any preceding claim in which the cooling means includes a thermal mass that, for use, is at a temperature below a target temperature of the payload space.

1514. A refrigerator according to claim 1413 in which the thermal mass is a body of water ice.

1615. A refrigerator according to claim 1413 or claim 1514 that includes a compartment for receiving the thermal mass.

1716. A refrigerator according to claim 1413 or claim 1514 in which the thermal mass is immersed in water within the headspace.

1817. A refrigerator according to claim 1615 or claim 17 in which the thermal mass is an ice pack.

1918. A refrigerator according to any preceding claim in which the payload space is within the cooling region.

2019. A refrigerator according to claim 1918 in which the payload space is submerged within the cooling region.

2120. A refrigerator according to any one of claims 1 to 1817 in which the cooling region is contained within the payload space.

2221. A refrigerator according to claim 2120 in which the cooling region includes one or more water-carrying passages that extend through the payload space.

2322. A refrigerator according to any preceding claim in which the headspace is located, in use, directly above the payload container.

2423. A refrigerator according to claim 2322 in which the payload container includes an opening and a closure located on one side of the payload container when the refrigerator is in use.

2524. A refrigerator according to any one of claims 1 to 2221 in which the headspace is located, in use, to one side of the payload container.

2625. A refrigerator according to claim 2524 in which the payload container includes an opening and a closure located on top of the payload container when the refrigerator is in use.

2726. A refrigerator according to claim 2625 in which the closure is an insulated door carried on the reservoir.

2827. A refrigerator according to any preceding claim in which a payload space within the payload container is in close thermal communication with the water in the reservoir.

2928. A refrigerator according to any preceding claim in which the reservoir is insulated to minimise transfer of heat between water within the reservoir and surroundings of the refrigerator.

3029. A refrigerator according to any preceding claim that further includes a freezer compartment.

3130. A refrigerator according to claim 3029 in which the freezer compartment is in close thermal communication with the cooling means.

3231. A refrigerator according to claim 3029 or claim 3130 in which the freezer compartment has an opening that is closed by an insulated door.

3332. A refrigerator according to any one of claims 3029 to 3231 in which the insulated door also closes the payload container.

3433. A refrigerator according to any preceding claim comprising an outer case within which is contained a water-containing liner.

3534. A refrigerator according to claim 3433 in which the liner is formed of a flexible plastics material.

3635. A refrigerator according to claim 3433 or claim 3534 in which the outer case provides structural strength and thermal insulation for the refrigerator.