CLAIMS:

1. A protective vest comprising:

a front panel to cover substantially a torso region of a user;

a back panel substantially matching the front cover;

two shoulder straps;

two or more side straps to adjustably connect the front and back panels to fit the protective vest on a user;

a cold spreader and a hot spreader attached to the front panel or the back panel or to both the front and back panels such that part of the attachment at each of the front or back panel has a vent or a plurality of vents leading to a space in between the cold and hot spreaders;

a thermoelectric module (TEM) with a cold junction being mounted on the cold spreader whilst a hot junction is mounted on the hot spreader; and

a thermal insulation separating the cold spreader from parts associated with the hot junction, wherein the thermal insulation is sculptured to form plenums through which air in contact with the parts associated with the hot junction is moved by a blower and exhausted through the vent or plurality of vents.

2. The protective vest according to claim 1, further comprising a heat pipe, with a proximal end of the heat pipe being connected to the hot junction and a distal end is connected to a heat sink.

3. The protective vest according to claim 2, wherein the hot junction, heat pipe, heat sink and blower are disposed in the plenums.

4. The protective vest according to claim 2, wherein the heat pipe, heat sink and blower have a thermal heat dissipation power twice the power generated at the hot junction.

5. The protective vest according to claim 2, further comprising a micro-controller, a micro-climate temperature sensor disposed inside the protective vest, a body temperature sensor and an ambient temperature sensor.

6. The protective vest according to claim 5, wherein the TEM is operated by pulse width modulation (PWM) signal from the micro-controller and by an adaptive control algorithm.

7. The protective vest according to claim 6, wherein the adaptive control algorithm is operated to adjust the duty cycle and rate of cooling of the TEM, speed of the blower or sequence of operation.

8. The protective vest according to any one of the preceding claims is used together with a uniform with materials of the uniform incorporating passive cooling mechanisms.

9. A vest system for a security or military personnel comprising:

a protective vest with active cooling mechanisms according to any one of claims 1-7; and

a uniform having passive cooling mechanisms incorporated into materials of the uniform.

10. The vest system according to claim 9, wherein the passive cooling mechanisms comprise thermal conductive threads interspersed with base materials of the uniform.

11. A method for transmitting cool energy from a thermoelectric module constituted in a protective vest according to any one of claims 1-8, the method comprising:

attaching a cold junction of the thermoelectric module onto a cool spreader;

disposing the cold spreader onto a uniform of a personnel wearing the protective vest ; and

wetting part of the uniform with sweat from the personnel and allowing the part of the uniform materials to expand cyclically, thereby giving rise to cyclic regenerative cooling at the uniform.

12. A method for transmitting warm energy from a thermoelectric module constituted in a protective vest according to any one of claims 1-8, the method comprising:

attaching a hot junction of the thermoelectric module onto a hot spreader;

disposing the hot spreader onto a uniform of a personnel wearing the protective vest; and

wetting part of the uniform with sweat from the personnel and allowing the part of the uniform materials to expand cyclically, thereby giving rise to cyclic regenerative heat transfer at the uniform.