CLAIMS

1. A smart socket device comprising:

a socket arranged to receive an electrical plug of an electrical appliance;

a mains current connector for connection to a mains current supply cable;

a PCB comprising a conductor arranged such that current flows through the conductor between the mains current connector and the electrical plug during use;

a thermal sensor arranged to detect a change in temperature of the conductor of the PCB;

a processor in communication with the thermal sensor, the processor configured to determine when the sensed temperature of the conductor of the PCB displays behaviour indicative of a potential electrical hazard;

a communications link configured to communicate with a remote device.

2. The smart socket device of claim 1 wherein the thermal sensor is configured to provide a contactless measurement of the temperature of the conductor of the PCB during use.

3. The smart socket device of claim 1 or claim 2 wherein the processor is configured to determine when the sensed temperature of the conductor exceeds a predetermined threshold.

4. The smart socket device of any preceding wherein the thermal sensor is an infrared sensor.

5. The smart socket device of any preceding claim comprising:

a first PCB, wherein the conductor is provided on the first PCB; and

a second PCB comprising the thermal sensor, wherein the second PCB is arranged adjacent to the first PCB.

6. The smart socket device of claim 5 wherein the first PCB comprises a relay for disconnecting the supply of mains power to an appliance plugged into the socket.

7. The smart socket device of claim 5 or claim 6 wherein the first PCB comprises a current sensor for measuring the current conducted through the conductor.

8. The smart socket device of any preceding claim where the conductor comprises a conductive track running across a face of the PCB, wherein the thermal sensor is arranged so as to be facing the conductive track.

9. The smart socket device of claim 8 comprising:

a first PCB, wherein the conductive track is positioned on a face of the first PCB; and

a second PCB comprising the thermal sensor, wherein the first and second PCBs are arranged such that the thermal sensor of the second PCB faces the conductive track on the first PCB.

10. The smart socket device of claim 9 wherein the first PCB is arranged between the socket and the second PCB, the first PCB comprising a first face that faces the socket and a second, opposing, face that faces the second PCB, where the conductive track is positioned on the second face.

11. The smart socket device of any preceding claim wherein the conductor comprises a connector arranged to contact a pin of the electrical plug when received in the socket.

12. The smart socket device of any preceding claim wherein the socket is configured to receive a plug comprising a live pin and a neutral pin, wherein the PCB comprises:

a live conductor arranged to conduct current between a live mains wire and the live pin; and

a neutral conductor arranged to conduct current between a mains neutral wire and the neutral pin;

wherein the thermal sensor is arranged to measure the temperature of the live conductor and/or the neutral conductor.

13. The smart socket device of claim 12 comprising a first thermal sensor arranged to measure the temperature of the live conductor and a second thermal sensor arranged to measure the temperature of the neutral conductor.

14. The smart socket device of any preceding claim comprising an ambient temperature sensor configured to measure the ambient temperature in the vicinity of the smart socket device.

15. The smart socket device of any preceding claim further comprising a relay configured to connect and disconnect the electrical plug from the mains current connector; wherein the processor is configured to control the relay in response to one or more of:

receiving, via the communications link, an instruction from a remote device;

the sensed surface temperature exceeding a threshold;

data from a programmable timer within the smart socket device.

16. The smart socket device of any preceding claim further comprising a current sensor arranged to detect the current passing through the conductor of the PCB, wherein the processor is configured to determine the presence of an electrical fault based on the combination of data received from the current sensor and data received from the thermal sensor.

17. The smart socket device of any preceding claim wherein the processor is configured to determine when the rate of change of the sensed temperature displays a particular behaviour.

18. An electrical safety system comprising:

a smart socket device according to any preceding claim; and

one or more remote devices; wherein the smart socket device is configured to send a signal to the remote device using the communications link when the processor determines that the surface temperature of the conductor of the PCB has exceeded the predetermined threshold.

19. The electrical safety system of claim 18 wherein the electrical system comprises one or more smart socket devices and one or more remote devices, wherein the smart socket devices and remote devices form a mesh network in which the smart socket devices and remote devices can communicate.

20. The electrical safety system of claim 19 wherein the smart socket devices and remote devices are configured to communicate according to the OpenThread network protocol.

21. The electrical safety system of any of claims 18 to 20 wherein at least one remote device comprises a smart user device and the smart user device is configured to provide an audio or visual alert after receiving a signal from the smart socket device.

22. The electrical safety system of any of claims 18 to 21 wherein at least one remote device comprises a dynamic sign comprising a configurable display, wherein the dynamic sign is configured to receive a signal from a smart socket and display information on the configurable display in response.

23. The electrical safety system of any of claims 18 to 22 wherein at least one remote device comprises an isolation unit comprising a communications link; wherein the isolation unit is configured to restrict a flow of water, gas or electricity through the isolation unit upon receiving a signal from the smart socket device.

24. The electrical safety system of any of claim 23 wherein at least one remote device comprises a smart user device and the smart user device is configured to send a signal to the isolation unit to remotely control the isolation unit after receiving a signal from a smart socket device.