OVERHEAT PROTECTION SYSTEM

Field of the Invention

The invention relates to overheat protection systems for water heating systems, and especially for thermal stores.

Background

With an increasing desire to reduce the use of fossil fuels, and to make most efficient use of other energy sources, heating and hot water systems are being developed to capture energy from a range of sources. For example, high-efficiency but relatively low output gas-fuelled devices such as gas boilers may be run effectively continuously to provide heat that can be stored in a thermal store, such a large tank of water. Such thermal stores may then be used to provide space heating, or hot water, as desired. One such system is described on our co-pending UK patent applications GB0815197.9 and GB0821969.3.

If the heat from the thermal store is not used, then the boiler can be switched off automatically, to prevent the temperature in the thermal store exceeding a safe level. For water-based thermal stores, and especially of the unvented variety, it is clear that the water needs to be held below boiling point, to prevent unwanted steam production with all

the safety issues that would result, especially in a domestic environment. Relatively conventional control systems may be employed to meet this need. Furthermore, in the event of electrical power failure, gas boilers are usually designed to switch off, thereby removing a potentially hazardous heat input from the thermal store – the systems essentially "fail-safe" in the event of an electrical power outage.

For even more efficiency, and less reliance of fossil fuels, the heat input to such a thermal store may be provided by e.g. a wood-burning stove, or by a passive solar collector. In these cases, it is again possible to provide an electrically-powered control system to isolate the heat source from the thermal store to provide the required degree of overheat protection. However, such a system is not immune to electrical power failure, with the result that overheat protection cannot be guaranteed.

As a result, passive overheat protection systems may be used. In a typical installation, a bypass radiator is provided, and arranged to be gravity-fed from the thermal store. In this way, excess heat from the thermal store may be dissipated. Figure 1 illustrates, in schematic view, such a system. In the system, a heat source 1, such as a wood burning stove, or a solar-collector, generates or collects heat, and delivers it to a thermal store 2 by means of heat supply 3 and return 4 pipelines. The thermal store 2 is illustrated without its other connections, for sake of clarity. A bypass radiator 5 is also provided, gravity fed with hot water from the thermal store 2 by means of radiator feed 6 and return 7 pipelines. It is practically essential in this configuration that the radiator is arranged to be gravity-fed, to ensure that the system is immune from power outages. However, as a consequence, there is always heat dissipation from the radiator, not only wasting heat when overheat protection is not in action, but also leading to an uncomfortable environment for the user of the system. As a result, users would have the tendency to attempt to isolate the radiator 5 from the system (to prevent too high a room temperature), thereby disabling the overheat protection function.

It is amongst the objects of the present invention to propose a solution to this problem.

Summary of the Invention

Accordingly, the invention provides an overheat protection system for a thermal store comprising: a heat exchange unit, in thermal connection with said thermal store; a connection for cold water input to said heat exchange unit; a thermostatic valve assembly arranged to allow cold water into said heat exchange unit when the temperature of said thermal store exceeds a pre-selected temperature; and means to discharge water from said heat exchange unit.

In this way, heat is withdrawn from the thermal store, and taken e.g. to waste only when the overheat protection system needs to operate. By arranging the system in this way, energy is conserved, and end users do not have to tolerate the presence of an unwanted bypass radiator.

Preferably, said heat exchange unit comprises a coil, located within the thermal store. The inventors have found that tubular copper, or stainless steel coils perform adequately.

Preferably also, in such a system, said cold water comprises mains water. Although it is possible to use cold water from e.g. a header tank, the use of mains pressure cold water ensures that there is always an adequate supply of water to provide emergency cooling. Also, with mains water supply, the flow rate of water through the cooling coil is significantly higher than would usually be achieved from a header tank, leading to greater heat exchange efficiency.

Preferably also, in any such system, said thermostatic valve assembly requires no power. Whist it would be possible to implement the system with a mains electricity, or battery-powered thermostatic valve, the use of a "passive", mechanical thermostat valve is preferred, as this makes the system more immune to power or battery failures.

Also included within the scope of the invention is a thermal store (e.g. in the form of a tank) for use with an overheat protection system according to any preceding claim, comprising a port, so sized as to receive a heat exchange unit. Preferably said port

comprises a 2.25inch BSP female connection. More preferably, said store comprises two such connections, and most preferably said store comprises three such connections, as will be discussed below. By these means, such an overheat protection system can be retro-fitted to a thermal store not initially having such a means when required, such as following the installation of a solar panel, or wood-burning stove, without having to replace the tank.

Also included within the scope of the invention is a method of providing overheat protection to a thermal store, comprising the step of fitting a heat exchange unit in thermal connection to said thermal store, and providing a thermostatically controlled source of cold water to said heat exchange unit.

Also included within the scope of the invention is an overheat protection system, a thermal store, and a method of providing overheat protection to a thermal store substantially as described herein, with reference to, and as illustrated by Figure 2 of the accompanying drawings.

Brief Description of the Drawings

The invention (and the prior art) will be described with reference to the accompanying drawings, in which:

Figure 1 illustrates an overheat protection system of the prior art; and
Figure 2 illustrates, schematically, an overheat protection system of the present invention.

Description of Preferred Embodiments

Figure 2 illustrates, in schematic view, thermal storage arrangement comprising an overheat protection system according to the present invention. A heat source 1, and especially a relatively uncontrollable heat source such as a wood burning stove, or a solar collector, generates or collects heat, and delivers it to a thermal store 2 by means of heat supply 3 and return 4 pipelines. The thermal store 2 is again illustrated without its other

connections, for sake of clarity. A heat exchanger 8, in the form of a coiled tube, is located within the body of the thermal store 2. A mains water feed 9 is connected to the heat exchanger coil 8 via a valve 10. The valve 10 is of the thermostatic type, controlled by a temperature-sensing connection 11 to the contents of the thermal store 2. The thermostatic valve assembly 10, 11 is arranged to open the valve when the temperature within the thermal store exceeds 95°C, thereby allowing the cold water to flow into the coil. Upon leaving the coil, the water passes through a discharge pipe 12 to a safe location, e.g. to be discharged to a drain.

In this embodiment, the thermal protection unit comprising the coil 8, and thermostatic valve assembly 10, 11 is arranged on a boss 13 that may be fitted to a thermal store cylinder though an appropriately sized and threaded port. The inventors have found that a heat exchange coil assembly using a copper coil mounted on a 2.25 inch BSP connector (as conventionally used for electric immersion heaters) may be conveniently used in such as system, and can provide, in some embodiments as much as 25kW of heat dissipation when used with a cold water feed at 10°C with a thermostatic valve setting of 95°C.

Accordingly in preferred embodiments of a thermal store, the tank providing the thermal storage is fitted with two 2.25 inch BSP female connectors (for the overheat protection system and for a heat input unit such as an immersion heater or solar panel feed). More preferably, the tank is fitted with three such connectors, to provide the ability to fit two heat input sources, in addition to the overheat protection coil.

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Amended claims 2 September 2011

CLAIMS

1. An overheat protection system when used with a thermal store, the system comprising:

a heat exchange unit, in thermal connection with said thermal store;

a connection for cold water input to said heat exchange unit;

a thermostatic valve assembly arranged to allow cold water into said heat exchange unit when the temperature of said thermal store exceeds a pre-selected temperature; and

means to discharge water from said heat exchange unit.

2. A system according to claim 1 wherein said heat exchange unit comprises a coil, located within the thermal store.

3. A system according to either claim 1 or claim 2 wherein said cold water comprises mains water.

4. A system according to any preceding claim wherein said thermostatic valve assembly requires no power.

5. A method of providing overheat protection to a thermal store, comprising the step of fitting a heat exchange unit in thermal connection to said thermal store, and providing a thermostatically controlled source of cold water to said heat exchange unit.

6. An overheat protection system substantially as described herein, with reference to, and as illustrated by Figure 2 of the accompanying drawings.

7. A method of providing overheat protection to a thermal store substantially as described herein, with reference to, and as illustrated by Figure 2 of the accompanying drawings.

ABSTRACT

Overheat Protection System

An overheat protection system for a thermal store having a heat exchange unit, in thermal connection with the thermal store; a connection for cold water input to the heat exchange unit; a thermostatic valve assembly arranged to allow cold water into the heat exchange unit when the temperature of said thermal store exceed a pre-selected temperature; and means to discharge water from the heat exchange unit.

Figure 2 should accompany the abstract

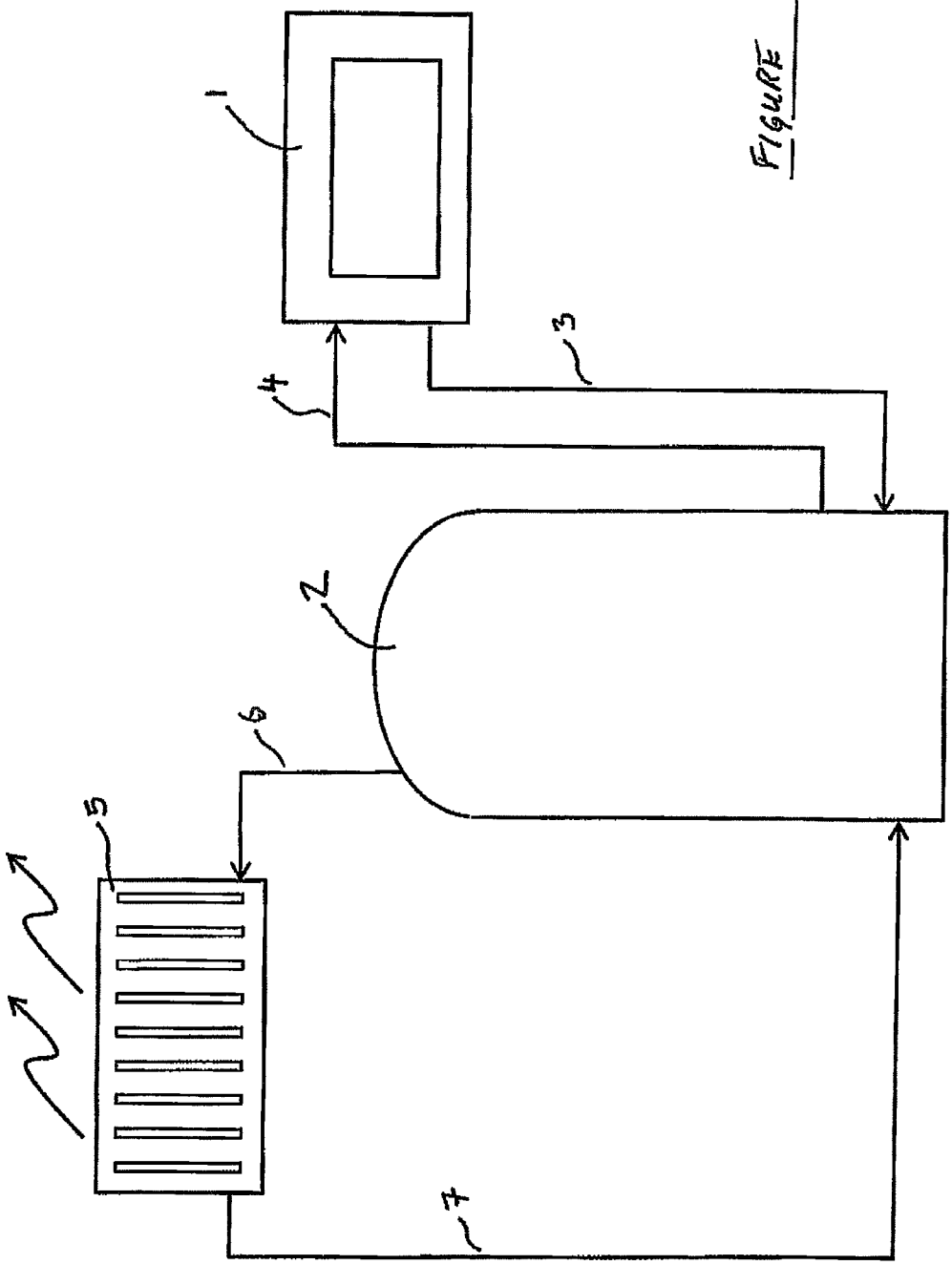


FIGURE 1

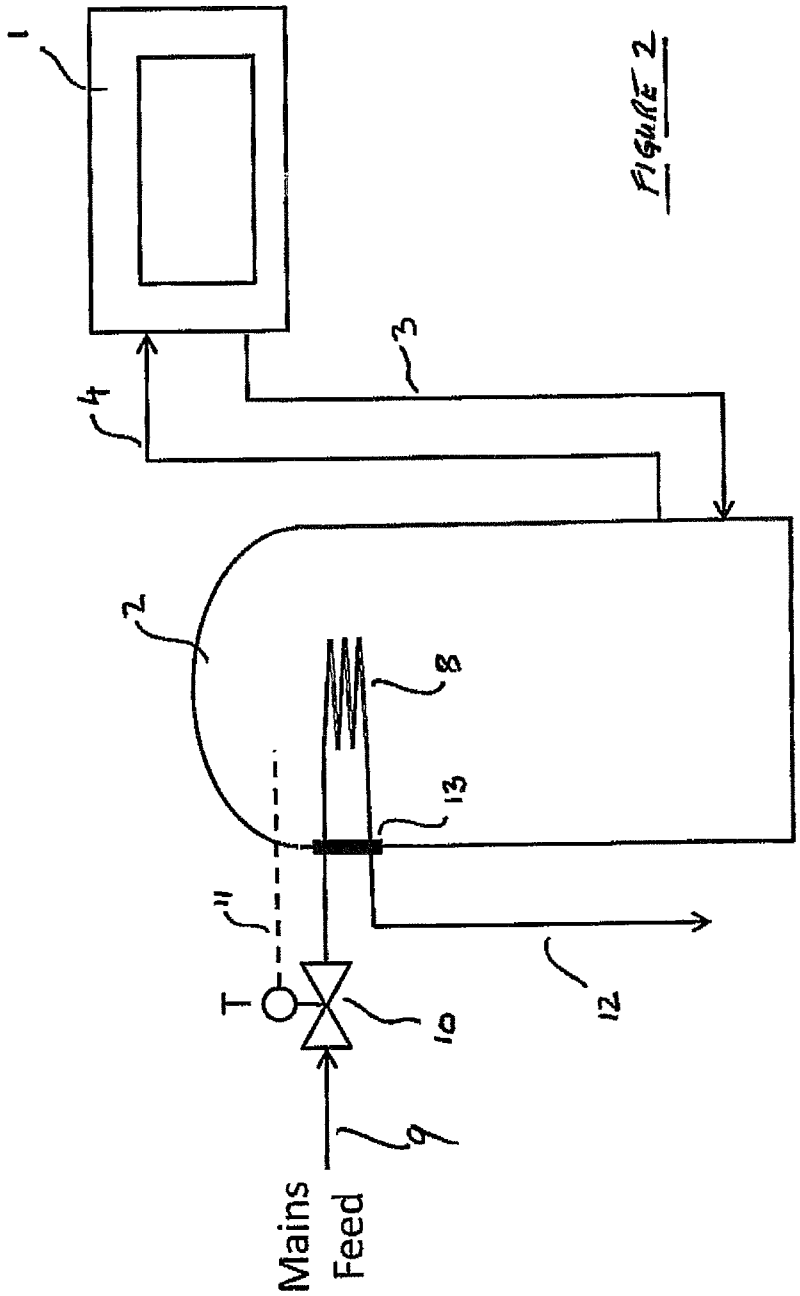


FIGURE 2