# Pump Control for Hot Water Stores using External Heat Exchanger for recovery.

Unique Principle: The use of a heating element (10) fitted into the upper part of a hot water store, whereby the heat generated by the element is moved down the store by activating the pump (3), so that varying quantities of hot water can be heated.

The system is a refinement to the method of using a plate heat exchanger (2) to heat up a body of water (1) (either a tank fed hot water cylinder, an unvented cylinder, or a thermal store). When heating the store from a seperate boiler, cold water (8) is drawn from the base of the hot water store, via pipe (6), and pumped through a plate heat exchanger (2) where it is heated before returning hot to the top of the store (9) via pipe (7). The heat for this is provided from a seperate boiler, with hot water supplied to the heat exchanger (2) from the boiler (4). This water gives up its heat to the stored water and returns to the boiler cooler (5).

This patent improves on this by adding an electric element (10) fitted into the top of the store that can be used as an alternative (or additional) source of heat to the remote boiler.

When only small quantites of hot water are required, the heating element (10) may be used on its own. The element is controlled using a thermostat (11) that cuts power to the element when target temperatures are achieved. As heat rises from heating elements, only the upper section of the store will be heated using this means.

If it is desired to heat up further quantities of the store using the electric element, then a thermostat (12) is used to turn on/off the pump (3). The thermostat (12) is set to a lower temperature than thermostat (11). As the temperature in the top of the store exceeds the setting on thermostat (12), the pump is turned on, bringing cold water from the base of the store (8) and circulating this into the top of the store (9). This water will be colder than the water in the top of the store and as such will mix and reduce the temperature of water in the upper part of the store, preventing water temperatures from increasing further. As the pump pulls water from the base of the store, the section of heated water at the top of the store moves down.

If the temperature of the water in the top of the store surrounding until thermostat (12) drops below the setting on thermostat (12), the pump (3) will be turned off, ensuring that temperatures in the top of the store are maintained.

In order to control accurately the volume of water to be heated, additional thermostats (13,14) may be fitted at varying points in the store. Once the volume of heated water at the top of the store has moved down the store to reach the desired thermostat (13 or 14) then the power to the electric element and pump can be turned off.

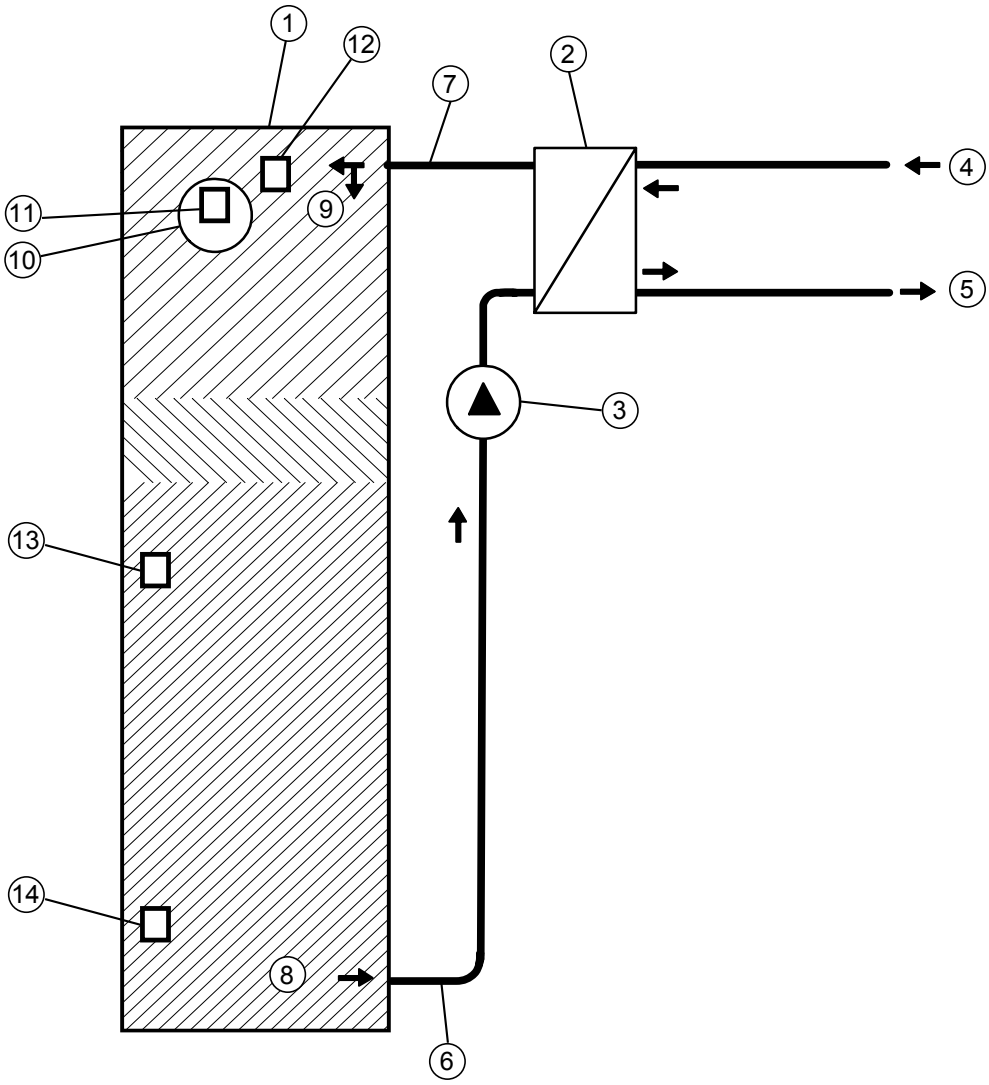
A simplified form of control may not use thermostats (13 or 14) but instead run the electric element for a set period of time.

The plate heat exchanger (3) may be a tube-in-tube heat exchanger or any other type of heat exchanger that employs active heat transfer.

The pump may be activated via other means for other functions not descibed here in detail.

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