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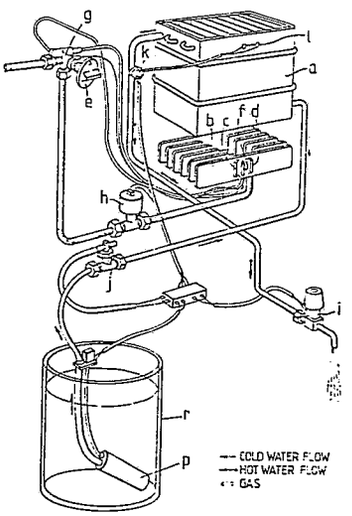
(54) Water heaters.

(57) A gas water heater incorporating a valve (h) for controlling the flow of gas to a burner (b) which is arranged to heat a heat exchanger (a) through which the water is fed, and monitoring means for causing the valve to close when the rate of flow of water through the heat exchanger falls below a predetermined value.



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Description

Water Heaters

This invention relates to water heaters fuelled by gas.

In conventional instantaneous water heaters, a combined water and gas valve is used to control the output. These valves have the disadvantages of being expensive and also of being dependent on the water pressure being high enough to raise the gas valve. In situations where the water pressure is low, the water heaters are therefore unable to operate. Storage water heaters have a very limited capacity so that either insufficient hot water is available or there are long delays whilst the water in the storage heater returns to the required temperature.

It is an object of this invention to provide a water heater in which some of the defects of presently known heaters are overcome.

According to the invention, a water heater comprises a heat exchanger into which water is arranged to be fed from an inlet pipe, a gas burner capable of heating the heat exchanger, a gas pipe capable of supplying gas to said burner, a valve adapted to control the supply of gas through said pipe and monitoring means capable of detecting a predetermined value of the flow rate of water into said inlet pipe and causing said valve to be closed when the flow rate lies below said predetermined value.

This prevents the temperature of the water rising to an unsafe value.

The valve is preferably an electrically operated valve, such as a solenoid valve, and the monitoring means in such a case is conveniently a flow switch operative to interrupt the electrical supply to the valve and cause it to be closed when the flow rate of water does not reach or falls below the predetermined value. The flow switch is conveniently of the paddle type.

Such a heater can function at very low operating water pressures (less than 35 g/cm^2).

Conveniently the solenoid valve also has in series with it, and with the flow switch, a further switch arranged to close when a tap controlling the flow of water through the heat exchanger is opened. This switch may be a microswitch operated directly by the operation of the tap, or a pressure switch mounted on the water supply pipe.

It will, however, be seen that because of the presence of the flow switch the solenoid valve will not be opened immediately the tap is opened, but will only open to supply gas to the burner when the water flow has reached a predetermined minimum value.

Similarly when the tap is subsequently closed the burner will turn off when the flow of water falls below the minimum value, ensuring a continued flow of cold water through the heat exchanger for a short while after the burner flames have been extinguished.

A thermostat is preferably also fitted to the outlet from the heat exchanger and is operative to cause the gas valve to close if the outlet water temperature exceeds a predetermined maximum. As an additional safety feature, in order to prevent damage to the water heater, a low temperature fused link is arranged to cause the gas supply to the heater to be cut off should the temperature of the water heater become unacceptably high.

The water may be fed to the heat exchanger from an external supply, or may be pumped from an associated reservoir tank by means of an electrically driven pump.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing, which shows the components of the water heater.

In a typical heat exchanger (a) 5 litres of water per minute are heated through 30°C. The heat input is 11.13 kW. The heat exchanger is heated by a gas burner (b). A permanent pilot (c) for the burner (b) is lit from a piezo ignitor (d), the piezo ignitor being built into and operated by a gas control tap (e). Flame safety protection is provided by a thermocouple (f), operating in conjunction with a thermomagnetic valve (g) within the body of the gas control tap (e).

In accordance with the invention the gas supply to the burner (b) is controlled by a gas solenoid valve (h). A hot water tap (i) controls the water supply passing through the heat exchanger (a). A switch is connected in series with the solenoid of the valve (h) and in the case of a low pressure system this may take the form of a microswitch within the head of the tap (i) or alternatively, in the case of higher pressure systems it may be a pressure switch in the water supply pipe, the switch contacts in either case being arranged to close when the tap (i) is opened. In the arrangement illustrated water is supplied to the heat exchanger (a) from a reservoir (r) by means of a pump, this being energised directly by closure of the microswitch or pressure switch as the case may be.

However the solenoid valve is not opened initially by closure of the switch, as the solenoid has in series with it a further switch (j) in the form of a flow switch fitted to the water inlet supply pipe and arranged to close at a minimum water flow rate of 1.2 litres per minute. This system permits a flow of cold water through the heat exchanger before the gas burner is activated, both before and after ignition, eliminating the risk of high water temperatures.

A high limit thermostat (k) is also fitted to the pipe on the outlet side of the heat exchanger and is operative to cut off the current to the solenoid valve (h) and cause the latter to close if the outlet water temperature reaches a predetermined high temperature. The whole assembly is enclosed in a suitable metal outer case with a single flue outlet.

Additionally the water inlet supply pipe may have an adjustable flow control tap or restrictor for high water pressure use. This is in the form of a simple restrictor orifice which is adjustable in two basic positions and is attached to the inlet hose connector in place of a submersible pump. With the pump leads

disconnected, the alternative inlet pipe is connected to the inlet of the flow control valve (j).

The gas control tap has four positions: 'Off' 'Ignition/pilot' only, 'Full-on' and 'Shower'. On igniting the pilot burner (b), the control tap is turned to either 'Full-open' or 'Shower' as required. Given an inlet cold water temperature of 15° C, the heated water temperature may be varied from 30° C to 70° C by adjusting the water flow rate. When the water temperature rises above 70° C, the high limit thermostat (k) closes off the gas, and the water pump remains operative until the tap is closed, thereby cooling down the water temperature. In conventional water heaters, if small amounts of water are drawn off frequently, the water temperature can rise to up to 90° C which is generally considered too high.

The heated water temperatures are dependent on the input cold water temperature. In case the water supply is reduced below its minimal flow or is closed altogether, and the thermostat fails to operate leaving the gas burner (b) on, a low temperature fused link (l) is fitted to the side of the heat exchanger. The fused link is formed of a material which will melt before the solder connections within the water heater are damaged, and will interrupt the electrical supply from the thermocouple interrupter resulting in the shutting off of the gas supply to the heater.

The water heater is suitable for attachment to a common flue duct system, such as that claimed in a co-pending patent application.

Although the heater is designed for mobile caravans using butane or propane gas, it could also be used as a domestic natural gas water heater.

For use in certain situations (e.g. use in bathrooms), the water heater would be provided with a room-sealed outer casing, providing an air intake and flue outlet to outside air.

Claims

1. A gas fuelled water heater comprising a heat exchanger into which water is arranged to be fed from an inlet pipe, a gas burner capable of heating the heat exchanger, a gas pipe capable of supplying gas to said burner, a valve adapted to control the supply of gas through said pipe and monitoring means capable of detecting a predetermined value of the flow rate of water into said inlet pipe and causing said valve to be closed when the flow rate lies below said predetermined value.

2. A water heater according to Claim 1 wherein the valve is an electrically operated valve.

3. A water heater according to Claim 2 wherein the monitoring means comprises a flow switch operative to interrupt the electrical supply to the valve and cause it to be closed when the flow rate of water does not reach or falls below the predetermined value.

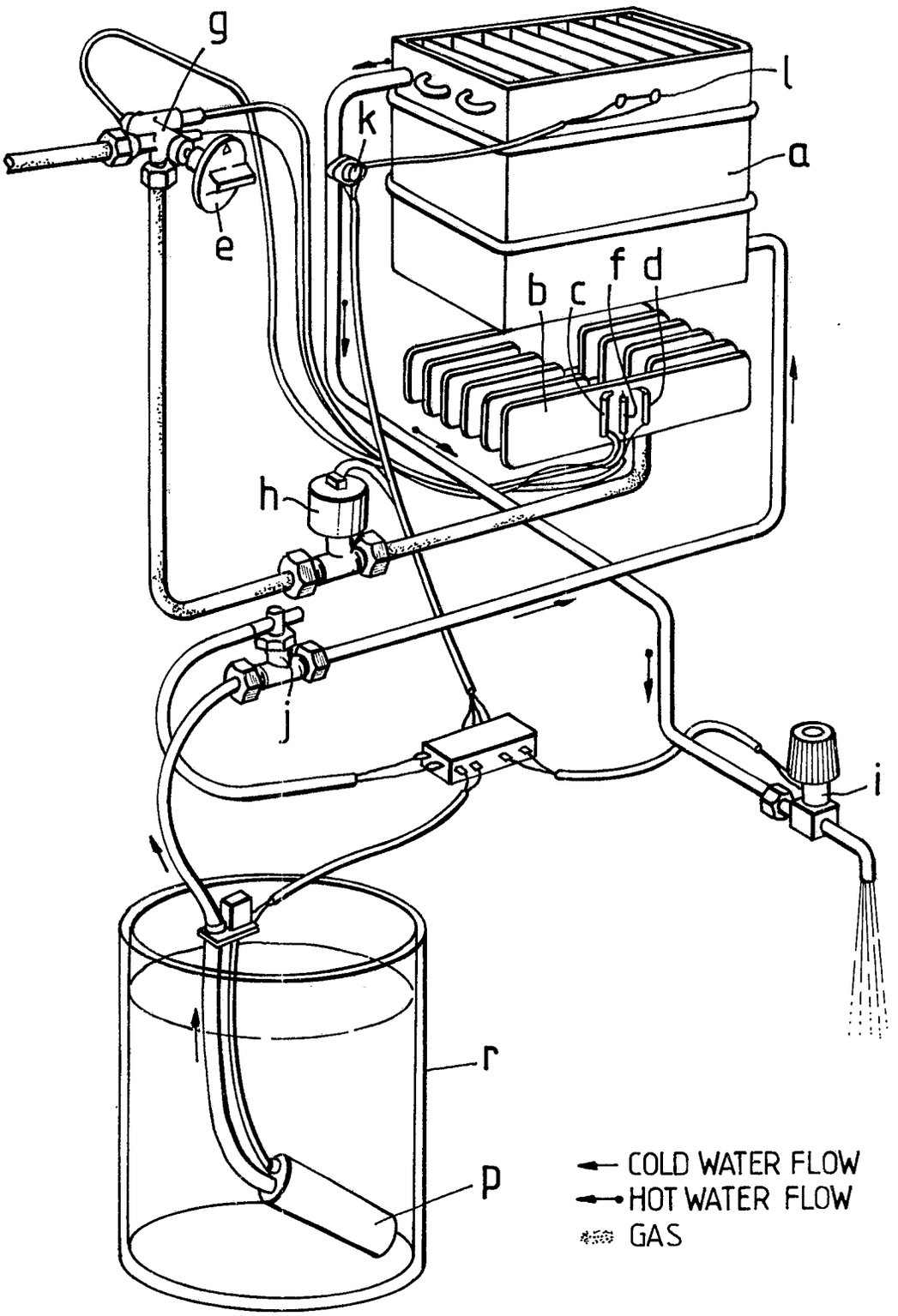
4. A water heater according to Claim 3 wherein the solenoid valve, also has in series with it, and with the flow switch, a further switch arranged to close when a tap controlling the flow of water through the heat exchanger is opened.

5. A water heater according to Claim 4 wherein the further switch comprises a microswitch operated directly by the operation of the tap, or a pressure switch mounted on the water supply pipe.

6. A water heater according to any preceding claim wherein a thermostat is fitted to the outlet from the heat exchanger and is operative to cause the gas valve to close if the outlet water temperature exceeds a predetermined maximum.

7. A water heater according to Claim 6 wherein a low temperature fused link is arranged to cause the gas supply to the heater to be cut off should the temperature of the water heater become unacceptably high.

8. A water heater according to any preceding claim in combination with a reservoir tank, and an electrically driven pump for pumping water to said heat exchanger from the reservoir, and means for energising the pump when a tap controlling the water supply passing through the heat exchanger is opened.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COLD WATER FLOW
HOT WATER FLOW
GAS

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EUROPEAN SEARCH REPORT

Application Number

EP 89 30 1040

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	BE-A- 531 309 (WEYDTS) * Whole document * ---	1-3	F 24 H 9/20
A	FR-A-2 415 269 (E.L.M. LEBLANC) * Page 1, lines 10-18 * ---	1,6	
A	CH-A- 376 630 (RADIATION Ltd) * Claims * ---	1,7	
A	PATENT ABSTRACTS OF JAPAN, vol. 9, no. 11 (M-351)[1734], 18th January 1985, page 31 M 351; & JP-A-59 158 932 (MATSUSHITA DENKI SANGYO K.K.) 08-09-1984 -----	7	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F 24 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13-03-1989	VAN GESTEL H.M.

CATEGORY OF CITED DOCUMENTS

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