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(54) **Method for limiting the flow rate of sanitary hot water in combined boiler of the instantaneous type or with semi-accumulation, and seasonal limiting valve**

(57) A method for limiting the flow rate of sanitary hot water in a combined, boiler of the instantaneous type or with semi-accumulation, provides for an automatic variation of the flow rate of hot sanitary water at the output of the boiler (or more in general of a limiting valve), as a function of the temperature of the water at the inlet of the boiler (or respectively of the limiting valve).

The seasonal limiting valve houses a heat-expanding element (6), comprising a wax capsule, which acts on the shutter (4) of the valve (1) causing the actuation of the shutter (4) to a position of greater opening (or respectively lesser opening) in correspondence with an increase (or respectively of a decrease) of the temperature of the water that traverses the valve.

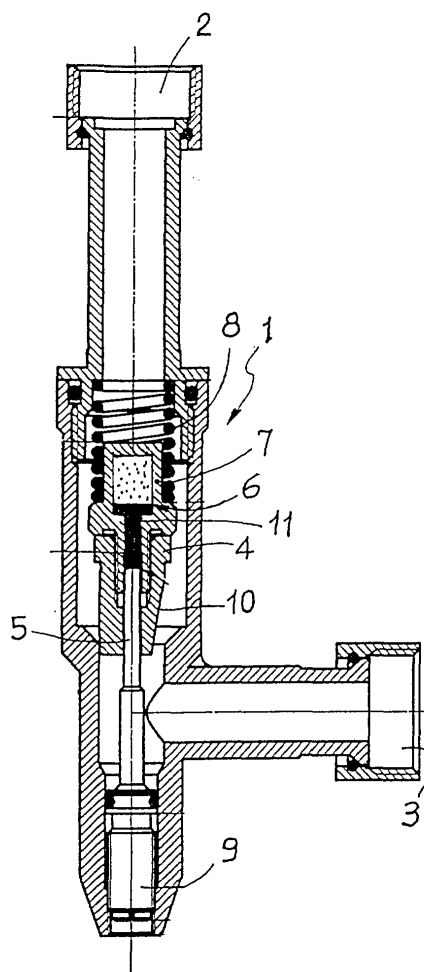


FIG. 2

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Description

[0001] The present invention relates to a method for limiting the flow rate of sanitary hot water in combined boilers of the instantaneous type or with semi-accumulation and a seasonal limiting valve.

[0002] In combined boilers, i.e. those destined to heating and to the production of hot water, of the instantaneous type, the flow rate of hot water at the output, at a certain temperature, depends on the temperature of the cold water entering the boiler.

[0003] It is obvious that during the winter months, when the temperature of the incoming water is at about 10°C, one obtains a smaller flow rate of sanitary hot water at 50°C than the rate achievable during summer months, when the temperature of the incoming water is about 20°C.

[0004] Currently, there are boilers without flow rate limiting devices which, depending on the temperature of the incoming water, provide at their output sanitary hot water with a constant flow rate but with a variable temperature (which in the summer can exceed 50°C but in the winter can drop even to about 40°C).

[0005] A second type of instantaneous combined boilers is provided with a flow rate limiting device which is set in such a way as to reduce the flow rate of hot water at the output in order to provide, even in the winter, hot water at a certain temperature, for instance 50°C.

[0006] However, it is evident that such a solution is penalising in summer months, when as a consequence of the higher temperature of the incoming water, a greater flow rate of hot water at the output at the temperature of 50°C could be obtained.

[0007] The aim of the present invention is to eliminate the aforesaid drawbacks making available a method and a device that allow, for equal temperature of the sanitary hot water required at the output from the boiler, to change its flow rate as a function of the temperature of the incoming water.

[0008] A further aim is to achieve this in an extremely simple and economical manner.

[0009] Said aims are fully achieved by the method and by the valve of the present invention, which are characterised by the content of the claims set out below and in particular in that the method provides for the automatic variation of the flow of sanitary hot water at the output of the boiler (or more in general of a limiting valve) as a function of the temperature of the water at the input of the boiler (or at the limiting valve).

[0010] The valve is a seasonal limiting valve positioned on the water inlet conduit and comprises means shaped in such a way as to regulate the flow rate of water supplied in the boiler according to the temperature of the water.

[0011] This and other features shall become more readily apparent from the following description of a preferred embodiment shown, purely by way of non limiting example, in the accompanying drawing tables, in which:

- Figure 1 shows a vertical section of the limiting valve in the winter or more closed position;
- Figure 2 shows a vertical section the limiting valve in the summer or more open position.

[0012] With reference to the figures, the number 1 globally indicates a seasonal limiting valve that is applied at the input of a combined boiler of the instantaneous type (or also with semi-accumulation) for heating and producing sanitary hot water. The valve 1 is preferably made of material suitable for use with food products (e.g. plastic, brass, ...). The valve 1 is provided with an inlet 2 through which enters the cold water of the home pipeline, and with a corresponding outlet 3.

[0013] Between the inlet 2 and the outlet 3 is located a shutter 4 provided with a through hole through which is inserted a pivot pin 5 destined to interact with a heat-expanding substance, in this specific case a capsule of wax 6.

[0014] In the shutter, from the opposite side relative to the through hole, is screwed on a threaded element 7 destined hermetically to envelop the wax between it and the pivot pin 5 and to close the through hole.

[0015] More specifically, the threaded element 7 is constituted by a copper cap applied to a threaded portion in such a way as to define a chamber that is filled with wax (or in any case with heat expanding material) or more preferably houses a capsule made of wax or of heat expanding material and interacts with a small piston 11, preferably made of metal. The threaded element 7 is pre-loaded by a spring 8.

[0016] To the pivot pin 5 is associated an adjusting screw 9, which allows to adapt the valve 1 to boilers with different ratings, with a fine adjustment of the flow rate range.

[0017] The adjusting screw 9 can be operated manually from the exterior by means of a screwdriver or it can also be operated automatically if connected to a control unit that acts, through an actuator, on the position of the shutter 4.

[0018] The operation of the valve is particularly simple. The automatic adjustment of the flow rate is performed by the wax capsule 6 which is a heat expanding cartridge, sensible to the temperature variation of the water flow that traverses it.

[0019] The increase (or respectively the decrease) of the incoming water temperature induces an elongation (or respectively a shortening) of the wax capsule and consequently an opening (or respectively a closing) motion of the shutter 4 together with the threaded element 7 integral therewith, regulating the flow rate of the water that traverses the valve and enters the boiler.

[0020] Essentially, when the wax capsule is elongated, it makes the shutter translate into a more open position overcoming the pre-loading of the spring, whilst when the wax capsule shortens, the shutter slides in the less open position, thrust by the spring.

[0021] The shutter 4 is cylindrical with a cone frustum

portion or taper 10 such as to define a water flow rate proportional to the displacement of the shutter itself.

[0022] The valve 1 does not serve the function of stabilising pressure at the inlet of the boiler and therefore if water supply pressures on the sanitary fitting are unstable, it is necessary to insert a pressure control organ upstream of the valve.

[0023] With the method and the valve of the present invention, the maximum flow rate of sanitary hot water that is obtained, by opening a hot water tap, changes automatically, within a pre-defined range, in consideration with the corresponding seasonal variation of the temperature of the sanitary water flowing into the boiler.

[0024] With low inlet temperatures (e.g. 10°C) the maximum supply flow rate is automatically reduced to a value that allows to obtain a sufficiently high output temperature (e.g. 50°C) with the boiler in continuous operation at nominal rating.

[0025] With high inlet temperatures (e.g. 20°C), the maximum supply flow rate is automatically increased to a value that allows to obtain always the same high output temperature (e.g. 50°C) with the boiler in continuous operation at nominal rating.

[0026] The automatic operation of the seasonal valve allows to obtain sanitary supply flow rates in proportion to the inlet water temperature, with flow rate increases of about 20-25% during warm seasons with respect to traditional flow limiting systems of the fixed type, which are calibrated for rather low water inlet temperatures (5-10°C) and are therefore penalising (for the low flow rates available) during seasonal periods in which the temperature of the inlet water would allow greater flow rates.

[0027] The adjustment screw 9 allows perfectly to adjust the position of the shutter 4 when calibrating the valve, taking into account the temperature and pressure of the sanitary water flowing into the boiler, the constant output temperature required and the nominal heat rating of the boiler whereto it is applied.

[0028] Calibration of the valve is simplified by a table, not illustrated herein, that indicates the number of turns of the adjustment screw required to position the shutter in the working range of the pre-defined supply flow rate.

temperature of the water.

3. Method as claimed in claim 1, wherein the water pressure at the inlet of the boiler is stabilised.
4. Seasonal limiting valve in a combined boiler of the instantaneous type or with semi-accumulation, **characterised in that** it houses a heat-expanding element (6) that acts on the shutter (4) of the valve (1) causing the actuation of the shutter (4) to a more open position (or respectively less open position) in correspondence with an increase (or respectively a decrease) of the temperature of the water that traverses the valve.
5. Valve as claimed in claim 4, wherein the heat-expanding element is a wax capsule.
6. Valve as claimed in claim 4, wherein the shutter (4) is pre-loaded by a spring (8).
7. Valve as claimed in claim 4, **characterised in that** it comprises an adjustment screw (9), able to be operated manually from the exterior by means of a screwdriver or automatically from a control unit, which acts through an actuator on the position of the shutter.
8. Valve as claimed in claim 4, wherein the shutter (4) is cylindrical with a truncated cone portion or taper (10) so shaped as to define a water flow rate that is proportional to the displacement of the shutter.
9. Valve as claimed in claim 4, **characterised in that** it is positioned at the inlet of the boiler.
10. Valve as claimed in claim 4, **characterised in that** it is made of a material suitable for use with food products.

Claims

1. Method for limiting the flow of sanitary hot water in combined boilers of the instant type or with semi-accumulation, **characterised in that** it provides for an automatic variation of the flow rate of sanitary hot water at the output of the boiler (or more in general of a limiting valve) as a function of the water temperature at the inlet of the boiler (or respectively of the limiting valve).
2. Method as claimed in claim 1, wherein said variation takes place whilst maintaining constant the output

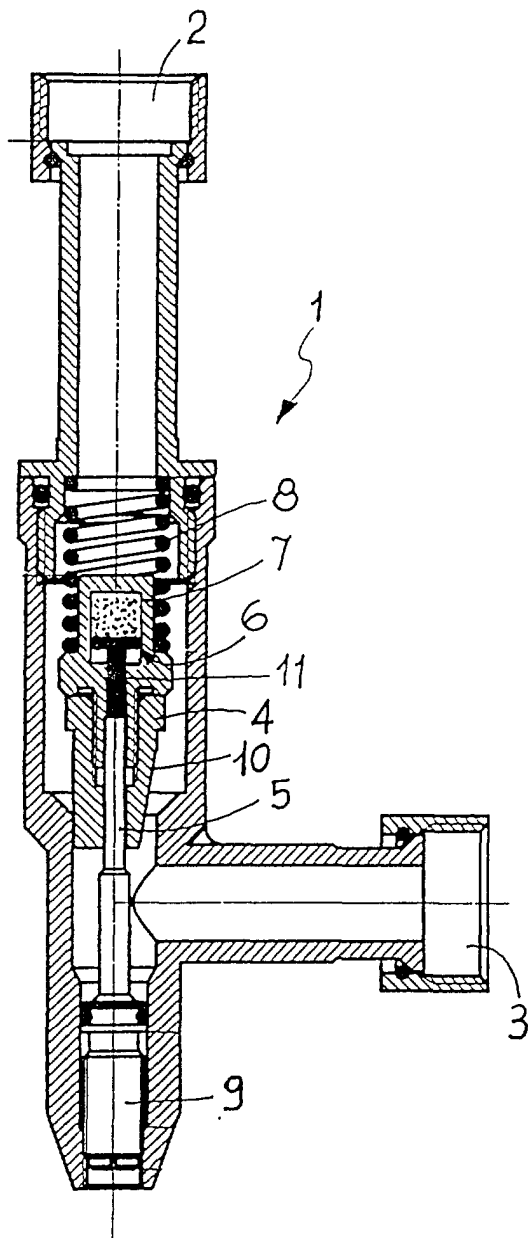


FIG. 1

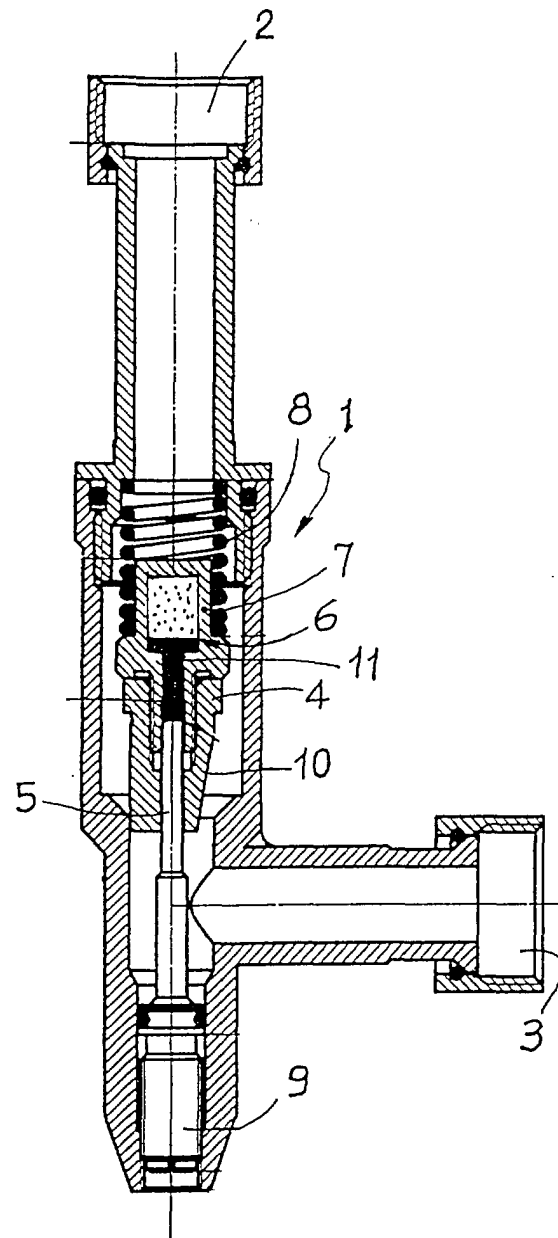


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 01 12 5510

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.7)
X	GB 2 281 380 A (TRITON PLC) 1 March 1995 (1995-03-01) * the whole document * -----	1,2,4-9	F24D19/10
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F24D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 December 2001	Examiner Van Gestel, H
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 12 5510

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-12-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2281380	A	01-03-1995	NONE

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82