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(54) **A device for a water heater**

Vorrichtung für einen Warmwasserbereiter

Dispositif pour un chauffe-eau

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Description

The present invention relates to a device of the type defined in the preamble of claim 1.

In SE laid open patent application 344 631 there is further disclosed a device which controls an electric element's energy output based on the temperature in an external circulation pipe provided between the cold water intake (the bottom area) and the hot water intake (the top area). The temperature is controlled by means of a thermostat which governs a control device consisting of one or more thyristors which can connect full or partial power from an electrical energy source.

EP-A-0309199 discloses a hot water boiling apparatus comprising a hot water tank with a bubble pump unit which sucks cold water from the bottom area of the storage tank, heats it and pumps it as hot water into the top area of the storage tank. The bubble pump unit is equipped with non-return valves at the inlet and the outlet, and the pumping effect is obtained by heating the water in the lower part of the bubble pump unit until it boils and forms bubbles, while the sucking effect is obtained by the subsequent condensation of these bubbles when they reaches colder water in the upper part of the bubble pump unit. A problem with bubble pumps is that they make noise and have a relatively low energy efficiency since they heat the water up to the boiling point.

In water heaters it is also known to use choke valves which reduce the through- flow of water mechanically without any kind of thermal control regulating the volume of water.

One requirement therefore is to provide a device for water heaters which can accumulate hot water at a constant temperature, e.g. 70°C, independently of the energy supplied as well as to concentrate the energy supplied in order to reduce the accumulation time for consumer hot water.

A further requirement of the invention is that hot water, which has lower density than cold water and which is added at the top of the water storage tank, should mix to as little an extent as possible with the cold water in the bottom of the storage tank.

Thus the object of the present invention is to provide a device for water heaters which satisfies these requirements.

This object is achieved with a device according to the type mentioned in the introduction, which is characterized by the features indicated in the attached claims.

By means of the invention there is obtained by simple means a device for water heaters which governs the through-flow of water with temperature monitoring, and the aim of which is to maintain a constant temperature independently of the energy supplied, i.e. the increase in temperature multiplied by the volume of water is kept constant by variation of the water volume.

The energy for heating the water can for instance be supplied by a conventional heating element or by a heat exchanger which is connected to hot gas from a heat pump or water-borne energy from one or more energy sources or steam.

The result of the design according to the present invention is that the hot water which is supplied to the top area of the water storage tank does not mix with the cold water, but remains lying in thin layers with a slowly sinking temperature gradient and without mixing to any noticeable extent with the cold water.

The invention will now be described in more detail by means of the embodiment which is illustrated on the single figure, which is a cross section of the device.

Figure 1 shows a device which consists of an insulated accumulation storage tank 1, a through-flow device 2 and a temperature-sensitive element 3, which expands under the influence of heat, and where these are connected by pipes 4, 11.

The storage tank 1 is supplied with cold water through an inlet pipe 5 and supplies hot water through an outlet pipe 6. The accumulation of hot water is provided by means of a through-flow device 2, which is provided between the storage tank's 1 bottom area 7 (cold water intake) and the temperature-sensitive element 3, which is connected to the top area 8 (hot water outlet) of the storage tank 1.

The through-flow device is supplied with a heating element (not shown), e.g. an electric element, which is thermostatically controlled by means of a thermostat 9 and equipped with an overheating control in the form of a further thermostat 10.

The energy which is supplied to the water heater is constant, i.e. the temperature of the water which leaves the through-flow device 2 is not controlled by means of the electric element, but by the actual flow of water through the temperature-sensitive element 3.

The temperature-sensitive element 3 is opened when the water temperature downstream of the element 3 agrees with the preset temperature and closes when the temperature falls below the preset temperature. When the water temperature exceeds the preset temperature, a piston (not shown) inside the element 3 is fully opened, thus increasing the through-flow of water and thereby mixing it with colder water. The device is arranged in such a manner that it never closes completely, but permits a certain amount of water to flow through, in order, amongst other things, to drain off expanded water.

The temperature-sensitive element 3, which is provided after the through-flow device, viewed in the direction of flow, consequently monitors the accumulation temperature of the water flowing into the upper part of the storage tank. The accumulation of hot water continues for as long as the water in the bottom of the storage tank is colder than the preset temperature, the process being stopped thereafter by the element's working thermostat (not shown), which is located in the lower part of the storage tank.

If, e.g., the through-flow device 2 is provided with a

3 kW element, the water heater according to the invention will have accumulated after approximately 50 minutes 33 litres of 70°C water, which is sufficient hot water for a shower (60 litres at 40°C) as opposed to known water heaters which take up to 7 hours to accumulated hot water at 70°C.

Figure 2 shows the progress of heating from 5°C to 70°C for a 200 (194) litre water heater, in the form of time consumption and number of litres accumulated of hot water at 70°C.

Claims

1. A device for a water heater consisting of an insulated accumulation storage tank (1) together with a through-flow device (2), wherein the through-flow device (2) sucks cold water from the bottom area (7) of the storage tank (1) through a first pipe (11), heats the water by a heating element before admitting such heated water through a second pipe (4) to the top area (8) of the storage tank (1), characterized in that the through-flow device (2) is supplied with a temperature-controlled flow/choke valve (3) arranged downstream of the heating element and regulating the water through-flow in the device (2) by regulating the opening of the valve (3) by means of a heat sensitive element, the valve (3) always allowing a through-flow of at least a certain minimum amount of water and being presettable for providing a desired temperature of the water exiting the device (2) when a normal water amount flows through the device, the valve (3) being opened further to allow an increased water through-flow if the temperature of the water exiting the device (2) exceeds a preset value.

2. A water heater according to claim 1, characterized in that the heating element is an electric element which is thermostatically controlled by a thermostat (9) and equipped with an overheating control in the form of a further thermostat (10).

3. A water heater according to claims 1 and 2, characterized in that the through-flow device (1) is equipped with a heat exchanger which is connected to hot gas from a heat pump or water-borne energy from one or more energy sources or steam.

Patentansprüche

1. Vorrichtung für einen Warmwasserbereiter bestehend aus einem isolierten Sammelspeichertank (1) gemeinsam mit einer Durchflußeinrichtung (2), worin die Durchflußeinrichtung (2) kaltes Wasser aus dem Bodenbereich (7) des Speichertanks (1) durch eine erste Leitung (11) ansaugt, das Wasser durch ein Heizelement vor einem Zuführen des derart erwärmten Wassers durch eine zweite Leitung (4) zu dem Kopfbereich (8) des Speichertanks (1) aufheizt, dadurch gekennzeichnet, daß die Durchflußeinrichtung (2) mit einem temperaturgesteuerten Durchfluß-Drosselventil (3) ausgestattet ist, welches stromabwärts des Heizelements angeordnet ist und den Wasserdurchfluß in der Einrichtung (2) durch Regulierung der Öffnung des Ventils (3) mit Hilfe eines wärmeempfindlichen Elements reguliert, wobei das Ventil (3) immer ein Durchströmen von wenigstens einer bestimmten, minimalen Menge an Wasser erlaubt und voreinstellbar ist, um eine gewünschte Temperatur des die Einrichtung (2) verlassenden Wassers zur Verfügung zu stellen, wenn eine normale Wassermenge durch die Einrichtung fließt, wobei das Ventil (3) weiter geöffnet wird, um einen vergrößerten Wasserdurchfluß zu erlauben, falls die Temperatur des die Einrichtung (2) verlassenden Wassers einen vorgegebenen Wert überschreitet.

2. Warmwasserbereiter nach Anspruch 1, dadurch gekennzeichnet, daß das Heizelement ein elektrisches Element ist, welches durch einen Thermostat (9) Thermostat-gesteuert bzw. -geregelt ist und mit einer Überhitzungssteuerung in Form eines weiteren Thermostats (10) ausgestattet ist.

3. Warmwasserbereiter nach Anspruch 1 und 2, dadurch gekennzeichnet, daß die Durchflußeinrichtung (2) mit einem Wärmetauscher ausgestattet ist, welcher mit heißem Gas von einer Wärmepumpe oder mit von Wasser übertragener Energie von einer oder mehreren Energiequellen oder Dampf verbunden ist.

Revendications

1. Dispositif pour un dispositif de chauffage d'eau, constitué d'un réservoir (1) isolé de stockage à accumulation et d'un dispositif (2) de passage de débit, dans lequel le dispositif (2) de passage de débit aspire de l'eau froide de la zone (7) de fond du réservoir (1) de stockage par un premier tuyau (11), chauffe l'eau par un élément chauffant avant d'admettre l'eau chauffée ainsi par un second tuyau (4) dans la zone (8) supérieure du réservoir (1) de stockage, caractérisé en ce que le dispositif (2) de passage de débit est alimenté par une vanne (3) d'étranglement/d'écoulement commandée par température, montée en aval de l'élément chauffant et régulant le débit d'eau passant dans le dispositif (2) en régulant l'ouverture de la vanne (3) au moyen d'un élément sensible à la chaleur, la vanne (3) permettant toujours un débit passant d'au moins une certaine quantité minimale d'eau et pouvant être ré-

glée à l'avance pour obtenir une température souhaitée de l'eau sortant du dispositif (2) lorsqu'une quantité d'eau normale s'écoule par le dispositif, la vanne (3) étant ouverte encore plus pour permettre un débit de passage d'eau accru si la température de l'eau sortant du dispositif (2) dépasse une valeur préréglée.

2. Dispositif de chauffage d'eau suivant la revendication 1

caractérisé en ce que l'élément chauffant est un élément électrique qui est commandé de manière thermostatique par un thermostat (9) et qui est muni d'un dispositif de commande de surchauffe sous la forme d'un thermostat (10) supplémentaire.

3. Dispositif de chauffage d'eau suivant la revendication 1 et 2,

caractérisé en ce que le dispositif (2) de passage de débit est muni d'un échangeur de chaleur, qui est relié à un gaz chaud d'une pompe à chaleur ou à de l'énergie. portée par de l'eau, provenant d'une ou de plusieurs sources d'énergie ou de vapeur.

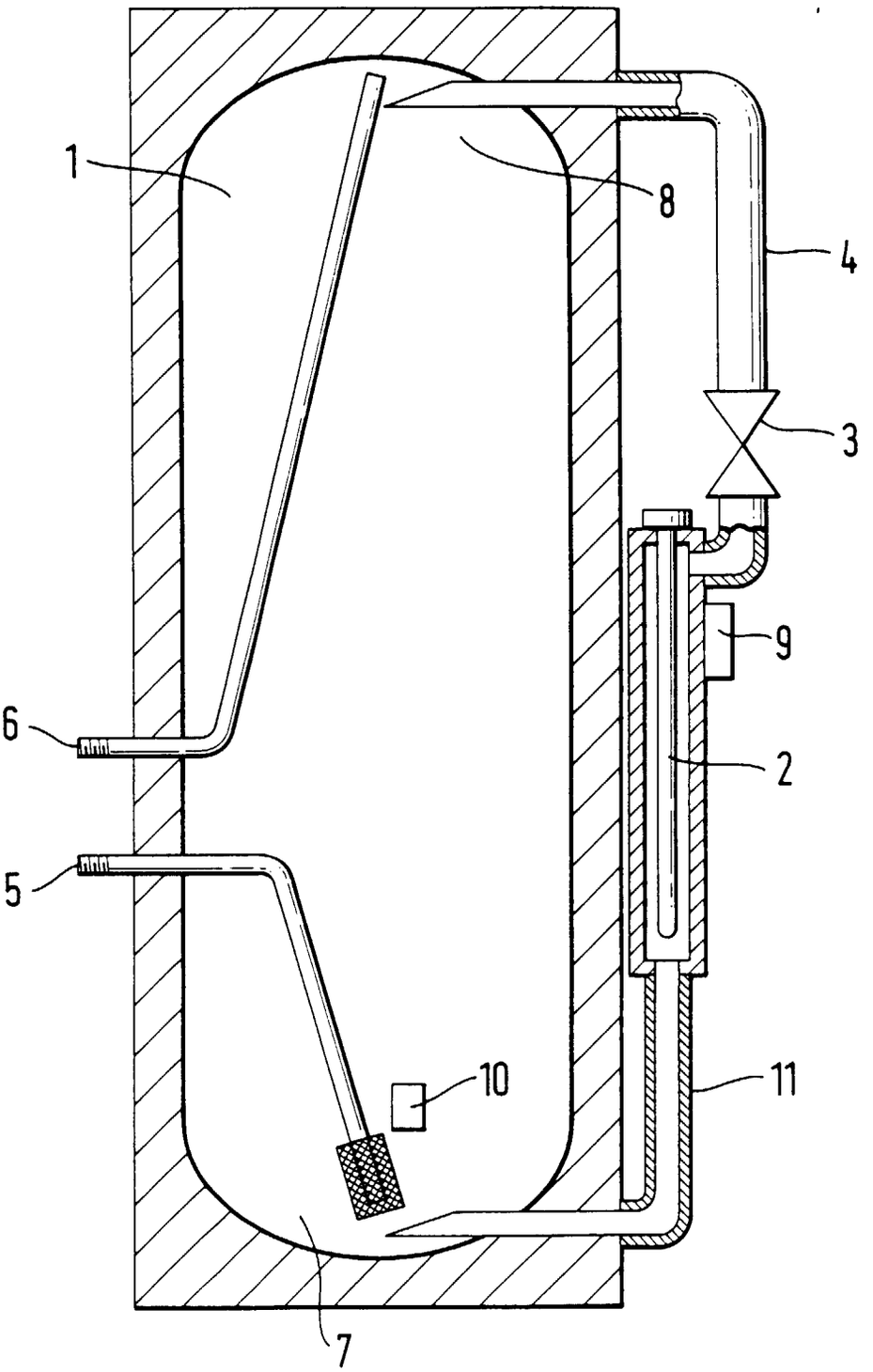


Fig. 1

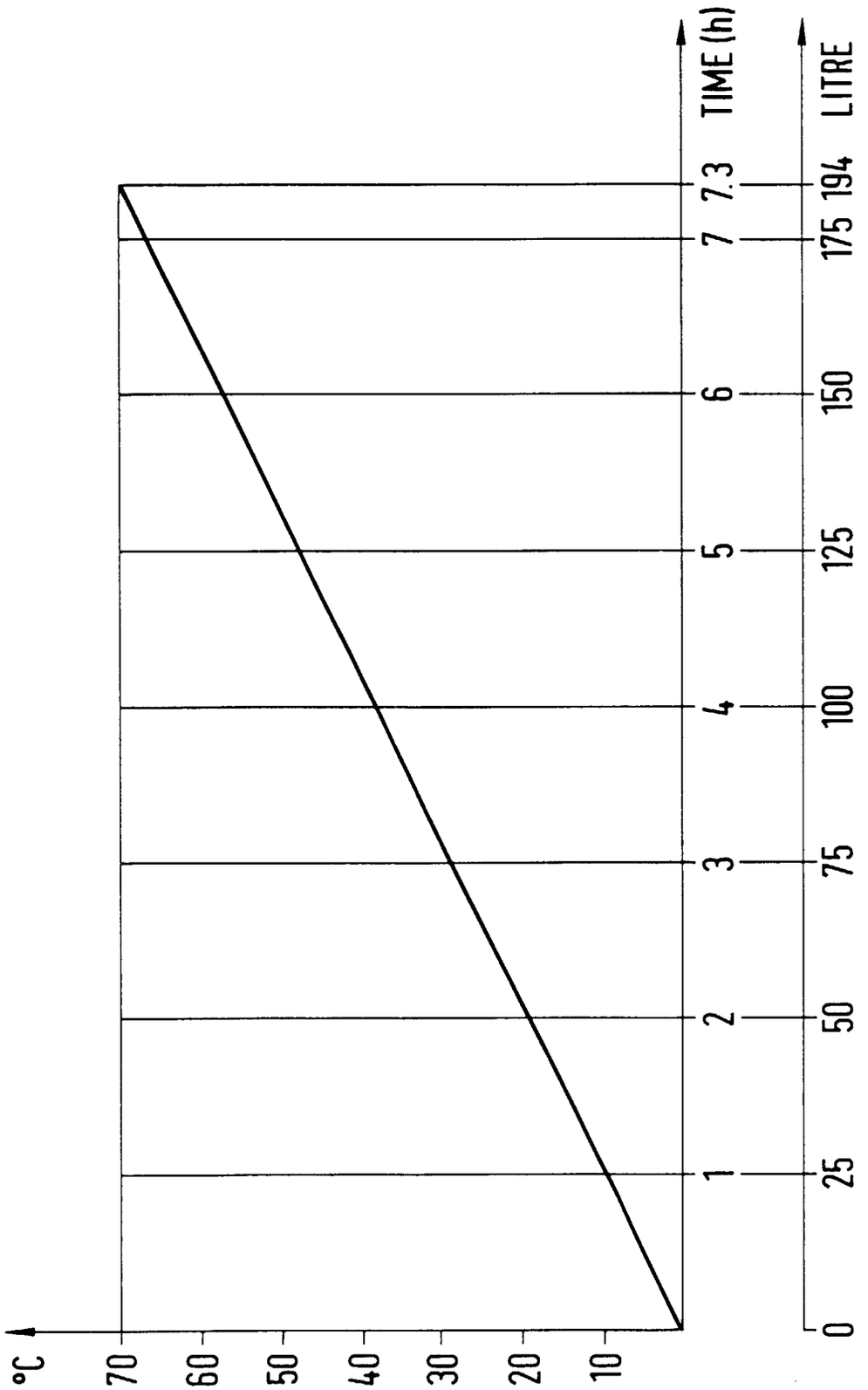

°C
70
60
50
40
30
20
10
TIME (h)
1
2
3
4
5
6
7
7.3
LITRE
25
50
75
100
125
150
175
194
0

Fig. 2