

**EUROPEAN PATENT SPECIFICATION**

- ④ Date of publication of patent specification: **04.05.88**      ⑤ Int. Cl.<sup>4</sup>: **F 24 H 1/22**  
① Application number: **84201494.6**  
② Date of filing: **15.10.84**

---

④ **Water heating appliance e.g. a domestic boiler.**

- |  |   |
|--|---|
| <p>④ Date of publication of application:<br/><b>23.04.86 Bulletin 86/17</b></p> <p>④ Publication of the grant of the patent:<br/><b>04.05.88 Bulletin 88/18</b></p> <p>④ Designated Contracting States:<br/><b>BE DE FR GB IT NL</b></p> <p>⑤ References cited:<br/><b>DE-C- 719 976</b><br/><b>DE-C-1 000 588</b><br/><b>NL-A-8 300 867</b><br/><b>US-A-3 544 005</b></p> | <p>⑦ Proprietor: <b>Plaatverwerkende Industrie van Wijk en Boerma B.V.</b><br/><b>Zuidlaarderweg 12</b><br/><b>NL-9482 TW Tynaarlo, Gem. Vries (NL)</b></p> <p>⑦ Inventor: <b>Zijlstra, Egbert</b><br/><b>p/a Zuidlaarderweg 12</b><br/><b>NL-9482 TW Tynaarlo (NL)</b></p> <p>⑦ Representative: <b>den Boer, Jan Johannes, Ir.</b><br/><b>et al</b><br/><b>Octrooibureau Polak &amp; Charlouis Laan Copes</b><br/><b>van Cattenburch 80</b><br/><b>NL-2585 GD The Hague (NL)</b></p> |
|--|---|

---

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European patent convention).

## Description

The invention relates to a hot water appliance, comprising a vertical container connected in the circuit of and positioned separately from a central heating boiler, a water circulation pump being provided in the circuit between the boiler and the container, a coil for trapping hot water being provided within the container, and one of said coil being connected to a water means and being provided adjacent to the container wall.

A similar appliance is known from NL—A—8300867. In that the container is filled with boiler water (temperature 75—80°) and has a substantial capacity (e.g. 40 liters), this appliance permits tapping hot water at constant temperature (e.g. 45°C) during a long period, via an automatic mixing device. Said period of course depends on the quantity of water which is tapped per unity of time.

It has now appeared that the tap water temperature may be maintained still better if care is taken that the water in the container having the highest temperature is always directly adjacent to the coil. For it is that the temperature in the container is only at the same value all over the container in a condition of equilibrium, if for considerable time no water has been tapped. In summer the central heating boiler is not operative for heating radiators and therefore, if heat supply to the water boiler is necessary, initially colder water will be supplied thereto by the central heating boiler than the water already present in the container. It must be avoided that this water directly contacts the coil.

This is achieved according to the invention in that a sleeve with a closed wall and open top has been provided within the container parallel to the vertical container wall, said sleeve extending to close to the container top and being closed at the under side by a bottom, the flow cross-section outside the sleeve being a couple of times smaller than that within the sleeve, the sleeve constituting a large part of the total container volume, the central heating water supply conduit opening centrally through said bottom within the sleeve in the container, the central heating water return conduit being connected to the container bottom. Thereby a constrained circulation is obtained through the container within the sleeve upwardly and on the outside of the sleeve downwardly, the supplied central heating boiler water becoming sufficiently mixed with the container contents before the water reaches the coil. Moreover, the space containing the coil is strongly reduced by the sleeve and the container wall relative to the remainder of the container, whereby the circulation velocity along the coil and thereby the heat transmission increases.

A similar hot water appliance, also having a sleeve with open top within the tapping water coil and connected at the bottom with the central heating circuit is known from DE—C—719976. However this relates to a hot water appliance which is built on top of and positioned separately

from said boiler. This causes heavy heat losses from the hot water supply in the container and in the heating boiler since this communicates with cold outside air through the chimney stack channel when the boiler is inoperative such as in summer. On behalf of the hot water production in summer the water in the container and the boiler will have to be kept at high temperature, whereby high heat losses will occur. The known apparatus operates through the thermosyphon-effect, whereby the water in the heating boiler only moves upwardly into the hot water appliance, if it has been heated to a somewhat higher temperature than the temperature present in that appliance.

However, with present central heating circuits operating with circulation by means of a pump, the cold heating boiler water will move upwardly immediately when the operation of the boiler is started through a thermostat signal indicating that the hot water temperature decreases below the set value, within the sleeve adjacent to its sidewall, i.e. close to the coil, whereby this coil is cooled.

According to the invention the sleeve having the closed bottom provides for entering the central heating water centrally into the sleeve, whereby it is mixed with water present in the sleeve and thereby heated before it reaches the coil. Thereby losses due to inoperation of the central heating boiler are minimized.

DE—C—1000585 reveals a hot water supply appliance, comprising a vertical container connected in the circuit of a central heating boiler and having a hot water tapping coil. The hot water discharge pipe of the central heating apparatus is upwardly extended within the boiler to close to the container top. This pipe only forms a small part of the total container volume and is meant for first heating the water in the tapping coil before it is transmitted to the radiators. This is obtained by providing opening along the pipe so that the water is returned to the central heating boiler as long as it is not hot enough to reach the top of the pipe. As applied to the appliance according to the invention any hot water in the coil would be cooled by this returning water, which is exactly what the present invention intends to avoid.

The invention is specially of importance by the tendency of the later years to reduce the boiler capacity of the central heating installation for houses. This has been reduced e.g. from 20 to 5 kw in connection with the smaller heat requirement as a result of better isolation of the houses. Thereby it takes longer before, after a period in which the burners have not been operative, the central heating boiler water is again at normal temperature.

Preferably in known manner the direction of movement of heated and heating water be contrary. Thereto the appliance is constructed such that the inlet end and the outlet end of the coil are provided at the underside of the container,

The invention will be further explained below with reference to the drawing, showing an

embodiment, given as an example, of the appliance according to the invention.

Fig. 1 shows schematically the water circuit of the hot water appliance connected to a central heating boiler.

Fig. 2 is a schematic longitudinal section through the appliance, having supply and discharge points for the water.

The circuit as shown in figure 1 comprises a cold water supply line 20, e.g. connected to a water mains, said line having a control valve 1, a check valve 2 and a stop valve 3 and leading to the appliance, e.g. a domestic boiler, said line being connected to the heat exchanger as formed by a coil 7 of said appliance, the water reservoir or container of which bears the reference number 8. The coil leaves the container at its underside and is connected to a line 21 which is also connected to the output of an automatic mixing valve or automatic mixing device 6, the input of which is connected by a conduit 22 to the cold water supply line 20. The line 21 constitutes the tap line of the appliance.

The automatic mixing device 6 also has a hot water output to a conduit 23, from which hot tap water may be obtained from the appliance, e.g. water which is not mixed with cold water.

The supply of hot central heating boiler water to the container 8 of the appliance is obtained with a conduit 9 extending through the under-wall of the container and opening into the bottom 28 of the sleeve 27, which has an open top. Said conduit 9 is connected through a three-way valve 10 and a conduit 24 to the output of the central heating boiler 12, while also radiators 11 are connected to said boiler through the conduit 24 and the three-way valve 10. The heating water in the container 8 leaves the container at the underside through a conduit 25, which opens in the wall of the container bottom in the area between the sleeve 27 and the wall of the container 8. Said conduit is connected through a pump 13 to the water input of the boiler 12. The return conduits 26 of the radiators 11 are likewise connected to the return line 25.

The primary or heating water leaving the boiler through the conduit 24 has a maximum temperature which is adjustable through the boiler thermostat 14 and said temperature e.g. has the value of 90°C. The temperature of the heating water in the container 8 is then e.g. 75—80°C.

The boiler container 8 is shown on an enlarged scale in figure 2 together with the different lines connected thereto. Within the container the sleeve 27 is provided, said sleeve having bottom 28. In said bottom from the lower side of the boiler the central heating water supply line 9 opens. The coil 7 is provided, as seen in the radial direction, substantially half between the wall of the container 8 and the vertical wall of the sleeve 27. The cold water supply end of the coil enters, in the embodiment shown, the underside of the container 8. From the upper end of the coil 7 an end portion 29 extends within the sleeve 27 downwardly, passes in sealed manner through the bottom 28 thereof and subsequently passes the

container bottom. The return line 25 between container and the boiler likewise leaves the container 4 at the underside.

In that the water supplied from the boiler to the container 8, which may be colder than the water present in the container after an inoperative period, is entered through the bottom 28 of the sleeve 27, it does not contact the coil 7. A mixture with the water present in the container is generated. Because water is discharged from the container through line 25 outside the sleeve, the water within the sleeve slowly rises upwardly and subsequently moves downwardly between the sleeve and the container wall in contact with the coil 7. Then the water has reached at the upper end of the sleeve the average of the water temperature in the container. In that colder water is heavier than warmer water, also due to that fact warmer water will be present at the top of the container. The warmest water is concentrated by the sleeve on the coil, which improves the heat transmission thereto. The flow cross-section outside the sleeve is a couple of times smaller than that within the sleeve, whereby the flow velocity along the coil is proportionally increases.

In the embodiment shown in figure 2, moreover, the water in the coil moves in the counterflow with that in the container outside the sleeve, whereby likewise the heat transmission efficiency is increased.

The temperature measuring element or sensor 30a of a thermostat 30 is provided substantially at half the height of the container 8 against its outer wall. It has appeared that this is the best position in order to keep the tap temperature constant. Said thermostat is electrically connected to the central heating boiler.

If the heat energy taken by the supplied mains water from the heating water is equal to or greater than the energy supplied by the central heating boiler, that boiler remains continuously operative.

The new appliance may be connected to all existing and new central heating boilers, which are suitable for connection with a hot water storage reservoir.

The appliance according to the invention permits tapping water having a constant temperature during a long period, during which the temperature differences are very small, smaller than 1°C. Due to the presence of the automatic mixing device the tap water temperature is not influenced by a somewhat higher or lower temperature of the primary heating water.

It is to be noted that when above a central heating boiler is mentioned, also a different heating source may be used. Particularly e.g. connection to a city heating system or to a heat pump may be practiced, in which also the superheat of the compressed gases in the primary circuit may be used for reaching a temperature of 70—75°C.

#### Claims

1. Hot water appliance, comprising a vertical

container (8) connected in the circuit of and positioned separately from a central heating boiler (12), a water circulation pump (13), being provided in the circuit (25) between the boiler (12) and the container (8), a coil (7) for tapping hot water being provided within the container (8), one end of said coil being connected to a water mains (20) and being provided adjacent to the container wall, characterized in that a sleeve (27) with a closed wall and open top has been provided within the container (8) parallel to the vertical container wall, at the other side of the coil (7) than the container wall, said sleeve extending to close the container top and being closed at the underside by a bottom (28), the flow cross-section outside the sleeve being a couple of times smaller than that within the sleeve, the central heating water supply conduit (9) opening centrally through said bottom within the sleeve (27) in the container (8), the central heating water return conduit (25) being connected to the container bottom.

2. Appliance according to claim 1, characterized in that the inlet end and the outlet end of the coil (7) are provided at the underside of the container (8).

#### Patentansprüche

1. Heisswasservorrichtung bestehend aus einem senkrechten Behälter (8), aufgenommen in Leitungsnetz eines Zentralheizungskessels (12) und gesondert von diesem Kessel angeordnet, aus einer Wasserumlaufpumpe (13) vorgesehen um Leitungsnetz (25) zwischen dem Kessel (12) und dem Behälter (8), einer Schlange (7) zum Zapfen Heisswassers, vorgesehen innerhalb des Behälters (8), von welcher Schlange ein Ende mit einer Hauptwasserleitung (20) verbunden ist und in der Nähe der Behälterwand angeordnet ist, dadurch gekennzeichnet, dass eine Büchse (27) mit geschlossener Wand und offener Oberende innerhalb des Behälters (8) und parallel zur senkrechten Behälterwand, an der anderen Seite der Schlange (7) als die Behälterwand, vorgesehen ist, welche Büchse sich bis in der Nähe des Behälteroberendes erstreckt und am unteren Ende mit einem Boden (28) abgeschlossen ist,

wobei der Durchstomsquerschnitt ausserhalb der Büchse einige Male kleiner ist als der Durchstromquerschnitt innerhalb der Büchse und die Büchse (27) einen grösseren Teil des Gesamtinhalts des Behälters (8) beaufschlägt, und die Wasserzufuhrleitung (9) für die Zentralheizung in der Mitte durch den Boden innerhalb der Büchse (27) in den Behälter (8), mündet, während die Wasserrückföhrleitung (25) für die Zentralheizung mit dem Behälterboden verbunden ist.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass das Einlassende und das Auslassende der Schlange (7) am unteren Ende des Behälters (8) vorgesehen sind.

#### Revendications

1. Appareil à eau chaude, comprenant un réservoir (8) vertical relié dans le circuit d'une chaudière de chauffage central et prévu séparé de ladite chaudière, une pompe (13) à circulation d'eau, prévue dans le circuit (25) entre la chaudière (12) et le réservoir (8), un serpentín (7) pour tirer d'eau chaude étant prévu à l'intérieur du réservoir (8), une extrémité dudit serpentín étant reliée à une amenée d'eau (20) et étant prévue proche de la paroi du réservoir, caractérisé en ce qu'une boîte (27) avec paroi fermée et extrémité supérieure ouverte a été prévue à l'intérieur de réservoir (8) en parallèle à la paroi de verticale du réservoir à l'autre cöte du serpentín (7) que la paroi du réservoir, ladite boîte s'étendent à près de l'extrémité supérieure du réservoir et étant fermée à l'extrémité inférieure par un fond (28), la section transversale de passage de la boîte étant un nombre de fois plus petite que la section transversale à l'intérieure de la boîte, la boîte (27) représentant une grande partie du volume totale du réservoir (8), la conduite (9) d'arrivée d'eau de chauffage central se terminant dans la centre à travers le dit fond à l'intérieur de la boîte (27) dans le réservoir (8), la conduite (25) de retour d'eau de chauffage central étant reliée au fond du réservoir.

2. Appareil selon la revendication 1, caractérisé en ce que l'extrémité d'entrée et l'extrémité d'échappement du serpentín (7) sont prévues au côté inférieur du réservoir (8)

50

55

60

65

4

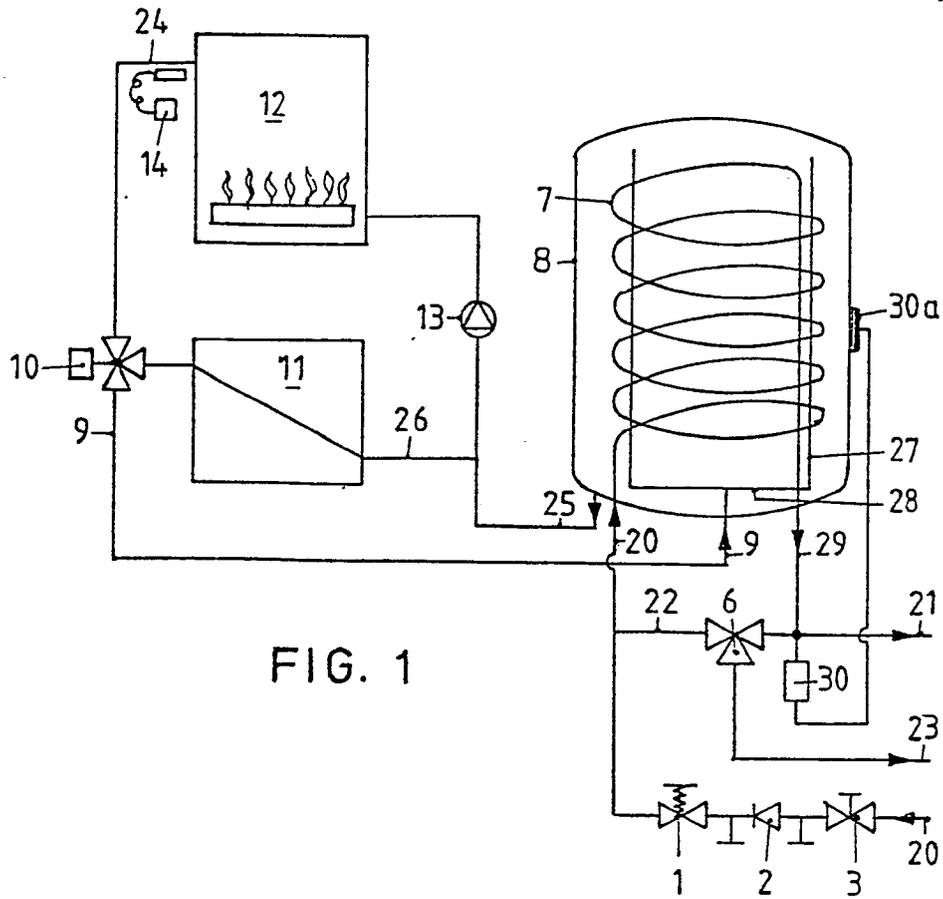


FIG. 1

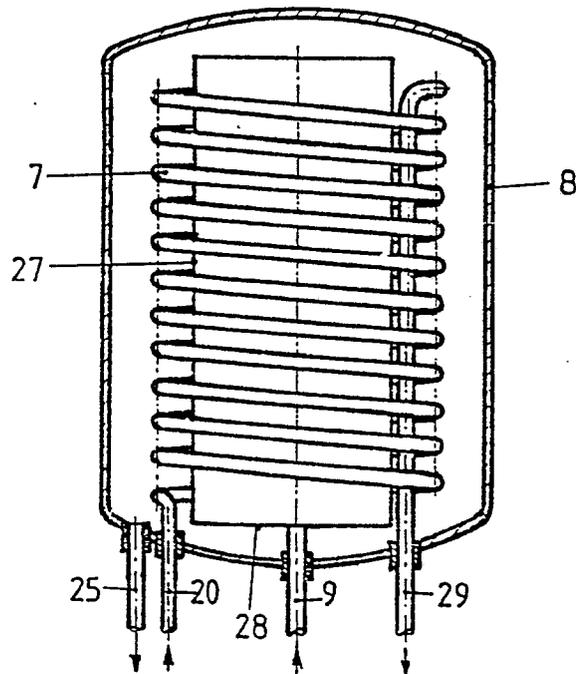


FIG. 2