(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 740 113 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
05.12.2001 Bulletin 2001/49

(51) Int Cl.[7]: **F24D 3/08**

(21) Application number: **96201018.7**

(22) Date of filing: **16.04.1996**

(54) **Combined heating boiler with improved performance**

Kombinierter Kessel mit verbesserter Leistung

Chaudière mixte avec performance améliorée

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB IT LI NL

(30) Priority: **24.04.1995 NL 1000210**

(43) Date of publication of application:
30.10.1996 Bulletin 1996/44

(73) Proprietor: **APPARATENFABRIEK WARMTEBOUW B.V.**
5741 HB Beek en Donk (NL)

(72) Inventor: **Megens, Marinus Antonius**
5463 AW Veghel (NL)

(74) Representative: **Eveleens Maarse, Pieter**
Arnold & Siedsma,
Advocaten en Octrooigemachtigden,
Sweelinckplein 1
2517 GK Den Haag (NL)

(56) References cited:
EP-A- 0 098 450
CH-A- 155 370
DE-U- 9 313 023
GB-A- 2 218 498

EP 0 740 113 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The invention relates to a combination boiler suitable for heating heating water circulating in an external heating circuit and for heating tap water, comprising:

- a heating unit for heating at least water circulating in a heating circuit;
- a buffer tank for storing a quantity of heated water.

[0002] Such combination boilers are generally known.
[0003] Understood by combination boiler is a boiler which is suitable for heating heating water circulating in an external heating circuit. This external heating circuit is generally understood to refer to a central heating circuit.
[0004] Such combination boilers are further suitable for heating tap water. In general the output of such a boiler for heating tap water is rather low. The output is sufficiently high to heat a quantity of tap water for showering, but the output is generally too low to heat a quantity of bath water, so that filling of a bath takes a relatively long time.
[0005] It is of course possible to increase the output of such a combination boiler by increasing the capacity of such combination boilers. This usually results in a total revision of the design of such boilers, which is per se expensive and for which inter alia new tools are necessary. This results in a considerable increase in cost price.
[0006] According to the prior art this problem is solved by using a buffer tank; in this buffer tank a quantity of heated tap water is stored which is supplied when tap water is demanded. Generally included in such a buffer reservoir is a heating coil which is fed with water circulating in the heating circuit.
[0007] When a large flow rate of tap water is drained, wherein the quantity of heat absorbed in the tap water per unit of time exceeds the output of the heating coil, the temperature of the heated tap water will fall after a period of time, which is of course undesirable. This is particularly undesirable since the usual norms in the house building sector stipulate that a determined flow rate of tap water of a determined temperature must be supplied in order to comply with the generally usual standard.
[0008] EP-A-0 098 450 discloses a combination boiler suitable for heating heating water circulating in an external heating circuit and for heating tap water, comprising:

- a heating unit for heating at least water circulating in a heating circuit;
- a buffer tank for storing a quantity of heated water,
- an additional heating device for the tap water, wherein the additional heating device is formed by a heat exchanger, one side of which is arranged in the heating circuit.

[0009] As a result of this additional heating device, which can have a small volume, it is possible, when the temperature of water coming from the buffer tank falls, to add to the drained tap water an amount of heat which is small but which becomes increasingly larger. It is thus possible to temporarily increase the capacity of the boiler while retaining the original boiler design.
[0010] It appears, however, that the temperature of the tap water delivered by the heat exchanger can be high leading to bums etcetera.
[0011] The aim of the invention is to provide such an apparatus, in which the tap water has a more constant temperature.
[0012] This aim is reached in that the heat exchanger is connected in parallel to the buffer tank on the side of the tap water and that the outlet of the heat exchanger is connected on the tap water side to a mixing valve, the other inlet of which is connected to the outlet of the buffer tank.
[0013] According to a first preferred embodiment the buffer tank is adapted to store a quantity of heated tap water, wherein the buffer tank is provided with a first heating element included in the heating circuit.
[0014] According to a second embodiment the buffer tank is incorporated in the heating circuit and a heat generating coil is arranged in the buffer tank, which coil is adapted to transfer heat from the buffer tank to tap water flowing through the coil.
[0015] The present invention will be elucidated hereinbelow with reference to the annexed drawings, wherein:

figure 1 is a diagram of a combination boiler according to a first embodiment of the present invention;
figure 2 is a diagram of a combination boiler according to a second embodiment of the present invention;
figure 3 is a diagram of a combination boiler according to a third embodiment of the present invention;
figure 4 shows a detail of a variant of the embodiment shown in figure 3; and
figure 5 is a diagram of a combination boiler according to a fourth embodiment of the present invention.

[0016] The diagram shown in figure 1 shows a heating unit 1 formed by a combustion space 2, above which is arranged a heat exchanger 3. In the present embodiment water circulating inside a heating circuit flows through the heat exchanger 3. This heating circuit is formed by a connection 4, for instance for water coming from a central heating installation and circulating therein. The connection 4 is connected to a three-way valve 5 which is connected via a pump 6 to heat exchanger 3. The outlet of heat exchanger 3 is connected to a central heating outlet 7. The parts described up to this point are the classic components of a typical central heating boil-

er.

[0017] The present combination boiler is further provided with a buffer tank 8 in which a heating coil 9 is arranged. The heating coil 9 is connected to the same heating circuit of which the central heating connections 4,7 form part. The feed connection of heating coil 9 is connected via a heat exchanger 10 to be discussed hereinbelow to the outlet of heating unit 1, while the outlet of heating coil 9 is connected to the three-way valve 5.

[0018] The buffer tank 8 is joined to a connection 11 for supplying cold tap water. The outlet of the buffer tank is connected to one of the inlets of a mixing valve 12. The other inlet of mixing valve 12 is joined to the connection 11 for the tap water. The mixing valve 12 is preferably formed by a thermostatic mixing valve, i.e. a mixing valve which can be controlled such that the temperature of the water delivered by the mixing valve is as constant as possible.

[0019] It is however also possible to make use of a mixing valve with fixed constrictions; this means that the ratio of the flow rate entering via both inlets is always constant.

[0020] As stated in the foregoing, a heat exchanger 10 is included in the heating circuit, this being the primary side thereof, i.e. 13.

[0021] The outlet of mixing valve 12 is connected to the secondary side 14 of heat exchanger 10.

[0022] The outlet of this secondary side 14 is joined to the connection 15 for hot tap water.

[0023] The operation of this device will now be elucidated. When the device is switched on, tap water is admitted into buffer tank 8 until it is filled. When the heating device is then switched on, the content of buffer tank 8 will be heated by hot water circulating in the heating circuit and by means of heating coil 9 until the required temperature is reached. Use is made for this purpose of a thermostatic control, which is not shown in the diagram but which is in any case widely known in the relevant field of the art.

[0024] When hot tap water is subsequently demanded, this tap water is partly taken from the buffer tank and partly taken directly from the connection 11 for cold tap water. The two quantities of water are mixed in mixing valve 12, either in a fixed mixing ratio when the mixing valve is provided with fixed constrictions or with a fixed temperature of the outflowing water, wherein various adjustments are made such that, with the increase in temperature caused by the heat exchanger 10, water having the required temperature is obtained at the tap point 15. It is pointed out here that as a result of water being drained from buffer tank 8 the temperature hereof slowly falls because the output of the heating coil 9 is exceeded by the output represented by the heated water.

[0025] It will be apparent that various changes can be made to the diagram shown in figure 1; figure 2 thus shows for instance a diagram which is slightly modified. The diagram of figure 2 differs in that heat exchanger 10 is included in the heat exchanger 3 of the heating unit. The construction is hereby simplified.

[0026] It is pointed out that an electrical heating element could be used in the configuration shown in figure 2. It is noted herein that by using an electrical heating element 17 it becomes easier to make use of a mixing valve 12 with fixed constrictions; the output of the electrical heating element can in any case then be controlled.

[0027] In the embodiment shown in figure 3 the heat ex-changer 10 is integrated into the buffer tank. This results in a more compact construction. The mixing valve 12 can then moreover be integrated into the relevant structural part.

[0028] In the shown embodiment the heating coil of the buffer tank is placed behind the heating coil of the heat exchanger in the heating circuit. This can of course also be reversed, although this results in a less attractive dimensioning.

[0029] It is also possible in this embodiment to integrate the mixing tap into the construction of the buffer tank. Particularly when the mixing tap is placed before the extra heating device, there then results a simple construction of which figure 4 shows a detail.

[0030] Finally, figure 5 shows a configuration where the function of buffer tank 8 is changed; instead of tap water as in the first three embodiments, the buffer tank of the embodiment of figure 5 contains water belonging to the heating circuit. Heating of the tap water takes place by means of the coil 9 which is arranged in buffer tank 8 and which is not used in this embodiment to heat the content of buffer tank 8. The liquid flowing through coil 9 is instead heated by the content of buffer tank 8.

[0031] The embodiment shown in figure 5 differs further in the location of mixing valve 12; in the present embodiment this is placed behind the secondary side 14 of heat exchanger 10, so that only after passing through heat exchanger 10 is the tap water mixed with the non-heated tap water. Particularly when a thermostatic mixing valve is used a more precise tap water temperature is obtained at the draw-off point; variations in the temperature increase caused by heat exchanger 10 are in any case equalized, while on the other hand the temperature at the end of the heat exchanger is higher, so that the heat exchanger is perhaps less effective.

[0032] The configuration of this embodiment otherwise corresponds with the configuration shown in figure 1. In order to control the temperature of the liquid present in buffer tank 8 use is made of a bypass 18, which is connected by means of a second three-way valve to the rest of the heating circuit.

[0033] It will otherwise be apparent that in this ■reversed■ function of the buffer tank the variations of figure 1 shown in figures 2 and 3 can also be applied to the configuration of figure 5.

[0034] It is finally pointed out that the steps shown in the diverse embodiments can be used in random combinations.

Claims

1. Combination boiler suitable for heating heating water circulating in an external heating circuit and for heating tap water, comprising:

   - a heating unit (1) for heating at least water circulating in a heating circuit;
   - a buffer tank (8) for storing a quantity of heated water,
   - an additional heating device (10) for the tap water, wherein the additional heating device is formed by a heat exchanger (10), one side (13) of which is arranged in the heating circuit,

   characterized in that the heat exchanger (10) is connected in parallel to the buffer tank (8) on the side of the tap water and that the outlet of the heat exchanger (10) is connected on the tap water side (14) to a mixing valve (12), the other inlet of which is connected to the outlet of the buffer tank (8).

2. Combination boiler as claimed in claim 1, **characterized in that** the buffer tank (8) is adapted to store a quantity of heated tap water, wherein the buffer tank (8) is provided with a first heating element included in the heating circuit.

3. Combination boiler as claimed in claim 1, **characterized in that** the buffer tank (8) is incorporated in the heating circuit and a heat generating coil (9) is arranged in the buffer tank (8), which coil (9) is adapted to transfer heat from the buffer tank (8) to tap water flowing through the coil (9).

4. Combination boiler as claimed in claim 1, 2 or 3, **characterized in that** the heat exchanger (10) is integrated into the heating unit (1).

5. Combination boiler as claimed in claim 1, 2 or 3, **characterized in that** the heat exchanger (10) is integrated into the buffer tank (8).

6. Combination boiler as claimed in one of the preceding claims, **characterized in that** the inlet of the heat exchanger (10) is connected to the outlet of the buffer tank (8), that the outlet of the heat exchanger (10) is connected to a mixing valve (12) and that the other inlet of the mixing valve (12) is directly connected to the inlet of the buffer tank (8).

7. Combination boiler as claimed in one of the preceding claims, **characterized in that** the outlet of the buffer tank (8) is connected to a first inlet of a mixing valve (12), the other inlet of which is connected to the inlet of the buffer tank (8) and that the outlet of the mixing valve (12) is connected to the inlet of the heat exchanger (1).

8. Combination boiler as claimed in one of the preceding claims, **characterized in that** the mixing valve (12) is a thermostatic mixing valve.

9. Combination boiler as claimed in one of the preceding claims, **characterized in that** the mixing valve (12) is a valve with fixed constrictions.

10. Combination boiler as claimed in any of the preceding claims, **characterized in that** the external heating circuit forms part of the heating circuit.

Patentansprüche

1. Kombinations-Heizkessel zur Erhitzung von Heizwasser, das in einem äußeren Heizkreis zirkuliert und zur Erhitzung von Leitungswasser mit den folgenden Teilen:

   - eine Heizeinheit (1) zur Erhitzung wenigstens des in einem Heizkreis zirkulierenden Wassers;

   - einen Puffertank (8) zur Speicherung einer Menge des erhitzten Wassers;

   - eine zusätzliche Heizeinrichtung (10) für das Leitungswassser, wobei die zusätzliche Heizeinrichtung durch einen Wärmeaustauscher (10) gebildet wird, von dem eine Seite (13) im Heizkreis liegt,

   dadurch gekennzeichnet, daß der Wärmeaustauscher (10) parallel zu dem Puffertank (8) auf der Leitungswasserseite angeschlossen ist und daß der Auslaß des Wärmeaustauschers (10) an der Leitungswasserseite (14) mit einem Mischventil (12) verbunden ist, dessen anderer Einlaß an den Auslaß des Puffertanks (8) angeschlossen ist.

2. Kombinations-Heizkessel nach Anspruch 1, **dadurch gekennzeichnet, daß** der Puffertank (8) eine bestimmte Menge von erhitztem Leitungswasser speichert, wobei der Puffertank (8) mit einem ersten Heizelement versehen ist, das im Heizkreis liegt.

3. Kombinations-Heizkessel nach Anspruch 1, **dadurch gekennzeichnet, daß** der Puffertank (8) im Heizkreis liegt und eine wärmeerzeugende Spule (9) im Puffertank (8) liegt, wobei diese Spule (9) Wärme aus dem Puffertank (8) auf das Leitungswasser überträgt, das die Spule (9) durchströmt.

4. Kombinations-Heizkessel nach den Ansprüchen 1,

2 oder 3,
dadurch gekennzeichnet, daß der Wärmeaustauscher (10) in die Heizeinheit (1) integriert ist.

5. Kombinations-Heizkessel nach den Ansprüchen 1, 2 oder 3,
dadurch gekennzeichnet, daß der Wärmeaustauscher (10) im Puffertank (8) integriert ist.

6. Kombinations-Heizkessel nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß der Einlaß des Wärmeaustauschers (10) mit dem Auslaß des Puffertanks (8) verbunden ist, daß der Auslaß des Wärmeaustauschers (10) mit einem Mischventil (12) verbunden ist, und daß der andere Einlaß des Mischventils (12) direkt mit dem Einlaß des Puffertanks (8) verbunden ist.

7. Kombinations-Heizkessel nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß der Auslaß des Puffertanks (8) an einen ersten Einlaß eines Mischventils (12) angeschlossen ist, dessen anderer Einlaß mit dem Einlaß des Puffertanks (8) verbunden ist, und daß der Auslaß des Mischventils (12) an den Einlaß des Wärmeaustauschers (10) angeschlossen ist.

8. Kombinations-Heizkessel nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß das Mischventil (12) ein thermostatisches Mischventil ist.

9. Kombinations-Heizkessel nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß das Mischventil (12) ein Ventil mit festen Durchlaßeinschnürungen ist.

10. Kombinations-Heizkessel nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß der äußere Heizkreis einen Teil des Heizkreises bildet.

Revendications

1. Chaudière mixte appropriée pour chauffer de l'eau de chauffage circulant dans un circuit de chauffage externe et pour chauffer de l'eau du robinet, comprenant :

- un module de chauffage (1) destiné à chauffer au moins de l'eau circulant dans un circuit de chauffage ;
- un réservoir tampon (8) destiné à contenir une certaine quantité d'eau chauffée,
- un dispositif de chauffage supplémentaire (10) pour l'eau du robinet, le dispositif de chauffage supplémentaire étant formé par un échangeur de chaleur (10), dont un côté (13) est agencé dans le circuit de chauffage,

caractérisée en ce que l'échangeur de chaleur (10) est raccordé en parallèle au réservoir tampon (8) du côté eau du robinet, et **en ce que** la sortie de l'échangeur de chaleur (10) est raccordée, du côté eau du robinet (14), à une vanne mélangeuse (12) dont l'autre entrée est raccordée à la sortie du réservoir tampon (8).

2. Chaudière mixte selon la revendication 1, **caractérisée en ce que** le réservoir tampon (8) est apte à contenir une certaine quantité d'eau du robinet chauffée, et **en ce que** le réservoir tampon (8) est pourvu d'un premier élément chauffant inclus dans le circuit de chauffage.

3. Chaudière mixte selon la revendication 1, **caractérisée en ce que** le réservoir tampon (8) est incorporé dans le circuit de chauffage, et un serpentin générateur de chaleur (9) est agencé dans le réservoir tampon (8), lequel serpentin (9) est apte à transférer de la chaleur du réservoir tampon (8) à l'eau du robinet s'écoulant à travers le serpentin (9).

4. Chaudière mixte selon la revendication 1, 2 ou 3, **caractérisée en ce que** l'échangeur de chaleur (10) est intégré dans le module de chauffage (1).

5. Chaudière mixte selon la revendication 1, 2 ou 3, **caractérisée en ce que** l'échangeur de chaleur (10) est intégré dans le réservoir tampon (8).

6. Chaudière mixte selon l'une quelconque des revendications précédentes, **caractérisée en ce que** l'entrée de l'échangeur de chaleur (10) est raccordée à la sortie du réservoir tampon (8), **en ce que** la sortie de l'échangeur de chaleur (10) est raccordée à une vanne mélangeuse (12), et **en ce que** l'autre entrée de la vanne mélangeuse (12) est raccordée directement à l'entrée du réservoir tampon (8).

7. Chaudière mixte selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la sortie du réservoir tampon (8) est raccordée à une première entrée d'une vanne mélangeuse (12), dont l'autre entrée est raccordée à l'entrée du réservoir tampon (8) et **en ce que** la sortie de la vanne mélangeuse (12) est raccordée à l'entrée de l'échangeur de chaleur (1).

8. Chaudière mixte selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la

vanne mélangeuse (12) est une vanne mélangeuse thermostatique.

9. Chaudière mixte selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la vanne mélangeuse (12) est une vanne à étranglements fixes.

10. Chaudière mixte selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le circuit de chauffage externe fait partie du circuit de chauffage.

FIG.1

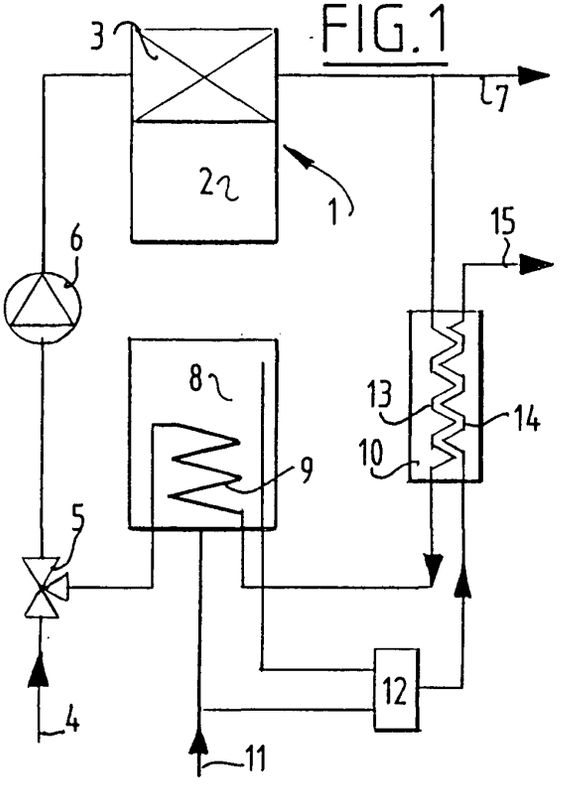


FIG.2

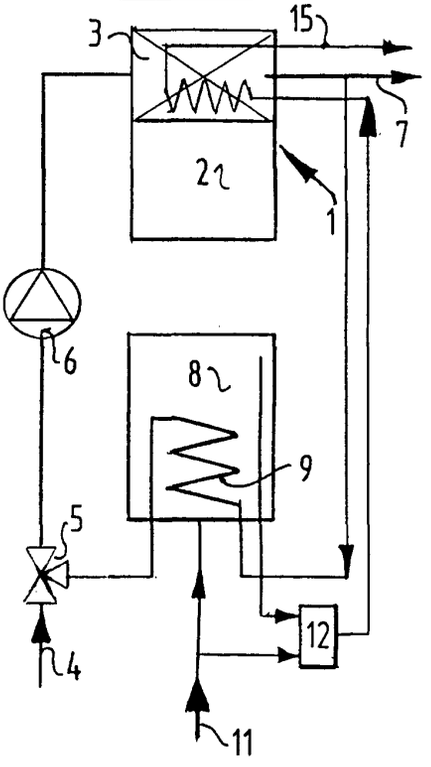
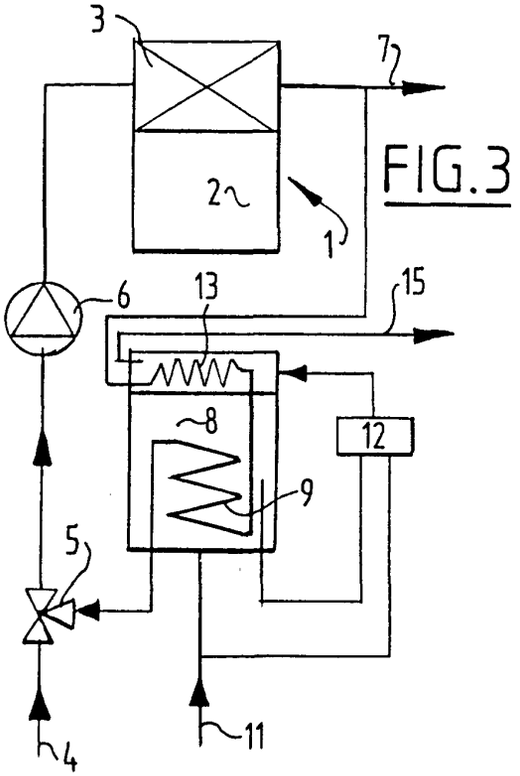


FIG.3



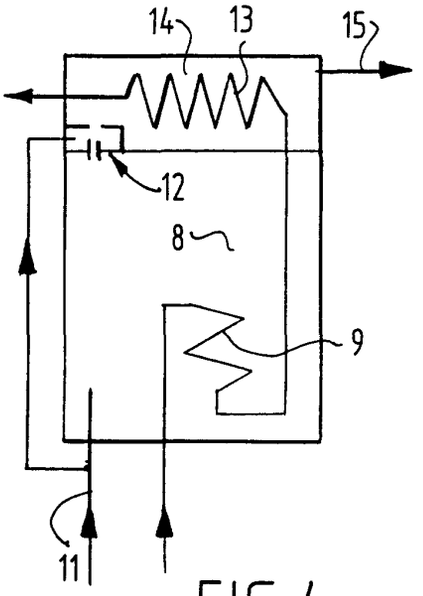


FIG.4

FIG.5