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(54) **GAS BOILER**

GASTHERME

CHAUDIERE A GAZ

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Description

TECHNICAL FIELD

[0001] The present invention relates to a gas boiler.

[0002] More specifically, the present invention relates to a wall-mounted combination gas boiler, i.e. a wall-mounted boiler for supplying both hot water to a heating circuit - hereinafter referred to as heating water - and domestic hot water.

BACKGROUND ART

[0003] A wall-mounted combination gas boiler normally comprises a heating circuit, along which hot heating water is conducted; and a domestic circuit, along which domestic water is conducted. The heating circuit is connected to an external heating circuit equipped with radiators; and the domestic circuit is connected at one end to the water mains or other domestic water source, and, at the other end, to a circuit for distributing hot domestic water to one or more user devices. A wall-mounted combination gas boiler also comprises a gas burner, and at least one heat exchanger for transferring the heat produced by the burner to the heating water and domestic water.

[0004] When hot domestic water is drawn off by a user device, a boiler of the above type operates as follows: on detecting domestic water flow, a flowmeter located along the domestic circuit lights the burner; and the domestic water is heated as it flows through the heat exchanger, and is fed to the user device. The wall-mounted gas boiler described above has several drawbacks, by failing to supply the domestic water user device immediately with water at a predetermined temperature. That is, between the water being supplied and reaching a predetermined temperature, there is a transient period during which the domestic water is supplied at gradually increasing temperature until the predetermined temperature is reached.

[0005] To eliminate the above drawback, Patent EP 719,989 proposes a wall-mounted combination gas boiler equipped with a storage tank, located along the domestic circuit, downstream from the heat exchanger, and with an auxiliary heating device for keeping the domestic water within a given temperature range inside the tank. According to the above patent and patent application, the auxiliary heating device is defined by an electric resistor inside the tank; a temperature sensor; and a control unit for activating the resistor as a function of the temperature detected. This solution is practical from the manufacturing standpoint, but expensive in terms of electricity consumption. In an alternative embodiment described in both the above patent and patent application, the auxiliary heating device comprises an auxiliary heat exchanger inside the tank; a temperature sensor; and a control unit for selectively diverting hot water to the auxiliary heat exchanger, which is defined by a coil fed by the heating circuit. This solution is cheaper to run, but has drawbacks as regards actual manufacture. That is, branching a conduit from the heating circuit into the tank complicates the tank and increases the number of components for assembly. In which connection, it should be borne in mind that the various assembled component parts must ensure correct hydraulic sealing and conform with strict safety regulations. Moreover, a hole in the coil would connect the heating circuit to the domestic circuit, thus seriously impairing the boiler as a whole.

DISCLOSURE OF INVENTION

[0006] It is an object of the present invention to provide a combination gas boiler equipped with a storage tank, and which provides for keeping domestic water inside the storage tank within a given temperature range in a straightforward, low-cost manner, both functionally and constructionwise.

[0007] According to the present invention, there is provided a combination gas boiler for producing heating water and domestic water, the boiler comprising a heating circuit and a domestic circuit, a gas burner, a heat exchanger located along the domestic circuit, and at least one domestic water storage tank located downstream from said heat exchanger; the boiler being characterized by comprising a pump incorporated in said tank, and a domestic recirculating branch for selectively conducting domestic water from the tank to said heat exchanger.

[0008] According to the present invention, no auxiliary heating devices are provided, those already forming part of the boiler being used. Moreover, integrating the pump in the tank greatly simplifies the recirculating branch, and minimizes the number of component parts and assembly work required to implement recirculation.

[0009] The present invention also relates to a method of operating a gas boiler.

[0010] According to the present invention, there is provided a method of operating a gas boiler as claimed in any one of Claims 1 to 19, wherein a temperature probe is located along the domestic circuit between said heat exchanger and said tank; the method being characterized by comprising the steps of:

- recirculating domestic water through said tank and said heat exchanger at predetermined time intervals;
- acquiring a first temperature, related to the temperature of the domestic water, by means of said temperature probe during the recirculating step;
- comparing the first temperature with a set temperature;
- lighting the burner when the first temperature is below the set temperature, and continuing recirculation of the domestic water.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] A number of non-limiting embodiments of the

present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view, with parts removed for clarity, of a gas boiler in accordance with the present invention and connected to external circuits;

Figure 2 shows a larger-scale view in perspective of a storage tank of the Figure 1 boiler;

Figure 3 shows a larger-scale section, with parts removed for clarity, of a detail of the Figure 2 tank;

Figures 4 and 5 show larger-scale exploded views in perspective of a detail of the Figure 2 tank;

Figure 6 shows a schematic view, with parts removed for clarity, of a variation of the Figure 1 boiler.

BEST MODE FOR CARRYING OUT THE INVENTION

[0012] Number 1 in Figure 1 indicates as a whole a wall-mounted combination gas boiler for supplying hot heating water and hot domestic water. Boiler 1 comprises a casing indicated by a dot-and-dash line in Figure 1, and is connected to an external heating circuit 2 equipped with radiators indicated schematically by 3, to the water mains 4, to a domestic water user device 5, and to the gas mains 6. Inside the casing, boiler 1 comprises a heating circuit 7, a domestic circuit 8, a burner 9, and a bithermal exchanger 10 for exchanging combustion-generated heat with both the heating water circulating in circuit 7, and the domestic water circulating in domestic circuit 8.

[0013] Heating circuit 7 comprises a delivery branch 11, a return branch 12, and a bypass branch 13 connecting branches 11 and 12. Return branch 12 is fitted with a heating water circulating pump 14, and an expansion vessel 15; and branch 13 is fitted with a bypass valve 16.

[0014] Domestic circuit 8 comprises a branch 17 for feeding cold domestic water to exchanger 10; a branch 18 for feeding hot domestic water from exchanger 10 to user device 5; a flowmeter 19 along branch 17; a storage tank 20 along branch 18; and a domestic recirculating branch 21 located between tank 20 and branch 17. That is, branch 21 connects tank 20 directly to branch 17, and comprises a non-return valve 22, so that domestic water only flows from tank 20 to branch 17. Circuit 8 also comprises a temperature probe 23 located along branch 18, between heat exchanger 10 and tank 20; and boiler 1 comprises an insulating shell 24 surrounding tank 20.

[0015] With reference to Figure 2, tank 20 extends along an axis A, and comprises a cup-shaped body 25 open at one end; and a pump 26 fitted to, so as to form the cap of, cup-shaped body 25. Cup-shaped body 25 is made of plastic material, extends along axis A, and comprises an end wall 27, a truncated-cone-shaped lateral wall 28 (tapering at an angle of close to zero), longitudinal stiffening ribs 29, and transverse stiffening ribs 30. Three fittings 31, 32, 33 are located along cup-shaped body 25 to connect tank 20 to branches 18 and 21. More specifically, fitting 31 is located along wall 28, close to wall 27, to connect tank 20 to branch 18 from exchanger 10, and therefore defines a domestic water inlet of tank 20; fitting 32 is located at pump 26 to connect branch 18 supplying user device 5, and defines a domestic water outlet of tank 20; and fitting 33 is located on the opposite side to fitting 32 and at pump 26 to connect tank 20 to recirculating branch 21, and defines a further domestic water outlet of tank 20. With reference to Figures 3 and 4, body 25 comprises, at the open end, a flange 34 having, inside, a shoulder 35 perpendicular to axis A, a cylindrical wall 36, and a groove 36A (Figure 4) extending along wall 36 and parallel to axis A, so as to form a seat 37 for pump 26.

[0016] With reference to Figures 4 and 5, pump 26 comprises a motor assembly 38 and a diffuser 39, which are fitted to cup-shaped body 25 to form tank 20. Motor assembly 38 comprises a synchronous electric motor 40; a shaft 41 (Figure 3); a radial-blade impeller 42; and a one-piece support 43 incorporating motor 40, and from which shaft 41 projects partly, and impeller 42 projects completely. Motor assembly 38 comprises a rotor 44 incorporated in support 43. In other words, support 43 comprises a shell 43A enclosing rotor 44; and a flange 45, from which impeller 42 projects, and along which is located a cylindrical projection 46 extending about axis A. That is, shell 43A and flange 45 are formed in one piece with no openings, and are made of plastic material permeable to electromagnetic waves, so that, in addition to supporting the component parts of motor assembly 38, support 43 also acts as a cap for cup-shaped body 25.

[0017] Diffuser 39 is formed in one piece of plastic material, is cup-shaped, and comprises a flat wall 47 perpendicular to axis A, and from which projects a cylindrical outer wall 48 having a rib 49 parallel to axis A. Diffuser 39 also comprises a volute 50 projecting on the opposite side to wall 48, and comprising a central suction hole 51 coaxial with axis A, and a lateral delivery hole 52 for connecting volute 50 to fitting 33. Diffuser 39 is housed inside seat 37 with wall 47 resting on shoulder 35, with wall 48 contacting wall 36, and with rib 49 engaging groove 36A to define a prismatic coupling and a one-only position of diffuser 39 with respect to cup-shaped body 25, so as to keep delivery hole 52 facing and connected to fitting 33. Flange 45 of motor assembly 38 is fitted to flange 34 of cup-shaped body 25 so that impeller 42 is housed inside volute 50, and cylindrical projection 46 contacts the inner face of wall 48, and so that the top end of wall 48, wall 36, flange 45, and projection 46 form a closed cavity housing a seal 53.

[0018] With reference to Figure 1, boiler 1 also comprises a control unit 54, which receives signals from flowmeter 19 and probe 23, provides for on-off control of burner 9 and motor 40 of pump 26, and provides for setting external data, such as the desired domestic hot water temperature.

[0019] In actual use, boiler 1 operates as follows. When no water is being drawn by user device 5, tank 20 contains a mass of relatively hot domestic water heated in the course of the previous draw. On account of inevi-

table heat losses, however, the temperature of the domestic water in tank 20 gradually falls. At regular intervals, therefore, pump 26 is activated, and the domestic water is recirculated through exchanger 10 and tank 20, while probe 23 detects a temperature T_R related to the domestic water temperature. At this step, the temperature values T_R are compared with a set value T_{SET}; and, when the detected temperature T_R is below the set temperature T_{SET}, burner 9 is lit, and pump 26 is kept running until temperature T_R reaches the set temperature T_{SET}. When this occurs, burner 9 is extinguished, and pump 26 continues recirculating the water for a predetermined time to acquire the residual heat from exchanger 10. In winter, simply recirculating the domestic water through bithermal exchanger 10 may be sufficient to restore the water to the set temperature. The recirculating step to determine whether the heat of exchanger 10 is sufficient to restore the required temperature conditions lasts about 30 seconds. If within this time the temperature is not restored, as determined by probe 23, control unit 54 provides for lighting burner 9 for a time period depending on the capacity of tank 20 and pump 26, and pump 26 continues recirculating the domestic water as described previously. Conversely, if water is being drawn off by user device 5, the signal from flowmeter 19 stops pump 26 or prevents the temperature-restoring operations from being started.

[0020] With reference to the variation in Figure 6, number 55 indicates a boiler mostly comprising component parts similar to those of boiler 1, and which are indicated in Figure 6 using the same reference numbers as in Figure 1.

[0021] Boiler 55 substantially differs from boiler 1 by bithermal exchanger 10 being replaced by a primary exchanger 56, which provides solely for heating heating water, and by a secondary exchanger 57 for transferring heat from heating circuit 7 to domestic circuit 8. In this case, tank 20 and probe 23 are located along branch 18 of domestic circuit 8, downstream from secondary exchanger 57. Heating circuit 7 comprises a recirculating branch 58 connecting branch 11 to exchanger 57; a branch 59 connecting exchanger 57 to branch 12; and an electrically controlled three-way valve 60 at the junction of branches 59 and 12. In this variation, control unit 54 is connected to three-way valve 60 and to pump 14 to regulate recirculation and heating of the heating water through exchangers 56 and 57. In exchanger 57, the heating water yields heat to the domestic water.

[0022] Operation differs from that described above by the temperature in tank 20 being maintained by recirculating the heating water and the domestic water. In all other respects, the temperature of the water in tank 20 is maintained as described with reference to the previous embodiment.

[0023] The best results have been found to be achieved using a tank 20 of preferably 2 to 5 litre capacity, a pump 26 of 2 to 6 litre/minute capacity, and a synchronous electric motor 40 of about 20 W, which provide for extremely short temperature-restoring cycles with very little electricity consumption.

[0024] In addition to the advantages already mentioned, it should be pointed out that tank 20, by incorporating pump 26, also has the advantage that hydraulic testing of tank 20 actually also comprises hydraulic testing of pump 26. Moreover, tank 20 is compact and made of plastic material.

Claims

1. A combination gas boiler for producing heating water and domestic water, the boiler (1; 55) comprising a heating circuit (7) and a domestic circuit (8), a gas burner (9), a heat exchanger (10; 57) located along the domestic circuit (8), and at least one domestic water storage tank (20) located along the domestic circuit (8), downstream from said heat exchanger (10; 57); the boiler (1; 55) being **characterized by** comprising a recirculating pump (26) incorporated in said tank (20), and a domestic recirculating branch (21) for selectively conducting domestic water from the tank (20) to said heat exchanger (10; 57).

2. A boiler as claimed in Claim 1, **characterized in that** said tank (20) comprises a cup-shaped body (25), and a cap defined by said recirculating pump (26).

3. A boiler as claimed in Claim 2, **characterized in that** the cup-shaped body (25) comprises a first flange (34) which fits onto said recirculating pump (26).

4. A boiler as claimed in Claim 2 or 3, **characterized in that** said cup-shaped body (25) comprises an inlet fitting (31), a first outlet fitting (32), and a second outlet fitting (33).

5. A boiler as claimed in Claims 3 and 4, **characterized in that** the first and second outlet fitting (32, 33) are located at said first flange (34).

6. A boiler as claimed in Claim 5, **characterized in that** the inlet fitting (31) is located along said cup-shaped body (25), at the opposite end to said first flange (34).

7. A boiler as claimed in any one of Claims 2 to 6, **characterized in that** said cup-shaped body (25) is made of plastic material.

8. A boiler as claimed in Claim 7, **characterized in that** the cup-shaped body (25) comprises stiffening ribs (29, 30).

9. A boiler as claimed in any one of Claims 3 to 8, **characterized in that** said recirculating pump (26) comprises a motor assembly (38) and a diffuser (39), which are fitted to said cup-shaped body (25).

10. A boiler as claimed in Claim 9, **characterized in that** said cup-shaped body (25) comprises a seat (37) at said first flange (34) for housing said diffuser (39).

11. A boiler as claimed in Claim 10, **characterized in that** said diffuser (39) comprises a central suction hole (51) and a lateral delivery hole (52).

12. A boiler as claimed in Claim 11, **characterized in that** said seat (37) and said diffuser (39) comprise respective elements for defining a prismatic coupling (36, 36A, 48, 49) and aligning the delivery hole (52) with the second outlet fitting (33).

13. A boiler as claimed in any one of Claims 10 to 12, **characterized in that** said motor assembly (38) comprises a supporting member (43) having a second flange (45) connectable to said first flange (34).

14. A boiler as claimed in Claim 13, **characterized by** comprising a seal (53) interposed between the cup-shaped body (25), the diffuser (39), and the motor assembly (38).

15. A boiler as claimed in any one of the foregoing Claims, **characterized in that** said recirculating pump (26) is powered by a synchronous electric motor (40).

16. A boiler as claimed in any one of the foregoing Claims, **characterized in that** said heat exchanger is a bithermal exchanger (10).

17. A boiler as claimed in any one of the foregoing Claims, **characterized in that** said heat exchanger is a secondary exchanger (57) for transferring heat from the heating circuit (7) to the domestic circuit (8).

18. A boiler as claimed in any one of the foregoing Claims, **characterized by** comprising a feed branch (17) for feeding domestic water to said heat exchanger (10; 57); said domestic recirculating branch (21) connecting the tank (20) directly to said feed branch (17).

19. A boiler as claimed in Claim 18, **characterized by** comprising a non-return valve (22) along said domestic recirculating branch (21), so that domestic water is only fed along said domestic recirculating branch (21) from the tank (20) to said heat exchanger (10; 57).

20. A method of operating a gas boiler as claimed in any one of Claims 1 to 19, wherein a temperature probe (23) is located along the domestic circuit (8) between said heat exchanger (10; 57) and said tank (20); the method being **characterized by** comprising the steps of:

- recirculating domestic water through said tank (20) and said heat exchanger (10; 57) at predetermined time intervals;
- acquiring a first temperature (T_R), related to the temperature of the domestic water, by means of said probe (23) during the recirculating step;
- comparing the first temperature (T_R) with a set temperature (T_{SET});
- lighting the burner (9) when the first temperature (T_R) is below the set temperature (T_{SET}), and continuing recirculation of the domestic water.

Patentansprüche

1. Kombinations-Gasheizkessel zum Erzeugen von Heizwasser und Haushaltswasser, wobei der Heizkessel (1; 55) einen Heizkreis (7) und einen Haushaltswasserkreis (8), einen Gasbrenner (9), einen Wärmetauscher (10; 57), der an dem Haushaltswasserkreis (8) angeordnet ist, und wenigstens einen Haushaltswasservorratsbehälter (20) umfasst, der an dem Haushaltswasserkreis (8) stromab von dem Wärmetauscher (10; 57) angeordnet ist, wobei der Heizkessel (1; 55) **dadurch gekennzeichnet ist, dass** er eine Rückführpumpe (26), die in den Behälter (20) integriert ist, sowie eine Haushaltswasser-Rückführabzweigung (21) zum selektiven Leiten von Haushaltswasser von dem Behälter (20) zu dem Wärmetauscher (10; 57) umfasst.

2. Heizkessel nach Anspruch 1, **dadurch gekennzeichnet, dass** der Behälter (20) einen schalenförmigen Körper (25) und eine Kappe umfasst, die durch die Rückführpumpe (26) gebildet wird.

3. Heizkessel nach Anspruch 2, **dadurch gekennzeichnet, dass** der schalenförmige Körper (25) einen ersten Flansch (34) umfasst, der auf die Rückführpumpe (26) passt.

4. Heizkessel nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** der schalenförmige Körper (25) ein Einlass-Anschlussteil (31), ein erstes Auslass-Anschlussteil (32) und ein zweites Auslass-Anschlussteil (33) umfasst.

5. Heizkessel nach den Ansprüchen 3 und 4, **dadurch gekennzeichnet, dass** sich das erste und das zweite Auslass-Anschlussteil (32, 33) an dem ersten Flansch (34) befinden.

6. Heizkessel nach Anspruch 5, **dadurch gekennzeichnet, dass** das Einlass-Anschlussteil (33) an dem schalenförmigen Körper (25) an dem dem ersten Flansch (34) gegenüberliegenden Ende ange-

ordnet ist.

7. Heizkessel nach einem der Ansprüche 2 bis 6, **dadurch gekennzeichnet, dass** der schalenförmige Körper (25) aus Kunststoffmaterial besteht.

8. Heizkessel nach Anspruch 7, **dadurch gekennzeichnet, dass** der schalenförmige Körper (25) Versteifungsrippen (29, 30) umfasst.

9. Heizkessel nach einem der Ansprüche 3 bis 8, **dadurch gekennzeichnet, dass** die Rückführpumpe (26) eine Motorbaugruppe (38) und einen Diffusor (39) umfasst, die an dem schalenförmigen Körpers (25) angebracht sind.

10. Heizkessel nach Anspruch 9, **dadurch gekennzeichnet, dass** der schalenförmige Körper (25) eine Aufnahme (37) an dem ersten Flansch (34) zum Aufnehmen des Diffusors (39) umfasst.

11. Heizkessel nach Anspruch 10, **dadurch gekennzeichnet, dass** der Diffusor (39) ein mittiges Ansaugloch (51) und ein seitliches Abgabeloch (52) umfasst.

12. Heizkessel nach Anspruch 11, **dadurch gekennzeichnet, dass** die Aufnahme (37) und der Diffusor (39) jeweils Elemente umfassen, die eine prismatische Kupplung (36, 36A, 48, 49) bilden und das Ausgabeloch (52) auf das zweite Auslass-Anschlussteil (33) ausrichten.

13. Heizkessel nach einem der Ansprüche 10 bis 12, **dadurch gekennzeichnet, dass** die Motorbaugruppe (38) ein Trageelement (43) umfasst, das einen zweiten Flansch (45) aufweist, der mit dem ersten Flansch (34) verbunden werden kann.

14. Heizkessel nach Anspruch 13, **dadurch gekennzeichnet, dass** er eine Dichtung (53) umfasst, die zwischen dem schalenförmigen Körper (25), dem Diffusor (39) und der Motorbaugruppe (38) angeordnet ist.

15. Heizkessel nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Rückführpumpe (26) durch einen Synchron-Elektromotor (40) angetrieben wird.

16. Heizkessel nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Wärmetauscher ein bithermaler Tauscher (10) ist.

17. Heizkessel nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Wärmetauscher ein sekundärer Tauscher (57) zum Übertragen von Wärme von dem Heizkreis (7) auf den Haushaltswasserkreis (8) ist.

18. Heizkessel nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** er eine Zuführ-Abzweigung (17) zum Zuführen von Haushaltswasser zu dem Wärmetauscher (10; 57) umfasst, wobei die Haushaltswasser-Rückführabzweigung (21) den Behälter (20) direkt mit der Zuführ-Abzweigung (17) verbindet.

19. Heizkessel nach Anspruch 18, **dadurch gekennzeichnet, dass** er ein Rückschlagventil (22) an der Haushaltswasser-Rückführabzweigung (21) umfasst, so dass Haushaltswasser nur in der Haushaltswasser-Rückführabzweigung (21) von dem Behälter (20) zu dem Wärmetauscher (10; 57) zugeführt wird.

20. Verfahren zum Betreiben eines Gasheizkessels nach einem der Ansprüche 1 bis 19, wobei eine Temperatursonde (23) an dem Haushaltswasserkreis (8) zwischen dem Wärmetauscher (10; 57) und dem Behälter (20) angeordnet ist und das Verfahren **dadurch gekennzeichnet ist, dass** es die folgenden Schritte umfasst:

    Rückführen von Haushaltswasser über den Behälter (20) und den Wärmetauscher (10; 57) in vorgegebenen Zeitintervallen,
    Ermitteln einer ersten Temperatur (T_R), die sich auf die Temperatur des Haushaltswassers bezieht, mittels der Sonde (23) während des Rückführschrittes;
    Vergleichen der ersten Temperatur (T_R) mit einer Soll-Temperatur (T_{SET});
    Zünden des Brenners (9), wenn die erste Temperatur (T_R) unter der Soll-Temperatur (T_{SET}) liegt, und Fortsetzen des Rückführens des Haushaltswassers.

Revendications

1. Chaudière à gaz combinée destinée à produire de l'eau de chauffage et de l'eau d'alimentation domestique, la chaudière (1 ; 55) comprenant un circuit de chauffage (7) et un circuit d'alimentation domestique (8), un brûleur à gaz (9), un échangeur de chaleur (10 ; 57) situé le long du circuit d'alimentation domestique (8) et au moins un réservoir de stockage d'eau d'alimentation domestique (20) situé le long du circuit d'alimentation domestique (8), en aval dudit échangeur de chaleur (10 ; 57), la chaudière (1 ; 55) étant **caractérisée en ce qu'**elle comprend une pompe de recirculation (26) incorporée dans ledit réservoir (20) et une dérivation de mise en recirculation d'alimentation domestique (21) destinée à diriger sélectivement l'eau d'alimentation domestique

depuis le réservoir (20) vers ledit échangeur de chaleur (10 ; 57) .

2. Chaudière selon la revendication 1, **caractérisée en ce que** ledit réservoir (20) comprend un corps en forme de cuvette (25) et une coiffe définie par ladite pompe de recirculation (26).

3. Chaudière selon la revendication 2, **caractérisée en ce que** le corps en forme de cuvette (25) comprend une première bride (34) qui s'adapte sur ladite pompe de recirculation (26).

4. Chaudière selon la revendication 2 ou 3, **caractérisée en ce que** ledit corps en forme de cuvette (25) comprend un raccord d'entrée (31), un premier raccord de sortie (32) et un second d'orifice de sortie (33).

5. Chaudière selon les revendications 3 et 4, **caractérisée en ce que** les premier et second raccords de sortie (32, 33) sont situés au niveau de ladite première bride (34).

6. Chaudière selon la revendication 5, **caractérisée en ce que** le raccord d'entrée (31) est situé le long dudit corps en forme de cuvette (25) à l'extrémité opposée à ladite première bride (34).

7. Chaudière selon l'une quelconque des revendications 2 à 6, **caractérisée en ce que** ledit corps en forme de cuvette (25) est constitué d'une matière plastique.

8. Chaudière selon la revendication 7, **caractérisée en ce que** le corps en forme de cuvette (25) comprend des rainures de renfort (29, 30).

9. Chaudière selon l'une quelconque des revendications 3 à 8, **caractérisée en ce que** ladite pompe de recirculation (26) comprend un groupe moteur (38) et un diffuseur (39) qui sont adaptés audit corps en forme de cuvette (25).

10. Chaudière selon la revendication 9, **caractérisée en ce que** ledit corps en forme de cuvette (25) comprend un siège (37) au niveau de ladite première bride (34) afin de loger ledit diffuseur (39).

11. Chaudière selon la revendication 10, **caractérisée en ce que** ledit diffuseur (39) comprend un alésage central d'aspiration (51) et un alésage latéral de distribution (52).

12. Chaudière selon la revendication 11, **caractérisée en ce que** ledit siège (37) et ledit diffuseur (39) comprennent des éléments respectifs destinés à définir un raccordement en forme de prisme (36, 36A, 48, 49) et à aligner l'alésage de distribution (52) avec le second raccord de sortie (33).

13. Chaudière selon l'une quelconque des revendications 10 à 12, **caractérisée en ce que** ledit groupe moteur (38) comprend un élément de support (43) comportant une seconde bride (45) pouvant être reliée à ladite première bride (34).

14. Chaudière selon la revendication 13, **caractérisée en ce qu'**elle comprend un joint (53) intercalé entre le corps en forme de cuvette (25), le diffuseur (39) et groupe moteur (38).

15. Chaudière selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ladite pompe de recirculation (26) est alimentée par un moteur électrique synchrone (40).

16. Chaudière selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit échangeur de chaleur est un échangeur bithermique (10).

17. Chaudière selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit échangeur de chaleur est un échangeur secondaire (57) destiné à transférer de la chaleur depuis le circuit de chauffage (7) jusqu'au circuit d'alimentation domestique (8).

18. Chaudière selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend une dérivation d'alimentation (17) destinée à alimenter en eau d'alimentation domestique ledit échangeur de chaleur (10 ; 57), ladite dérivation de mise en recirculation d'alimentation domestique (21) reliant le réservoir (20) directement à ladite dérivation d'alimentation (17).

19. Chaudière selon la revendication 18, **caractérisée en ce qu'**elle comprend une vanne anti-retour (22) le long de ladite dérivation de mise en recirculation d'alimentation domestique (21), de telle sorte que l'eau d'alimentation domestique ne soit fournie que le long de ladite dérivation de mise en recirculation d'alimentation domestique (21) à partir du réservoir (20) jusqu'audit échangeur de chaleur (10 ; 57).

20. Procédé de mise en oeuvre d'une chaudière à gaz selon l'une quelconque des revendications 1 à 19, dans lequel une sonde de température (23) est située le long du circuit d'alimentation domestique (8) entre ledit échangeur de chaleur (10 ; 57) et ledit réservoir (20), le procédé étant **caractérisé en ce qu'**il comprend les étapes de :

- mise en recirculation de l'eau d'alimentation

domestique dans ledit réservoir (20) et ledit échangeur de chaleur (10 ; 57) à des intervalles de temps prédéterminés,

- acquisition d'une première température (T_R), liée à la température de l'eau d'alimentation domestique, au moyen de ladite sonde (23) pendant l'étape de mise en recirculation,
- comparaison de la première température (T_R) à une température déterminée (T_{SET}),
- allumage du brûleur (9) lorsque la première température (T_R) se trouve en dessous de la température déterminée (T_{SET}) et poursuite de la mise en recirculation de l'eau d'alimentation domestique.

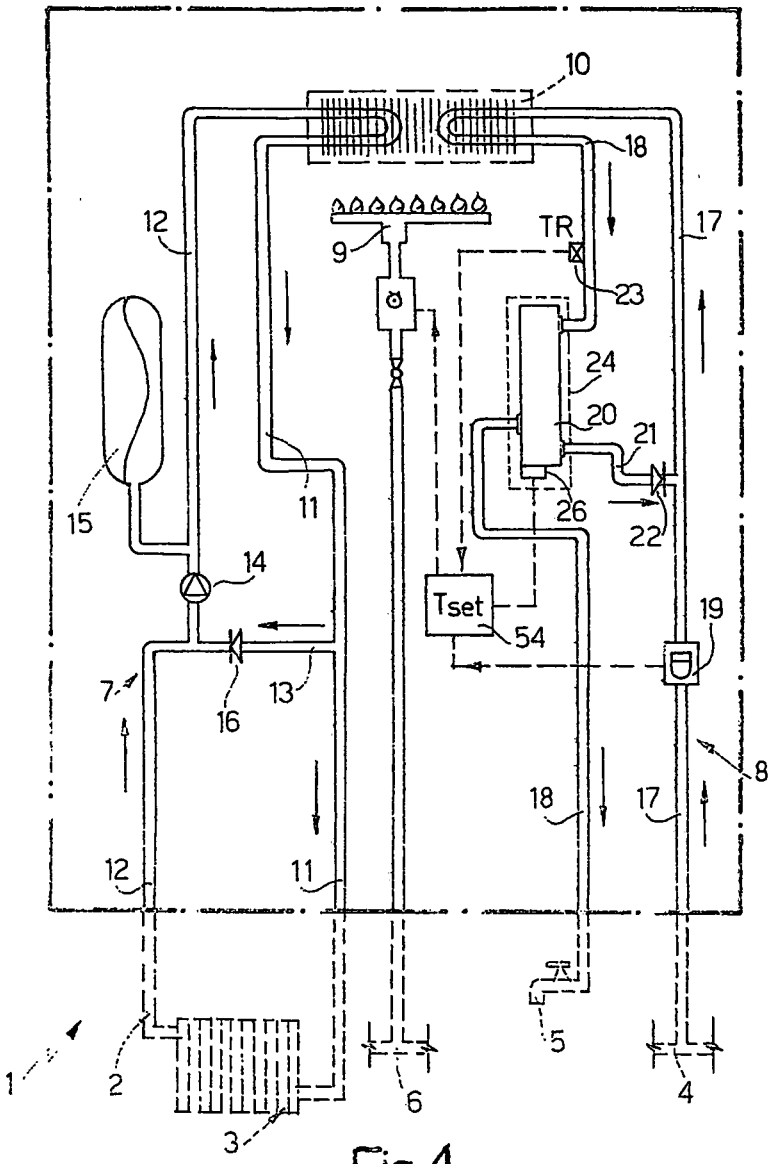
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Fig. 1

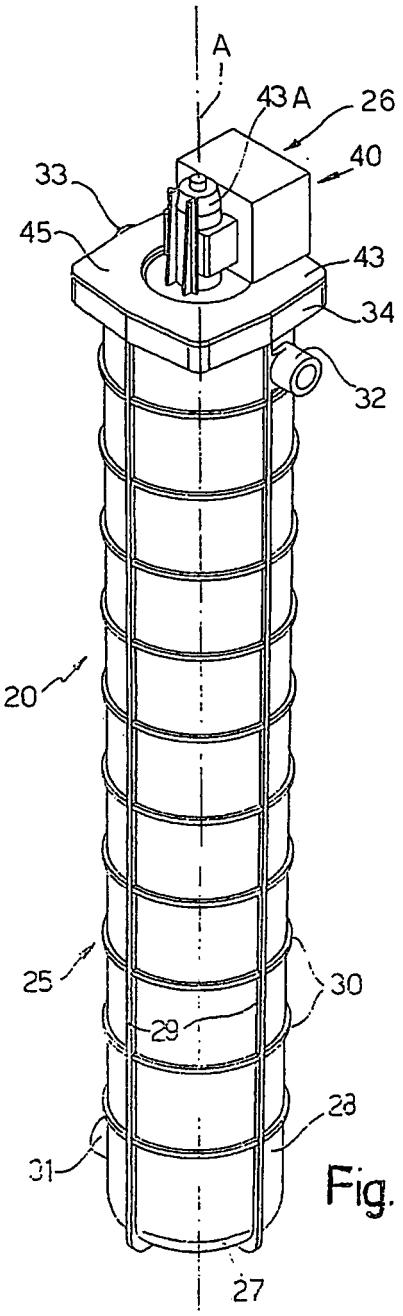
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Fig. 2

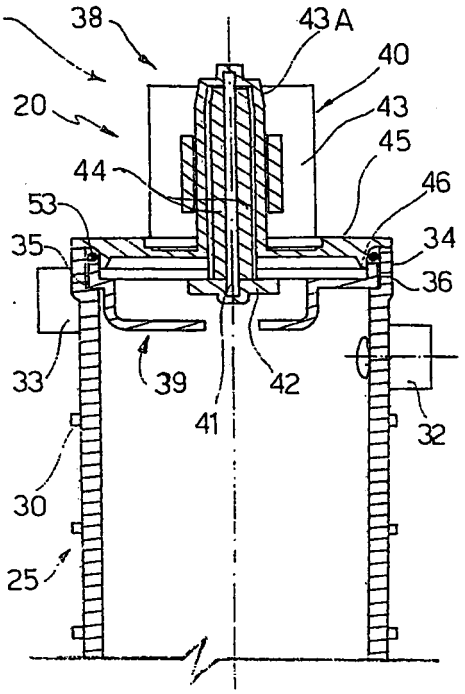
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Fig. 3

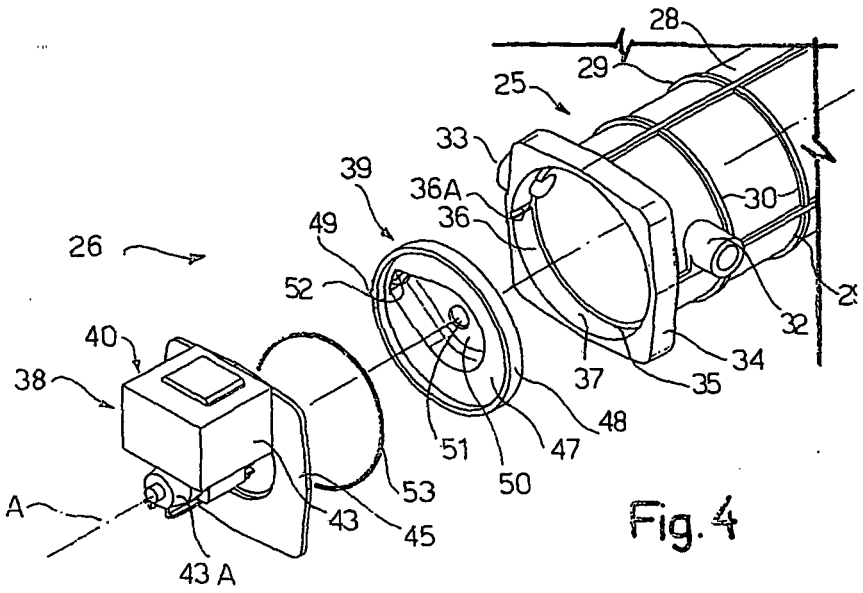
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Fig. 4

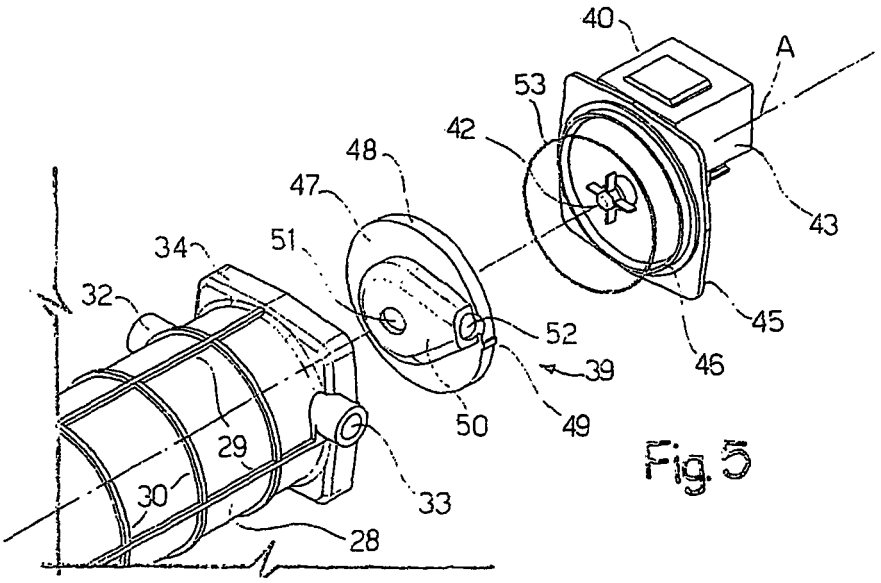
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Fig. 5

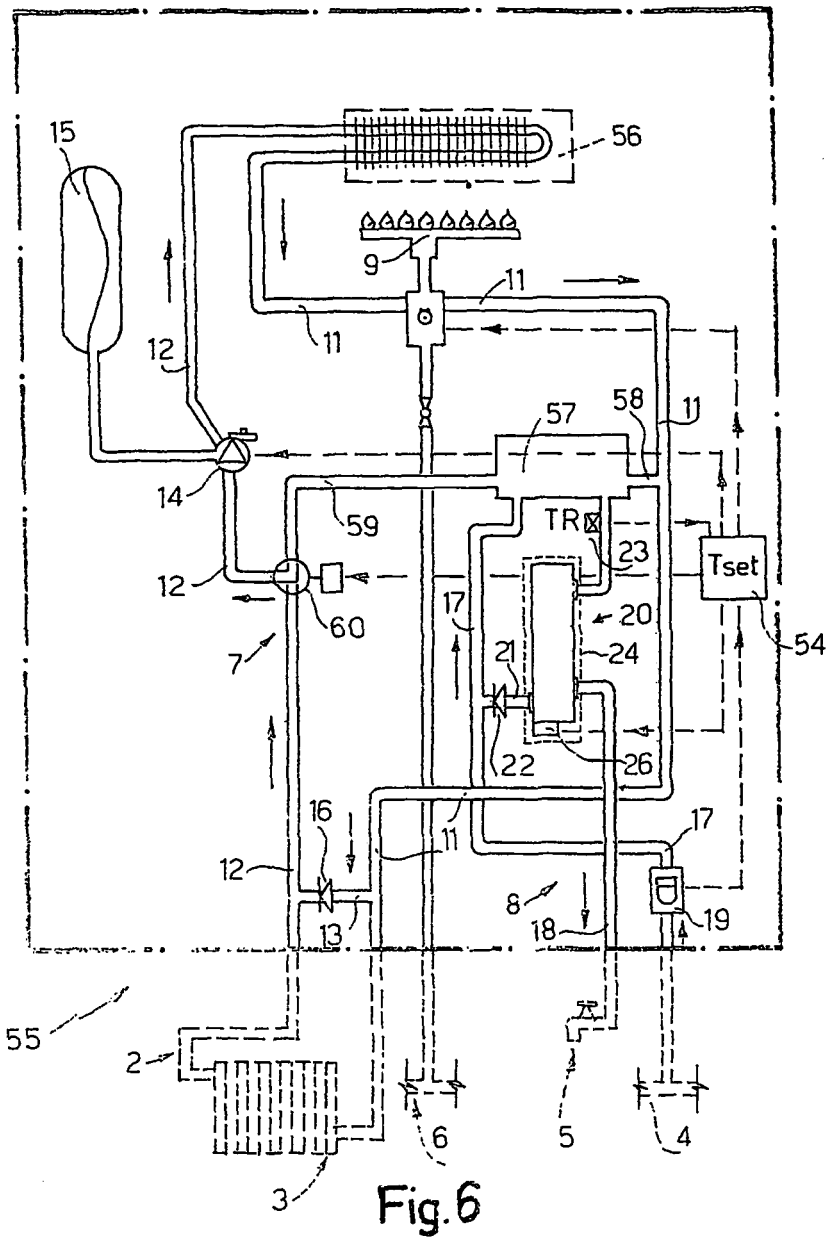
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Fig.6