

(19)



(11)

EP 1 831 609 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
04.05.2011 Bulletin 2011/18

(51) Int Cl.:
F24D 3/08 *(2006.01)* **F24H 9/14** *(2006.01)*
F28D 7/02 *(2006.01)* **F28D 7/14** *(2006.01)*

(21) Application number: **05810014.0**

(86) International application number:
PCT/IB2005/003604

(22) Date of filing: **30.11.2005**

(87) International publication number:
WO 2006/059208 (08.06.2006 Gazette 2006/23)

(54) **HEAT EXCHANGER FOR A COMBINED BOILER, AND COMBINED BOILER USING SAID HEAT EXCHANGER**

WÄRMETAUSCHER FÜR EINEN KOMBIKESSEL UND KOMBIKESSEL MIT DIESEM WÄRMETAUSCHER

ECHANGEUR THERMIQUE POUR CHAUDIERE COMBINEE, ET CHAUDIERE COMBINEE UTILISANT UN TEL ECHANGEUR THERMIQUE

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

(30) Priority: **01.12.2004 IT TO20040846**

(43) Date of publication of application:
12.09.2007 Bulletin 2007/37

(73) Proprietor: **Cosmogas S.R.L.
47014 Meldola (IT)**

(72) Inventor: **ALESSANDRINI, Alberto
47014 Meldola (FC) (IT)**

(74) Representative: **Gallarotti, Franco
Via Maria Vittoria 18
10123 Torino (IT)**

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Description

[0001] The present invention relates to an instantaneous heat exchanger for a boiler of a combined type, i.e., a boiler designed to produce both hot water for a plant for heating an environment and hot water for sanitary purposes. The invention likewise relates to a boiler of a combined type using such an instantaneous heat exchanger.

[0002] The invention finds particular application in the case of boilers of a combined type that comprise:

- a primary circuit for a heating fluid or primary fluid, having at least:
 - one delivery branch and one return branch, designed for connection to a plant for heating an environment;
 - one auxiliary branch that connects the delivery branch with the return branch;
- a main heat exchanger, preferably a gas-burner heat exchanger, for the heating of the primary fluid;
- a circulation pump arranged along the primary circuit;
- a secondary circuit for sanitary water, or secondary fluid;
- an auxiliary heat exchanger, inserted in said auxiliary branch of the primary circuit and provided for heat exchange between the primary fluid and the secondary fluid; and
- means for deviating selectively the circulation of the primary fluid towards said auxiliary branch or towards the plant for heating an environment,

the boiler further comprising a connection assembly prearranged for installation of an auxiliary heat exchanger of the plate type, the connection assembly having at least:

- one first standardized connection and one second standardized connection, for connection of the auxiliary heat exchanger to the auxiliary branch of the primary circuit; and
- one third standardized connection and one fourth standardized connection, for connection of the auxiliary heat exchanger to the secondary circuit.

[0003] In boilers of the type referred to, the main heat exchanger, which is usually of the type using a gas burner, brings about heating of the primary fluid which, via the pump, is made to circulate in the heating plant in order to supply a plurality of radiators located in a domestic environment.

[0004] In the absence of a requirement of hot water for sanitary purposes, a deviator device, such as a three-way valve, enables circulation of the primary fluid only in the plant for heating the environment. In the case where a user requires, instead, a supply of hot sanitary water

(for example for a shower), the deviator device directs, in all or in part, the primary fluid into the aforesaid auxiliary branch of the primary circuit, and then towards the auxiliary heat exchanger. In this way then, the auxiliary heat exchanger can carry out heating of the sanitary water by virtue of the fact that the heat of the fluid of the heating plant is transferred to said water. Once the requirement of hot sanitary water has ceased, the deviator device returns to its original position, so that the primary fluid returns to circulate only in the heating plant. In certain solutions, the means for deviating the primary fluid towards the auxiliary heat exchanger comprise, instead of a three-way valve, a second pump with respective valve.

[0005] Boilers of a combined type should ideally be able to guarantee an immediate production of hot sanitary water, be constructionally simple and inexpensive, and above all have small overall dimensions.

[0006] In order to contain the overall dimensions, in the majority of combined boilers of a compact type, auxiliary heat exchangers of the plate type are used. Said heat exchangers are basically constituted by a plurality of metal plates, packed together so as to define a certain number of parallel cavities. The cavities are connected in alternating series so that, for example, the primary fluid circulates in the cavities of even number and the secondary fluid circulates in the cavities of odd number. In each cavity, one of the two fluids can thus exchange heat with the other, through both of the plates that delimit the cavity itself.

[0007] From a functional standpoint, the plate structure enables instantaneous heat exchangers to be obtained that are very compact and are provided with good characteristics of heat exchange. By virtue of their diffusion, plate-type heat exchangers for combined boilers have in effect become standardized components produced on a large scale, with evident advantages in terms of reduction of costs. On the other hand, the plate-type heat exchangers currently used on compact combined boilers present some drawbacks. A first drawback is represented by the fact that plate-type heat exchangers are particularly subject to clogging, typically on account of precipitation of lime within them. Said drawback is particularly felt in the case of boilers installed in areas where the mains water is very hard. Another drawback is that the volume of water that can be stored within a plate-type heat exchanger of a compact boiler is very small, never greater than one litre for each circuit. Said reduced capacity of storage has two main negative consequences from the functional standpoint:

- the times necessary for obtaining hot sanitary water can be relatively long (in the order of 15-20 seconds), above all when the pipes of the plant for water for washing purposes are relatively cold; and
- the supply of hot water may not be constant in the presence of changes of flow rate at the facilities using sanitary water, as typically occurs in the normal adjustment of a tap or a mixer when somebody is using

a shower.

[0008] The first of the above drawbacks, i.e., the short service life, is mitigated by the fact that plate-type heat exchangers have by now become available as spare parts having a relatively contained cost for combined boilers. On this point, it should be emphasized that the standardization of production has had as a consequence that also the interface or hydraulic/mechanical connection assembly of plate-type heat exchangers of combined boilers has over time assumed a substantially standardized configuration, suitable for enabling fast and simple replacement of the heat exchanger.

[0009] The aforesaid functional limits could, instead, be reduced using plate-type heat exchangers having cavities of dimensions larger than the current ones, and hence with greater storage capacity; however, this would inevitably entail an increase in the overall dimensions of the boiler.

[0010] In order to overcome the reduced functional capacities of plate-type heat exchangers there have thus been proposed boilers of a combined type having a storage tank in which a certain amount of water is maintained at a given temperature, ready for use. In certain cases, the storage tank has the function of maintaining a certain amount of water for heating at a given temperature, to be able to release it when required, in a fast way, to a secondary heat exchanger, so that this can produce the hot sanitary water quickly. In the meantime, the primary heat exchanger can overcome the thermal inertia and will then be able to exploit its maximum power in favour of the secondary heat exchanger. The temperature of the water in the tank is usually controlled via a suitable sensor. When said temperature drops below a threshold value, the control system of the boiler issues a command for a new heating thereof, via appropriate electrical means (such as a resistance), or else by starting the primary heat exchanger and possibly the circulation pump. In other cases, the storage tank has, instead, the function of maintaining a certain amount of sanitary water at a given temperature, to be able to release it in a fast way following upon a requirement for use for washing purposes. As in the previous case, the primary heat exchanger can in the meantime reach its own maximum power and thus enable a secondary heat exchanger to function at normal running conditions. Also in these solutions the temperature of the sanitary water in the tank is controlled via a suitable sensor and, if required, heated via electrical means.

[0011] If, on the one hand, the provision of a storage tank enables prevention of problems of slowness and inconstancy of supply of plate-type heat exchangers, on the other hand, this occurs at the expense of the compactness of the combined boiler, its simplicity of construction, and its cost.

[0012] Even though boilers provided with storage tanks are more cumbersome, they are, however, preferred in areas with very hard mains water. On the other

hand, combined boilers with a secondary plate-type heat exchanger continue to be very much in demand on account of their compactness and their contained cost, above all in areas where the level of hardness of the mains water is relatively low. Their functional limits in terms of times of response and constancy of supply are considered acceptable for a fair share of the market.

[0013] For the aforesaid reasons, boiler manufacturers are thus forced to diversify their production, this being at the expense of the standardization of production.

[0014] DE 89 12 339 U1 discloses a heat exchanger having the features of the preamble of claim 1.

[0015] EP 1 288 588A1 discloses a two-sided header system for hydraulic circuit of wall boilers. Three-components are provided: an apparatus integrating into the centrifugal pump spiral a two-sided header and a coaxial air separator-filter wet well, a three-way valve and a plate-type exchanger header.

[0016] The aim of the present invention is to solve the aforesaid problems. Said purpose is achieved, according to the invention, by a heat exchanger for a boiler of a combined type and by a boiler of a combined type having the characteristics indicated in the annexed claims, which form an integral part of the descriptive content of the present patent application.

[0017] Further purposes, characteristics and advantages of the invention will emerge from the ensuing description with reference to the annexed plate of drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a partial and schematic exploded view of a boiler of a combined type with plate-type heat exchanger of a standard type;
- Figure 2 is a front view of a plate-type heat exchanger used in the boiler of Figure 1;
- Figure 3 is a perspective view of an instantaneous heat exchanger according to the invention;
- Figure 4 is a perspective view of the heat exchanger of Figure 3, with a part of the respective shell omitted;
- Figure 5 is a perspective view of an instantaneous heat exchanger in accordance with a preferred embodiment of the heat exchanger according to the invention;
- Figure 6 is a partially exploded view of the heat exchanger of Figure 5;
- Figure 7 is a view similar to that of Figure 1, where, instead of a plate-type heat exchanger, there is envisaged the installation on the boiler of a heat exchanger according to the invention;
- Figure 8 is a schematic front view (inside the boiler) of the heat exchanger according to the invention connected to the respective means of hydraulic and mechanical interface of the boiler;
- Figure 9 is a cross-sectional view according to the line IX-IX of Figure 8;
- Figure 10 is an enlarged detail of Figure 9;
- Figure 11 is a partial and schematic view from be-

neath of a combined boiler provided with a heat exchanger according to the invention;

- Figures 12, 13 and 14 are, respectively, a front view, a first perspective view, and a second perspective view of a heat exchanger according to an advantageous variant of the invention, with a part of the respective shell omitted;
- Figure 15 is a longitudinal cross-sectional view of the heat exchanger of Figures 12-14, at a larger scale; and
- Figure 16 is a view similar to that of Figure 1, where adapter means usable in combination with a heat exchanger according to the invention are illustrated.

[0018] Partially represented in Figure 1 is a combined boiler of the type pre-arranged for installation of an auxiliary plate-type heat exchanger. It may be noted that, in said figure, as in some of the subsequent figures, only the components of the boiler useful for an understanding of the present invention are represented.

[0019] The boiler, designated as a whole by 1, presents an as a whole known structure and for this purpose comprises a body 2 for support and containment of the various functional components. Purely by way of indicative example, the overall dimensions of the body 2 may be approximately 450 mm in width, 325 mm in depth, and 800 mm in height.

[0020] Installed within the body 2 is a main heat exchanger, represented only schematically and partially in the figures, designated by 3 and preferably of the gas-burner heat-exchanger type. From the main heat exchanger 3 there branches off a delivery branch and a return branch for a primary circuit, in which a primary fluid, typically water, for a domestic heating plant, is to circulate.

[0021] The delivery and return branches are provided with respective hydraulic connections, designated respectively by 4 and 5, for connection to the pipes of the aforesaid heating plant (not represented). The connections 4 and 5, preferably of a threaded type, are associated to a supporting plate, designated by P, fixed to the body 2 in the rear part of the latter.

[0022] The connections 4, 5 are in hydraulic communication with respective threaded connections 4a, 5a, between which there is to be installed a known by-pass pipe (not represented herein in so far as it is of a type and operation in themselves known). The aforesaid delivery branch 4 and return branch 5 are moreover connected to one another by means of an auxiliary branch of the primary circuit, inside an auxiliary heat exchanger. For this purpose, from said two branches pipes are derived, designated by 6 and 7, which terminate with respective hydraulic connections 8 and 9 supported by the plate P, designed for connection with a secondary plate-type heat exchanger, designated as a whole by 10.

[0023] The reference numbers 11 and 12 designate two further hydraulic connections for connection with a branch, inside the heat exchanger 10, of a secondary

circuit, provided for heating sanitary water. The attachments 11 and 12 are connected, via respective pipes 13 and 14, to further connections, preferably of a threaded type associated to the plate P, designated by 15 and 16, for connection to the rest of the secondary circuit, or to the plant for water for domestic washing purposes.

[0024] The arrangement or interface for connection of the boiler 1 is of a substantially standardized type for plate-type heat exchangers. Said arrangement consists basically of two connection assemblies, designated by 17 and 18, each having a respective connection 8, 9 to the stretch inside the heat exchanger 10 of the auxiliary branch of the primary circuit, as well as a respective connection 11, 12 to the stretch inside the heat exchanger 10 of the secondary circuit. The axes of said connections 8, 9 and 11, 12 are parallel to one another. The assemblies 17 and 18 further comprise a respective connection 4, 5 to the domestic heating plant and a respective connection 15, 16 to the plant for water for domestic sanitary purposes, said connections projecting below the plate P. Also the axes of the connections 4, 5 and 15, 16 are parallel to one another and extend perpendicularly with respect to the axes of the connections 8, 9 and 11, 12. The aforesaid connections 8, 9 and 11, 12 are of the quick-change type (i.e., they are not threaded) and for this purpose are provided with seats for the partial housing of respective O-rings, designated by 19, typically having an internal diameter of 16 mm. The ends of the connections 8, 9 and 11, 12 defining the seats for the O-rings 19, lie substantially on one and the same vertical plane. The body of each connection assembly 17, 18 further envisages a seat 20, designed to co-operate with a respective projection of the heat exchanger 10, for the purposes of fixing the latter, via screws designated by 21. The axes of the seats 20 are parallel to the axes of the connections 8, 9 and 11, 12.

[0025] Figure 2 shows the front plate of the heat exchanger 10 that is not visible in Figure 1, i.e., the one that is to interface with the boiler 1.

[0026] As may be seen, the heat exchanger 10 has, in its end plate 10a, two upper holes, designated by 11a and 12a, horizontally aligned to one another, which are designed for connection with the connections 11 and 12 of the connection assemblies 17, 18. The plate 12a moreover envisages two lower holes 8a, 9a, aligned underneath the holes 11a, 12a, which are designed for connection to the connections 8 and 9 of the assemblies 17 and 18. From the surface of the plate 10a there moreover project two cylindrical projections 20a, having an axial cavity provided with female thread.

[0027] The mechanical and hydraulic connection of the heat exchanger 10 is obtained by positioning the O-rings 19 in the respective connections 8, 9 and 11, 12, the seats of which are sized so that a portion of said rings projects at the front on the outside of the seats themselves. The heat exchanger 10 is then set up against the boiler 1 so that the projections 20a of the front plate of the heat exchanger itself are inserted in the seats 20 of

the assemblies 17, 18. In this way, there is also obtained rapid alignment between the holes 8a, 9a and 11a, 12a of the heat exchanger 10 with respect to the connections 8, 9 and 11, 12 of the assemblies 17 and 18. Next, the screws 21 are screwed, through the open ends of the seats 20, into the threaded holes of the projections 20a, so as to bring the heat exchanger 10 progressively up to the connection interface until the front surface of the plate 10a is brought into contact with the portions of the O-rings 19 projecting from the respective seats of the connections 8, 9 and 11, 12, with the projecting portion of each O-ring 19 that in this way comes to surround a respective hole 8a, 9a and 11a, 12a of the heat exchanger 10. The further tightening of the screws 21 brings about elastic deformation of each O-ring 19 between the surface of the plate 10a and the connections 8, 9 and 11, 12 of the assemblies 17 and 18. Once tightening is completed, the heat exchanger 10 is then fitted mechanically and in a fluid-tight way to the respective connection interface of the boiler 1.

[0028] As previously mentioned, the interface, including the assemblies 17 and 18, is practically of a standardized type for plate-type heat exchangers. Merely by way of indication, the standardized distance between centres of the holes 8a and 11a and the holes 9a, 12a, i.e., the distance designated by A in Figure 2, is typically 40 mm, whilst the distance between centres of the holes 8a, 9a and 11a, 12a, i.e., the distance designated by B in Figure 2, is standardized in three measurements, namely, 154 mm, 172 mm, and 278 mm. Other standardized heat exchangers envisage a distance between centres A of 42 mm and a distance between centres B of 172 mm. The distance between centres of the connections 4 and 15, on the one hand, and 5 and 16 on the other, is instead typically 65 mm (said distance between centres is, for example, designated by C in Figure 11).

[0029] To return to Figure 1, the reference number 23 designates a deviation device of a type in itself known, such as for example a three-way valve. As per the known art, said valve 23 is operative for deviating, if need be, the fluid for the domestic heating plant into the aforesaid auxiliary branch, and hence within the heat exchanger 10. Finally, the reference number 24 designates a sensor assembly, which can include a flow meter of an ON/OFF type or else of a modulating type, provided for detecting either a very precise flow rate or a water requirement in the secondary circuit, or else a requirement of a supply of hot sanitary water. In this circumstance, the control system of the boiler 1 brings about switching of the valve 23 so as to deviate the heating fluid of the primary circuit into the secondary heat exchanger 10, as has been explained, at the same time activating the main heat exchanger 3.

[0030] Preferably associated to one of the assemblies 17, 18 is also a temperature sensor, having the function of monitoring the temperature of the sanitary water present within the auxiliary heat exchanger. In the case where said temperature drops below a predefined thresh-

old value, the control system issues a command to the valve 23 to deviate the heating fluid of the primary circuit into the secondary heat exchanger 10, at the same time activating the main heat exchanger. Preferably, a temperature sensor is positioned in the proximity of the outlet branch 11 of sanitary water in order to control the temperature of the water and render it equal to the one required by modulation of the flame of the heat exchanger 3.

[0031] Figures 3 and 4 show an instantaneous heat exchanger built according to the invention.

[0032] The heat exchanger, designated as a whole by 30, has an outer body or casing 31, preferably made up of two half-shells 31a and 31b, for example made of metal material, which are then welded to one another. In the non-limiting example provided herein, the overall dimensions of the body 31 are approximately 390 mm in width, 115 mm in depth, and 256 mm in height. In the example, the body 31 has a substantially toroidal overall shape, defining within it a substantially annular chamber. One half of said chamber, designated by 32, is visible in detail in Figure 4, where the half-shell 31b is not represented.

[0033] Formed within the chamber 32 is an internal space for containment and storage, defined by a spiral or coiled tubing, designated as a whole by 33, preferably made of metal. As may be noted in Figure 4, in an advantageous embodiment of the invention, the tubing 33 is wound in a helix that follows the annular development of the chamber 32.

[0034] According to an important aspect of the invention, the heat exchanger 30 is provided with a respective connection "interface", designed to enable the connection of the heat exchanger itself in the position where a plate-type heat exchanger 10 is normally installed. For said purpose, and as may be seen in Figure 3, the front half-shell 31b of the heat exchanger 30 has two protuberances or projecting portions, designated by 34 and 35. The portions 34, 35 can be formed by metal bodies, welded to the half-shell 31b in a position corresponding to respective openings provided in the latter. On the other hand, in an advantageous embodiment, the portions 34 and 35 can be obtained directly via drawing of the half-shell 31b, or else in the moulding step, in the case where the half-shells 31a, 31b are made, for example, of plastic material or aluminium.

[0035] The portions 34, 35 each have a respective front, preferably plane, surface designated by 34a, 35a, provided with an upper hole 11b, 12b and a lower hole 8b, 9b. The lower holes 8b, 9b communicate directly, via the hollow portions 34, 35, with the inside of the casing 31, and hence with the chamber 32. In a position corresponding to each upper hole 11b, 12b there is, instead, fixed in a sealed way, for example welded, a respective end 33a, 33b (see Figure 4) of the spiral tubing 33 inside the heat exchanger 30. Projecting moreover from the front surfaces 34a, 35a of the hollow portions 34, 35 are cylindrical fixing projections 20b, each provided with a respective threaded blind hole. The arrangement of the

holes 8b, 9b, 11b, 12b and of the projections 20b is standardized, i.e., similar to that of the homologous elements 8a, 9a, 11a, 12a and 20a of the plate-type heat exchanger 10 described previously.

[0036] Figures 5 and 6 illustrate an advantageous variant embodiment of the heat exchanger 30, in accordance with which the two half-shells 31a and 31b of the body 31 are fitted to one another in a separable way, via screws or bolts, designated as a whole by 36.

[0037] In the case exemplified, each half-shell 31a, 31b is provided with a respective peripheral flange 31a', 31b' and with a central wall 31 a", 31b", in a position corresponding to which are provided holes 37, for reciprocal fixing of the half-shells via the bolts 36. Between said flanges 31a', 31b' and central walls 31 a", 31b" there are designed to be installed sealing gaskets, designated by 38' and 38". In the example provided, moreover, the front surfaces 34a, 35a of the portions 34, 35 in which the holes for hydraulic connection 8b, 11b and 9b, 12b are present, are constituted by plates or brackets fixed via screws 36 to the half-shell 31b of the body 31, also in this case with interposition of suitable sealing means. In said variant, moreover, the plates 34a, 35a are provided with seats or holes (not visible in the figure), in which are crimped or in any case mechanically immobilized the projections 20b, which, in said embodiment, are hence configured as distinct components. In the heat exchanger 30 according to the variant of Figures 5 and 6, the two half-shells 31a, 31b can, if required, be separated from one another, by removing the screws or bolts 36, in order to dismantle the spiral tubing 33. In a particularly advantageous embodiment, moreover, at least the two half-shells 31a, 31b can be made of aluminium or moulded plastic material, which enables good characteristics of thermal insulation for the water contained in the heat exchanger 30 to be obtained, without any need to equip the latter with specific casings or guards for thermal insulation.

[0038] As has been explained, in the heat exchanger 30 according to the invention, the arrangement of the holes 8b, 9b, 11b, 12b and of the projections 20b is similar to that of the homologous elements 8a, 9a, 11a, 12a and 20a of the plate-type heat exchanger 10 described previously. Consequently, as may be appreciated from Figure 7, the heat exchanger 30 can be installed on the boiler 1 in a simple and fast way, with modalities similar to the ones described previously with reference to the plate-type heat exchanger 10. For said purpose, after positioning of the O-rings 19 of the connections 8, 9 and 11, 12, the projections 20b can be fed into the seats 20 of the assemblies 17, 18. Next, the screws 21 are tightened through the aforesaid seats, in the threaded blind holes of the projections 20b so as to "pull" the front surfaces 34a, 35a of the portions 34, 35 of the heat exchanger 30 towards the connections 8, 9 and 11, 12. The portions of the O-rings 19 that project from the connections 8, 9 and 11, 12 in this way come into contact with the aforesaid surfaces 34a, 35a, surrounding a respective hole 8b, 9b

and 11b, 12b of the heat exchanger 30. The further tightening of the screws 21 brings about the elastic deformation of each O-ring 19 between the surfaces 34a, 35a and the connections 8, 9 and 11, 12 of the assemblies 17 and 18, until the desired mechanical fit in a fluid-tight way of the heat exchanger 30 to the connection interface of the boiler 1 is obtained.

[0039] Figures 8 to 10 illustrate the modalities of fast coupling, in the absence of threaded hydraulic connections, which is obtained between the heat exchanger 30 and the arrangement for connection of the boiler 1, constituted by the two connection assemblies 17 and 18. In particular, Figure 8 is a view of the heat exchanger 30 from inside the boiler, Figure 9 is a cross-sectional view according to the line IX-IX of Figure 8, and Figure 10 is an enlarged detail of Figure 9. In the example of Figures 8-10, the heat exchanger 30 is of the type with separable half-shells 31a, 31b, i.e., obtained according to Figures 5 and 6.

[0040] Clearly visible in Figure 10 is the portion 34, with the respective plate or front bracket 34a. As may be seen, formed in the body of the portion 34 are an upper passage, in which an end of the tubing 33 is inserted (here slightly projecting from the hole 11b), and a lower passage, which terminates in a position corresponding to the hole 8b of the plate 34. As may be noted, provided between the plate 34a and the body of the portion 34 are O-rings, designated by 34c, in positions corresponding to the holes 8b, 11b. Likewise visible in the figure are a projection 20b and the connections 8 and 11 of the assembly 17, with the respective seats in which the O-rings 19 find partial housing. In the case exemplified, the projection 20b is configured as element separate from the plate 34a, with a region crimped or mechanically blocked in a respective seat provided in the plate itself; an internal region of the projection 20 is driven into the body of the portion 34. A screw 21 is tightened into the threaded hole of the projection 20b, said screw 21 passing through the respective seat 20 provided in the body of the assembly 17.

[0041] From the foregoing description it may be appreciated how the heat exchanger 30 according to the invention can be installed, in a simple and fast way, on the boiler 1 in place of the plate-type heat exchanger 10. This can be done in the final stages of a cycle of production of the boiler 1, or else even directly at the premises of the end user, for the purposes of replacement of the plate-type heat exchanger 10, if the latter is clogged.

[0042] Figure 11 illustrates the heat exchanger 30 according to the invention in the installed condition. From said figure it may be appreciated how the heat exchanger 30 finds convenient housing in the rear part of the body 2 of the boiler 1, within the latter. Moreover visible in said figure is the by-pass pipe previously mentioned, designated by 39, which extends between the connections 4a and 5a of the primary circuit. Figure 6 further shows a central pipe union, which projects at the bottom from the supporting plate P. Said pipe union, designated by G, is

provided for the connection of the boiler to a gas mains supply, necessary for operation of the burner of the main heat exchanger 3.

[0043] Operation of the heat exchanger 30 is substantially similar to that of a traditional plate-type heat exchanger 10 as regards the step of heating of the water for sanitary purposes and as regards maintenance of the latter at the desired temperature, via the deviator valve 23, the flow switch 24, and the sensor means for sensing the temperature of the boiler 1.

[0044] In the preferred embodiment, the heat exchanger 30 is conceived for obtaining a forced circulation, or a circulation in any case in a predefined direction, of the heating fluid within the chamber 32. Advantageously, moreover, the heat exchanger is pre-arranged so that the flow of the sanitary water present in the coiled tubing 33 will come about in countercurrent, i.e., in a direction opposite to the flow of the heating fluid. Said advantageous embodiment of the invention is illustrated in Figures 12-15.

[0045] In said embodiment, positioned in the chamber 32 are, in addition to the coiled tubing 33, a flow divisor 40, an upper flow deviator 41 and a lower flow deviator 42.

[0046] The divisor 40 is substantially configured as a wall or partition having the function of enabling circulation of the fluid in just one direction within the chamber 32, from the respective inlet 8b to the respective outlet 9b. The flow deviators 41, 42 have here a basically hollow cylindrical shape, each having a closed end that opposes the direction of the flow of the fluid within the chamber 32. As may be seen in Figure 14 or Figure 15, the deviators 41, 42 are each positioned in a respective substantially rectilinear stretch of the coil formed by the tubing 33.

[0047] In the figures, moreover, the reference number 43 designates a device for bleeding the chamber 32, said device being of a conception in itself known.

[0048] The fluid coming from the primary circuit penetrates into the chamber 32 through the opening 8b. Given the presence of the partition constituted by the divisor 40, the fluid is forced to traverse the chamber 32 in a unidirectional way, in the direction designated by the arrow F1 in Figure 14. During its path in the chamber 32, the fluid encounters the upper flow deviator 41, and in particular its closed end, designated by 41 a in Figure 15. In this way, the fluid is forced to flow necessarily between the coils of the tubing 33 that wind around the body of the deviator itself. In this way, heat exchange is increased in the upper part of the heat exchanger 30. In the rest of its path, part of the fluid can then fill the deviator 41, entering from the open end of the latter, designated by 41b. Another part of the fluid proceeds, instead, along the annular development of the chamber 32, until it encounters the lower flow deviator 42. Also in this case, the fluid encounters first the closed end of the deviator 42, designated by 42a in Figure 15. The fluid is then forced between the coils of the tubing 33 that wind around the body of the deviator 42. In this way, heat exchange is increased in the lower part of the heat exchanger 30. In

the rest of its path, the fluid then reaches the divisor 40, which, on the one hand, prevents the fluid itself from recirculating in the heat exchanger and, on the other, causes the fluid to fill the deviator 42, entering from the open end 42b of the latter (see Figure 15). As may be seen particularly in Figures 12 and 15, from the closed end 42a of the deviator 42 there branches off a stretch of tube, designated by 44, which connects the inside of the deviator itself with the opening 9b of the heat exchanger 30. In this way, the heating fluid can then come out of the chamber 32 and return into the primary circuit.

[0049] On the other hand, the coiled tubing 33 is configured so that the flow of the sanitary water inside it flows in a direction opposite to that of the heating fluid, as indicated by the arrow F2 of Figure 14. For said purpose, the sanitary water penetrates into the tubing 33 from the inlet 12b. As may be noted particularly in Figure 15, a first stretch of the tubing 33, designated by 33c, extends within the hollow body of the lower deviator 42, then traversing the cylindrical wall thereof. The tubing then proceeds following its coiled pattern along the development of the chamber 32, to terminate in a position corresponding to the hole 11b, as may be seen particularly in Figure 14. In this way, then, the direction of the flow F2 of the sanitary water is contrary to that of the flow F1 of the heating fluid. Thanks to this "cross" flow, the boiler increases its own efficiency and condenses more quickly, since it can work at lower temperatures, with considerable benefits also as regards the reduction of the calcareous deposits within the coiled tubing 33.

[0050] The provision of the heat exchanger 30 described, instead of the plate-type heat exchanger 10, enables important benefits to be obtained.

[0051] A first advantage is represented by the fact that the heat exchanger 30 according to the invention, even though it is in any case an instantaneous heat exchanger, enables accumulation within it of a substantial mass of water in the respective portions of circuit, which can be maintained at the desired temperature, waiting to be drawn off.

[0052] In the preferred embodiment, the heat exchanger 30 guarantees a substantial storage of sanitary water within the tubing 33 as compared to the usual plate-type heat exchangers for compact boilers, and in any case greater than one litre, preferably greater than two litres. In the specific case represented, the amount of sanitary water that can be stored in the heat exchanger 30 is approximately 4-5 litres, i.e., equal to at least four times the quantity that can be stored within a plate-type heat exchanger of the maximum capacity currently used for combined compact boilers.

[0053] As compared to the traditional plate-type heat exchanger 10, then, the heat exchanger 30 enables an adequate convenience of supply to be achieved, with fast delivery of a considerable mass of hot sanitary water, in short times and in a constant way, even in the presence of changes of flow rate, but without the need to equip the boiler with a specific storage tank. With respect to a plate-

type heat exchanger, the properties of heat exchange moreover remain unvaried, notwithstanding the difference of the volume of water contained.

[0054] Another advantage is represented by the fact that the heat exchanger 30 is less subject to clogging, since the mains water for sanitary purposes passes through a single tube (i.e., the spiral tubing 33), and not through a series of cavities of small cross section in series, as occurs, instead, in the plate-type heat exchanger.

[0055] It is thus clear how, thanks to the heat exchanger 30, the problems deriving from the installation of the boiler 1 in areas with very hard mains water can be overcome. In such cases, in fact, the boiler can be equipped with the heat exchanger 30. In areas in which the mains water is soft, and for those who so desire, the boiler 1 can in any case be installed with the traditional plate-type heat exchanger 10.

[0056] It goes without saying that, given the standardized type of mechanical and hydraulic interfacing, in the case of boilers 1 already installed with plate-type heat exchanger, the latter may, if required, be replaced in a simple and fast way with a heat exchanger 30.

[0057] The invention enables important advantages to be obtained also for boiler manufacturers, for which the need to diversify production is reduced. In fact, it is possible to obtain two different types of products starting from one and the same basic structure of the boiler 1. Only in the advanced stage of production, the latter may be diversified, by installing the plate-type heat exchanger 10 to meet said type of requirement, or else the heat exchanger 30 according to the invention, thus preventing the need to equip the boiler with additional storage tanks.

[0058] Illustrated in Figure 16 is a further possible variant of the invention, according to which there are provided adapter elements, designated as a whole by 50. As previously mentioned, the distance between centres of the holes 8a 11a and 9a, 12a of the plate-type heat exchangers used in compact combined boilers is standardized in some standard measurements (see what was described previously with reference to the distances designated by A and B in Figure 2). According to the variant proposed, there can thus be provided the adapters 50 to enable installation of a single version of heat exchanger 30 on combined boilers having different standardized attachments.

[0059] In the case exemplified in Figure 16, each adapter 50 comprises a substantially L-shaped body, for example made of metal material, so as to define two surfaces 50a and 50b opposite and parallel to one another, the first designed to co-operate with the connections 8, 11 or 9, 12 of the boiler 1, and the second designed to co-operate with the holes 8b, 11b or 9b, 12b of the heat exchanger 30. For said purpose, the body of each adapter 50 is provided with two respective internal passages. In a position corresponding to the surface 50a, the ends of said passages form holes (not visible in the figure), designed to co-operate with the connections 8, 11 or 9, 12 of the boiler 1. In a position corresponding to the sur-

face 50b, the ends of the same passages form, instead, holes 8c, 11c or 9c, 12c, designed to co-operate with the holes 8b, 11b or 9b, 12b of the heat exchanger 30.

[0060] In the body of each adapter there are moreover provided mechanical fixing seats; for example, a first threaded through seat 51 can be provided, designed to receive the end of a respective screw 21 for fixing of the adapter 50 to a respective assembly 17, 18. The body of the adapter can then comprise a second seat 52 with open end, designed to receive a respective projection 20b of the heat exchanger 30 for fixing via a respective screw (i.e., with modalities similar to the ones described previously with reference to the seats 20, the screws 21, and the projections 20b). In said variant, the seal between the adapters 50 and the attachments of the boiler will be obtained via the O-rings 19 described previously. On the other hand, the seal between the adapters 50 and the heat exchanger 30 will be obtained via similar O-rings, operatively set between the surface 50b of the adapter and a respective surface 34a, 35b of the heat exchanger. The holes 8c, 11c and/or 9c, 12c may be provided with a peripheral seat for partial housing of said O-rings.

[0061] Each internal passage of an adapter 50 can be obtained by making, in the body of the adapter itself, three blind holes, two parallel to one another and one orthogonal to these, which intersects them. For said reason, the end of the aforesaid orthogonal hole, designated by 53 in Figure 9 must be occluded in a sealed way, for example using appropriate plugs, two of which are designated by 54 in the Figure.

[0062] Obviously the embodiment described is only one possible way of making the adapters 50, which may also have a different shape from the one described by way of example.

[0063] It may be appreciated how, via the pre-arrangement of a limited series of adapters 50, one and the same type of heat exchanger 30 can be installed also on boilers pre-arranged for different standard plate-type heat exchangers.

[0064] In accordance with a further advantageous embodiment of the invention, instead of the adapter elements 50 there can be provided some versions of half-shell 31b, differentiated with respect to one another by the position of the projecting portions 34, 35 with respect to one another and/or by the position of the holes 8b, 9b, 11b, 12b and of the projections 20b within said portions. As may be appreciated, in this way, to one and the same type of half-shell 31a, with the internal components of the heat exchanger (tubing 33, divisor 40, deviators 41, 42), there can be fitted, as required, different types of half-shell 31b, according to the type of standardized connection provided on the boiler concerned (see again what was described previously with reference to the distances designated by A and B in Figure 2). Said variant is advantageous and convenient to implement particularly in the case where the various differentiated half-shells 31b are obtained by moulding of plastic material. Also this embodiment thus enables important benefits to be ob-

tained in terms of standardization of production. It is pointed out then that different versions of the heat exchanger 30 could possibly be obtained starting from one and the same casing 31 (for example, as in Figures 5 and 6), envisaging different versions of plates 34a, 35a, also in this case differentiated as regards the position of the holes 8b, 9b, 11b, 12b and of the appendages 20b.

[0065] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to what is described and illustrated herein purely by way of example, without thereby departing from the scope of the present invention.

[0066] The instantaneous heat exchanger according to the invention may also have a shape different from the substantially toroidal one illustrated previously; for example, it may as a whole be cylindrical, at the same time maintaining its capacity for storing a substantial mass of water unaltered and maintaining the prearrangement for installation in the place of an ordinary plate-type heat exchanger. Also in the case of a cylindrical shape, the body of the heat exchanger will be provided with the projecting portions, similar to the ones previously designated by 34, 35, and a single chamber in which a tubing or pipe in the form of a coil extends. It may be noted that a single projecting portion could also be provided, equipped with the inlets and outlets 8b, 9b, 11b, 12b in the appropriate positions.

[0067] The heat exchanger could be designed for storing, within the coil-shaped channel 33, the heating fluid of the primary circuit, and, in the chamber 32, the water for washing purposes, and thus with an arrangement of connection that is reversed with respect to the one previously described by way of example.

[0068] The holes 8b, 9b and 11b, 12b of the heat exchanger 30 could be shaped so as to present an annular peripheral seat for housing a portion of the respective O-ring 19.

Claims

1. An instantaneous heat exchanger for heating sanitary water in a combined boiler (1), particularly a domestic boiler of compact dimensions, the heat exchanger (30) having a casing (31) defining a chamber (32) for a first fluid, within which there extends a conduit or tubing (33) for a second fluid, wherein at least one of the chamber (32) and the conduit (33) has a capacity of containment of a substantial quantity of the respective fluid, in particular greater than one litre, **characterized in that:**

- on one and the same face (31 b) of the casing (31) there are provided:

- a first inlet (8b) and a first outlet (9b), of said chamber (32); and

- a second inlet (12b) and a second outlet (11b), of said tubing (33),

- said inlets (8b, 12b) and outlets (9b, 11b) are pre-arranged for fast hydraulic connection to a connection assembly (P, 17, 18) without the aid of threaded pipe unions;

- the chamber (32) has a substantially annular shape and the conduit or tubing (33) is wound in a helix that follows the annular development of the chamber (32).

2. The heat exchanger according to Claim 1, **characterized in that** the conduit (33) has a capacity of containment or storage of the respective fluid greater than two litres, preferably comprised between three and six litres.

3. The heat exchanger according to Claim 1, **characterized in that** on said face (31b) of the casing (31) there are provided means (20b) for the positioning and/or the mechanical fixing of the heat exchanger (30) to the boiler (1).

4. The heat exchanger according to Claim 3, **characterized in that** said means of positioning and/or mechanical fixing comprise a first element and a second element (20b) horizontally aligned to one another, in particular configured as projections having a threaded cavity.

5. The heat exchanger according to Claim 1, **characterized in that** the axes of said inlets and outlets (8b, 9b, 11b, 12b) are substantially parallel to one another, wherein:

- the first inlet (8b) and the first outlet (9b) are horizontally aligned to one another;

- the second inlet (12b) and the second outlet (11b) are horizontally aligned to one another.

6. The heat exchanger according to Claim 5, **characterized in that:**

- the first inlet (8b) and the second outlet (11b) are vertically aligned to one another; and

- the second inlet (12b) and the first outlet (9b) are vertically aligned to one another.

7. The heat exchanger according to Claim 1, **characterized in that** it comprises conveying means (40, 41, 42) to bring about a flow according to a substantially predefined path or direction of the first fluid within said chamber (32).

8. The heat exchanger according to Claim 1, **characterized in that** the heat exchanger (30) is pre-arranged so that the flow of the second fluid occurs,

within said conduit (33), in countercurrent, or in a direction opposite to the flow of the first fluid within said chamber (32).

9. The heat exchanger according to Claim 7, **characterized in that** said conveying means (40, 41, 42) comprise at least one of:

- a partition member (40) designed to enable circulation of the first fluid in just one direction within said chamber (32), from the respective inlet (8b) to the respective outlet (9b),
- a body (41, 42) housed in said chamber (32) and operative for forcing the first fluid to flow through coils of said conduit (33), the latter being configured in the form of a coil, said body (41, 42) preferably having the shape of a hollow cylinder with a respective closed end (41a, 42a) that opposes the direction of the flow of the first fluid within said chamber (32).

10. The heat exchanger according to Claims 1 and 3, **characterized in that** said face (31b) comprises at least one, preferably projecting, portion (34, 35) having a respective front, preferably plane, surface (34a, 35a), there opening in said front surface (34a, 35a) at least two of said inlets and outlets (8b, 9b, 11b, 12b) and there being provided at least one first means (20b) of positioning and/or fixing.

11. The heat exchanger according to any of the preceding claims, **characterized in that**:

- the vertical distance between centres (A) of the first inlet (8b) and the first outlet (9b) and the vertical distance between centres (A) of the second inlet (12b) and the second outlet (11b) are substantially equal to one another and measure approximately 40 mm, or else 42 mm; and
- the horizontal distance between centres (B) of said first inlet (8b) and first outlet (9b), and the horizontal distance between centres (B) of said second inlet (12b) and second outlet (11b) are substantially equal to one another and measure approximately 154 mm, 172 mm, or else 278 mm.

12. The heat exchanger according to Claim 1, **characterized in that** the casing (31) has an as a whole annular shape.

13. The heat exchanger according to at any of the preceding claims, **characterized in that** the casing (31) is formed by at least two components (31a, 31b) joined together in a sealed way.

14. The heat exchanger according to claim 13, **characterized in that** said components comprise two half-

shells (31a, 31b) joined to one another in a separable way, between the two half-shells there being operatively positioned water sealing means (38', 38").

15. The heat exchanger according to Claim 10, **characterized in that** said surface (34a, 35a) is defined by a front element, fixed in a separable way to a component (31a, 31b) of said casing (31), where in particular there is provided a plurality of front elements (34a, 35a) of different types, differentiated with respect to one another at least as regards the relative position between said inlets and outlets (8b, 9b, 11b, 12b).

16. The heat exchanger according to any of the preceding claims, **characterized in that** adapter means (50) are provided, designed to be fixed mechanically and in a sealed way between said connection assembly (P, 17, 18) and the heat exchanger itself, said adapter means (50) defining internal channels designed for hydraulic connection with said inlets and outlets (8b, 9b, 11b, 12b).

17. The heat exchanger according to Claim 16, **characterized in that** said adapter means comprise one or more adapter bodies, each body (50) having at least one internal passage that extends between two opposite and parallel faces (50a, 50b) of the body itself, there being provided, on a face (50a), means (51) for the positioning and/or mechanical fixing of the body (50) with respect to the boiler (1), and there being provided, on the other face, second means (52) for positioning and/or mechanical fixing of the heat exchanger (30) with respect to the body (50).

18. The heat exchanger according to Claim 13, **characterized in that** said components comprise at least one component of a first type (31a, 31b) that may be selectively coupled to components of a second type differentiated with respect to one another at least as regards the relative position between said inlets and outlets (8b, 9b, 11b, 12b).

19. The heat exchanger according to any of the preceding claims, **characterized in that** the casing (31) is at least in part obtained by moulding, in particular of a synthetic or aluminium material.

20. The heat exchanger according to any of the preceding claims, **characterized in that** the overall dimensions of the casing (31) are not greater than approximately 400 mm in width, 120 mm in depth, and 270 mm in height.

21. A boiler of a combined type comprising:

- a primary circuit for a heating fluid or primary fluid, having at least:

- a delivery branch (4) and a return branch (5), designed for connection with a plant for heating an environment;
- an auxiliary branch (8, 9) that connects the delivery branch (4) to the return branch (5);

- a main heat exchanger (3), preferably a gas-burner heat exchanger, for heating the primary fluid;
- a circulation pump arranged along the primary circuit;
- a secondary circuit (15, 16) for the sanitary water, or secondary fluid;
- an auxiliary heat exchanger, inserted in said auxiliary branch (8, 9) of the primary circuit (4, 5) and provided for heat exchange between the primary fluid and the secondary fluid; and
- means (23) for deviating selectively the circulation of the primary fluid towards said auxiliary branch (8, 9) or towards the plant for heating an environment,

the boiler (1) moreover comprising a connection assembly (P, 17, 18) for installation, on the boiler itself, of a heat exchanger of the plate type, the connection assembly having at least:

- a first connection and a second connection (8, 9), for the connection of the auxiliary heat exchanger to the auxiliary branch of the primary circuit; and
- a third connection and a fourth connection (11, 12), for connection of the auxiliary heat exchanger to the secondary circuit,

said first, second, third and fourth connections (8, 9 and 11, 12) being in particular of the quick-change type, or without threaded pipe unions, said boiler being **characterized in that** said auxiliary heat exchanger (30) is built in accordance with one or more of Claims 1 to 20.

- 22.** The boiler according to Claim 21, **characterized in that** said assembly comprises two connection units (17, 18) associated to one and the same support (P), each unit having a respective connection (8, 9) to a portion (32) inside the heat exchanger (30) of the auxiliary branch of the primary circuit, as well as a respective connection (11, 12) to a stretch (33) inside the heat exchanger (30) of the secondary circuit.

- 23.** The boiler according to Claim 22, **characterized in that** each connection unit (17, 18) further comprises at least one of:

- a respective connection (4, 5) to the plant for heating an environment and a respective connection (15, 16) to a plant for sanitary water,

where said further connections (4, 5, 15, 16) project underneath said support (P) and have respective axes substantially parallel to one another and perpendicular with respect to the axes of said first, second, third and fourth connections (8, 9 and 11, 12),

- a means of positioning and/or mechanical fixing (20, 21), designed to co-operate with a respective means of positioning and/or mechanical fixing (20b) of the heat exchanger (30).

- 24.** The boiler according to any of claims 21-23, **characterized in that** it comprises a shell (2) with overall dimensions not greater than approximately 500 mm in width, 400 mm in depth, and 900 mm in height.

Patentansprüche

- 1.** Sofort-Wärmeaustauscher zum Erhitzen von Brauchwasser in einem kombinierten Heißwasserbereiter (1), insbesondere einem Haushalt-schweißwasserbereiter mit kompakten Abmessungen, wobei der Wärmeaustauscher (30) ein Gehäuse (31) hat, das eine Kammer (32) für ein erstes Fluid definiert, innerhalb derer sich eine Leitung oder Verrohrung (33) für ein zweites Fluid erstreckt, wobei wenigstens eine der Komponenten Kammer (32) und Leitung (33) ein Rückhaltevermögen für eine beträchtliche Menge des jeweiligen Fluids, insbesondere von mehr als einem Liter, hat, **dadurch gekennzeichnet, dass:**

- auf ein und derselben Seite (31 b) des Gehäuses (31) Folgendes bereitgestellt wird:

- ein erster Einlass (8b) und ein erster Auslass (9b) der Kammer (32) und
- ein zweiter Einlass (12b) und ein zweiter Auslass (11 b) der Leitung (33),

- die Einlässe (8b, 12b) und die Auslässe (9b, 11b) für eine schnelle hydraulische Verbindung mit einer Verbindungsbaugruppe (P, 17, 18) ohne die Hilfe von mit Gewinde versehenen Rohrverbindungen vorangeordnet sind,
- die Kammer (32) eine im Wesentlichen ringförmige Gestalt hat und die Leitung oder Verrohrung (33) in einer Spirale gewickelt ist, die der ringförmigen Entwicklung der Kammer (32) folgt.

- 2.** Wärmeaustauscher nach Anspruch 1 **dadurch gekennzeichnet, dass** die Leitung (33) ein Rückhalte- oder Speichervermögen für das jeweilige Fluid hat, das größer als zwei Liter ist, vorzugsweise zwischen drei und sechs Liter umfasst.

3. Wärmeaustauscher nach Anspruch 1 **dadurch gekennzeichnet, dass** auf der Seite (31b) des Gehäuses (31) Mittel (20b) für das Anordnen und/oder das mechanische Befestigen des Wärmeaustauschers (30) an dem Heißwasserbereiter (1) bereitgestellt werden. 5
4. Wärmeaustauscher nach Anspruch 3 **dadurch gekennzeichnet, dass** die Mittel zum Anordnen und/oder mechanischen Befestigen ein erstes Element und ein zweites Element (20b) umfassen, die horizontal zueinander ausgerichtet sind, insbesondere konfiguriert als Vorsprünge, die einen mit Gewinde versehenen Hohlraum haben. 10
5. Wärmeaustauscher nach Anspruch 1, **dadurch gekennzeichnet, dass** die Achsen der Einlässe und Auslässe (8b, 9b, 11b, 12b) im Wesentlichen parallel zueinander sind, wobei: 15
- der erste Einlass (8b) und der erste Auslass (9b) horizontal zueinander ausgerichtet sind,
 - der zweite Einlass (12b) und der zweite Auslass (11b) horizontal zueinander ausgerichtet sind. 20
6. Wärmeaustauscher nach Anspruch 5, **dadurch gekennzeichnet, dass:** 25
- der erste Einlass (8b) und der zweite Auslass (11b) vertikal zueinander ausgerichtet sind,
 - der zweite Einlass (12b) und der erste Auslass (9b) vertikal zueinander ausgerichtet sind. 30
7. Wärmeaustauscher nach Anspruch 1, **dadurch gekennzeichnet, dass** er Fördermittel (40, 41, 42) umfasst, um einen Durchfluss entsprechend einer im Wesentlichen vordefinierten Bahn oder Richtung des ersten Fluids innerhalb der Kammer (32) herbeizuführen. 35
8. Wärmeaustauscher nach Anspruch 1, **dadurch gekennzeichnet, dass** der Wärmeaustauscher (30) so vorangeordnet ist, dass der Durchfluss des zweiten Fluids, innerhalb der Leitung (33), im Gegenstrom oder in einer Richtung, entgegengesetzt zu dem Durchfluss des ersten Fluids innerhalb der Kammer (32) stattfindet. 40
9. Wärmeaustauscher nach Anspruch 7, **dadurch gekennzeichnet, dass** die Fördermittel (40, 41, 42) wenigstens eines der Folgenden umfassen: 45
- ein Abteilungselement (40), das dafür gestaltet ist, ein Umwälzen des ersten Fluids in nur einer Richtung innerhalb der Kammer (32), von dem jeweiligen Einlass (8b) zu dem jeweiligen Auslass (9b), zu ermöglichen, 50
 - einen Korpus (41, 42), der in der Kammer (32) untergebracht und funktionsfähig ist, um das erste Fluid zu zwingen, durch Wendeln der Leitung (33) zu fließen, wobei die letztere in der Form einer Wendel konfiguriert ist, wobei der Korpus (41, 42) vorzugsweise die Gestalt eines hohlen Zylinders hat, mit einem jeweiligen geschlossenen Ende (41a, 42a), das der Richtung des Durchflusses innerhalb der Kammer (32) entgegenwirkt. 55
10. Wärmeaustauscher nach Anspruch 1 und 3, **dadurch gekennzeichnet, dass** die Seite (31b) wenigstens einen, vorzugsweise vorspringenden, Abschnitt (34, 35) umfasst, der eine jeweilige vordere, vorzugsweise ebene, Fläche (34a, 35a) hat, wobei sich in der vorderen Fläche (34a, 35a) wenigstens zwei der Einlässe und Auslässe (8b, 9b, 11b, 12b) öffnen und wenigstens ein erstes Mittel (20b) zum Anordnen und/oder Befestigen bereitgestellt wird.
11. Wärmeaustauscher nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass:**
- der vertikale Abstand zwischen den Mittelpunkten (A) des ersten Einlasses (8b) und des ersten Auslasses (9b) und der vertikale Abstand zwischen den Mittelpunkten (A) des zweiten Einlasses (12b) und des zweiten Auslasses (11b) einander im Wesentlichen gleich sind und ungefähr 40 mm beziehungsweise 42 mm messen und
 - der horizontale Abstand zwischen den Mittelpunkten (B) des ersten Einlasses (8b) und des ersten Auslasses (9b) und der horizontale Abstand zwischen den Mittelpunkten (B) des zweiten Einlasses (12b) und des zweiten Auslasses (11b) einander im Wesentlichen gleich sind und ungefähr 154 mm, 172 mm beziehungsweise 278 mm messen.
12. Wärmeaustauscher nach Anspruch 1, **dadurch gekennzeichnet, dass** das Gehäuse (31) in seiner Gesamtheit eine ringförmige Gestalt hat.
13. Wärmeaustauscher nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Gehäuse (31) durch wenigstens zwei Bestandteile (31a, 31b) gebildet wird, die auf eine abgedichtete Weise miteinander verbunden sind.
14. Wärmeaustauscher nach Anspruch 13, **dadurch gekennzeichnet, dass** die Bestandteile zwei Halbschalen (31a, 31b) umfassen, die auf eine trennbare Weise miteinander verbunden sind, wobei es zwischen den zwei Halbschalen wirksam angeordnete Wasserabdichtungsmittel (38', 38'') gibt.

15. Wärmeaustauscher nach Anspruch 10, **dadurch gekennzeichnet, dass** die Fläche (34a, 35a) durch ein Frontelement definiert wird, das auf eine trennbare Weise an einem Bestandteil (31a, 31b) des Gehäuses (31) befestigt ist, wobei insbesondere mehrere Frontelemente (34a, 35a) unterschiedlicher Arten bereitgestellt werden, die in Bezug aufeinander wenigstens, was die relative Stellung zwischen den Einlässen und Auslässen (8b, 9b, 11b, 12b) betrifft, differenziert sind.
16. Wärmeaustauscher nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** Adaptermittel (50) bereitgestellt werden, die dafür gestaltet sind, mechanisch und auf eine abgedichtete Weise zwischen der Verbindungsbaugruppe (P, 17, 18) und dem Wärmeaustauscher selbst befestigt zu werden, wobei die Adaptermittel (50) innere Kanäle definieren, die für eine hydraulische Verbindung mit den Einlässen und Auslässen (8b, 9b, 11 b, 12b) gestaltet sind.
17. Wärmeaustauscher nach Anspruch 16, **dadurch gekennzeichnet, dass** die Adaptermittel einen oder mehrere Adapterkorpusse umfassen, wobei jeder Korpus (50) wenigstens einen inneren Durchgang hat, der sich zwischen zwei entgegengesetzten und parallelen Seiten (50a, 50b) des Korpus selbst erstreckt, wobei, auf der einen Seite (50a), Mittel (51) für das Anordnen und/oder mechanische Befestigen des Korpus (50) in Bezug auf den Heißwasserbereiter (1) bereitgestellt werden und wobei, auf der anderen Seite, zweite Mittel (52) zum Anordnen und/oder mechanischen Befestigen des Wärmeaustauschers (30) in Bezug auf den Korpus (50) bereitgestellt werden.
18. Wärmeaustauscher nach Anspruch 13, **dadurch gekennzeichnet, dass** die Bestandteile wenigstens einen Bestandteil einer ersten Art (31 a, 31 b) umfassen, der selektiv an Bestandteile einer zweiten Art gekoppelt werden kann, die in Bezug aufeinander wenigstens, was die relative Stellung zwischen den Einlässen und Auslässen (8b, 9b, 11b, 12b) betrifft, differenziert sind.
19. Wärmeaustauscher nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Gehäuse (31) wenigstens zum Teil durch Formen, insbesondere eines synthetischen oder Aluminiumwerkstoffs, gewonnen wird.
20. Wärmeaustauscher nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Gesamtabmessungen des Gehäuses (31) nicht größer als ungefähr 400 mm in der Breite, 120 mm in der Tiefe und 270 mm in der Höhe sind.
21. Heißwasserbereiter einer kombinierten Art, der Folgendes umfasst:
- einen Primärkreis für ein Primärfluid oder erstes Fluid, der wenigstens Folgendes hat:
 - einen Zuleitungszeit (4) und einen Rückleitungszeit (5), gestaltet für eine Verbindung mit einer Anlage zum Erhitzen einer Umgebung,
 - einen Nebenzweig (8, 9), der den Zuleitungszeit (4) mit dem Rückleitungszeit (5) verbindet,
 - einen Haupt-Wärmeaustauscher (3), vorzugsweise einen Gasbrenner-Wärmeaustauscher, zum Erhitzen des Primärfluids,
 - eine Umwälzpumpe, die längs des Primärkreises angeordnet ist,
 - einen Sekundärkreis (15, 16) für das Brauchwasser oder Sekundärfluid,
 - einen Neben-Wärmeaustauscher, der in den Nebenzweig (8, 9) des Primärkreises (4, 5) eingefügt ist und für einen Wärmeaustausch zwischen dem Primärfluid und dem Sekundärfluid bereitgestellt wird,
 - Mittel (23) für das selektive Umleiten der Umwälzung des Primärfluids zu dem Nebenzweig (8, 9) hin oder zu der Anlage zum Erhitzen einer Umgebung hin,
 - wobei der Heißwasserbereiter (1) darüber hinaus eine Verbindungsbaugruppe (P, 17, 18) für einen Einbau eines Wärmeaustauschers des Plattentyps, an dem Heißwasserbereiter selbst, umfasst, wobei die Verbindungsbaugruppe wenigstens Folgendes hat:
 - eine erste Verbindung und eine zweite Verbindung (8, 9) für die Verbindung des Neben-Wärmeaustauschers mit dem Nebenzweig des Primärkreises und
 - eine dritte Verbindung und eine vierte Verbindung (11, 12) für die Verbindung des Neben-Wärmeaustauschers mit dem Sekundärkreis,
- wobei die erstem die zweite, die dritte und die vierte Verbindung (8, 9 und 11, 12) insbesondere von dem Schnellwechsellertyp oder ohne mit Gewinde versehene Rohrverbindungen sind, wobei der Heißwasserbereiter **dadurch gekennzeichnet ist, dass** der Neben-Wärmeaustauscher (30) nach einem oder mehreren der Ansprüche 1 bis 20 gebaut ist.
22. Heißwasserbereiter nach Anspruch 21, **dadurch gekennzeichnet, dass** die Baugruppe zwei Verbindungseinheiten (17, 18) umfasst, die mit ein und demselben Träger (P) verknüpft sind, wobei jede Einheit eine jeweilige Verbindung (8, 9) zu einem

Abschnitt (32) innerhalb des Wärmeaustauschers (30) des Nebenzweiges des Primärkreises sowie eine jeweilige Verbindung (11, 12) zu einer Strecke (33) innerhalb des Wärmeaustauschers (30) des Sekundärzweiges hat.

23. Heißwasserbereiter nach Anspruch 22, **dadurch gekennzeichnet, dass** jede Verbindungseinheit (17, 18) ferner wenigstens eines der Folgenden umfasst:

- eine jeweilige Verbindung (4, 5) zu der Anlage zum Erhitzen einer Umgebung und eine jeweilige Verbindung (15, 16) zu einer Anlage für Brauchwasser, wobei die weiteren Verbindungen (4, 5, 15, 16) unterhalb des Trägers (P) vorspringen und jeweilige Achsen haben, die parallel zueinander und senkrecht in Bezug auf die Achsen der ersten, der zweiten, der dritten und der vierten Verbindung (8, 9 und 11, 12) sind,
- ein Mittel zum Anordnen und/oder mechanischen Befestigen (20, 21), das dafür gestaltet ist, mit einem jeweiligen Mittel zum Anordnen und/oder mechanischen Befestigen (20b) des Wärmeaustauschers (30) zusammenzuwirken.

24. Heißwasserbereiter nach einem der Ansprüche 21 bis 23, **dadurch gekennzeichnet, dass** er eine Hülse (2) mit Gesamtabmessungen, die nicht größer als ungefähr 500 mm in der Breite, 400 mm in der Tiefe und 900 mm in der Höhe sind, umfasst.

Revendications

1. Echangeur thermique instantané pour chauffer de l'eau sanitaire dans une chaudière combinée (1), particulièrement dans une chaudière domestique de dimensions compactes, l'échangeur thermique (30) comportant une enceinte (31) définissant une chambre (32) destinée à un premier fluide, à l'intérieur de laquelle s'étend un conduit ou un tube (33) destiné à un second fluide, dans lequel au moins l'un de la chambre (32) et du conduit (33) présente une capacité de confinement d'une quantité substantielle du fluide respectif, en particulier supérieure à un litre, **caractérisé en ce que**:

- sur une seule et même face (31b) de l'enceinte (31) il est prévu :

- un premier orifice d'entrée (8b) et un premier orifice de sortie (9b) dans, et hors de, ladite chambre (32) ; et
- un second orifice d'entrée (12b) et un second orifice de sortie (11b) dans et hors du dit tube (33),

- lesdits orifices d'entrée (8b, 12b) et de sortie (9b, 11b) sont pré-agencés en vue d'un raccordement hydraulique rapide à un ensemble de raccordement (P, 17, 18) sans l'aide de raccords de jonction filetés ;

- la chambre (32) présente une configuration essentiellement annulaire et le conduit ou le tube (33) est enroulé suivant une forme hélicoïdale qui suit le développement annulaire de la chambre (32).

2. Echangeur thermique selon la revendication 1, **caractérisé en ce que** le conduit (33) possède une capacité de confinement ou de stockage du fluide respectif supérieure à deux litres comprise, de préférence, entre trois et six litres.

3. Echangeur thermique selon la revendication 1, **caractérisé en ce que** sur ladite face (31b) de l'enceinte (31), sont prévus des moyens (20b) servant au positionnement et/ou à la fixation mécanique de l'échangeur thermique (30) de la chaudière (1).

4. Echangeur thermique selon la revendication 3, **caractérisé en ce que** lesdits moyens de positionnement et/ou de fixation mécanique comportent un premier élément et un second élément (20b) alignés horizontalement l'un avec l'autre, configurés, en particulier, sous forme de parties en saillie présentant une cavité taraudée.

5. Echangeur thermique selon la revendication 1, **caractérisé en ce que** les axes desdits orifices d'entrée et de sortie (8b, 9b, 11b, 12b) sont essentiellement parallèles les uns aux autres, dans lequel :

- le premier orifice d'entrée (8b) et le premier orifice de sortie (9b) sont alignés horizontalement l'un avec l'autre ;
- le second orifice d'entrée (12b) et le second orifice de sortie (11b) sont alignés horizontalement l'un avec l'autre.

6. Echangeur thermique selon la revendication 5, **caractérisé en ce que** :

- le premier orifice d'entrée (8b) et le second orifice de sortie (11b) sont alignés verticalement l'un avec l'autre ; et
- le second orifice d'entrée (12b) et le premier orifice de sortie (9b) sont alignés verticalement l'un avec l'autre.

7. Echangeur thermique selon la revendication 1, **caractérisé en ce qu'il** comporte des moyens de transfert (40, 41, 42) pour entraîner un flux suivant un parcours ou une direction du premier fluide essentiellement prédéfini(e) à l'intérieur de ladite chambre

- (32).
8. Echangeur thermique selon la revendication 1, **caractérisé en ce que** l'échangeur thermique (30) est pré-agencé de façon que le flux du second fluide se produise, à l'intérieur dudit conduit (33), à contre-courant, ou dans une direction opposée à celle du flux du premier fluide à l'intérieur de ladite chambre (32).
9. Echangeur thermique selon la revendication 7, **caractérisé en ce que** lesdits moyens de transfert (40, 41, 42) comportent au moins l'un de :
- un élément de cloison (40) conçu pour permettre la circulation du premier fluide juste dans une direction à l'intérieur de ladite chambre (32) à partir de l'orifice d'entrée respectif (8b) vers l'orifice de sortie respectif (9b),
 - un corps (41, 42) logé dans ladite chambre (32) et agissant pour forcer le premier fluide à circuler à travers les spires dudit conduit (33), ce dernier étant configuré sous la forme d'un serpent, le dit corps (41, 42) présentant, de préférence, la forme d'un cylindre creux doté d'une extrémité fermée respective (41a, 42a) qui s'oppose à la direction de la circulation du premier fluide à l'intérieur de ladite chambre (32).
10. Echangeur thermique selon les revendications 1 et 3, **caractérisé en ce que** ladite face (31b) comporte au moins une partie, de préférence en saillie, (34, 35) présentant une surface frontale respective, de préférence plane, (34a, 35a), au moins deux desdits orifices d'entrée et de sortie (8b, 9b, 11b, 12b) s'ouvrant dans ladite surface frontale (34a, 35a) et laquelle est dotée d'au moins un premier moyen (20b) de positionnement et/ou de fixation.
11. Echangeur thermique selon l'une quelconque des revendications précédentes, **caractérisé en ce que** :
- la distance verticale entre les centres (A) du premier orifice d'entrée (8b) et du premier orifice de sortie (9b) et la distance verticale entre les centres (A) du second orifice d'entrée (12b) et du second orifice de sortie (11b) sont essentiellement égales l'une à l'autre et mesurent environ 40 mm, ou sinon, 42 mm ; et
 - la distance horizontale entre les centres (B) dudit premier orifice d'entrée (8b) et dudit premier orifice de sortie (9b) et la distance horizontale entre les centres (B) dudit second orifice d'entrée (12b) et dudit second orifice de sortie (11b) sont essentiellement égales l'une à l'autre et mesurent, approximativement, 154 mm, 172 mm, ou sinon 278 mm.
12. Echangeur thermique selon la revendication 1, **caractérisé en ce que** l'enceinte (31) présente une configuration totalement annulaire.
13. Echangeur thermique selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'enceinte (31) est formée par au moins deux composants (31a, 31b) reliés l'un à l'autre par un moyen étanche.
14. Echangeur thermique selon la revendication 13, **caractérisé en ce que** lesdits composants comprennent deux demi coques (31a, 31b) reliées l'une à l'autre d'une façon séparable, des moyens d'étanchéité à l'eau (38', 38'') se trouvant positionnés fonctionnellement entre les deux demi coques.
15. Echangeur thermique selon la revendication 10, **caractérisé en ce que** ladite surface (34a, 35a) est définie à partir d'un élément frontal, fixé d'une façon séparable à un composant (31a, 31b) de ladite enceinte (31), dans lequel, en particulier, il est prévu une pluralité d'éléments frontaux (34a, 35a) de types différents, se différenciant les uns par rapport aux autres au moins par ce qui concerne la position relative entre lesdits orifices d'entrée et lesdits orifices de sortie (8b, 9b, 11b, 12b).
16. Echangeur thermique selon l'un quelconque des revendications précédentes, **caractérisé en ce que** des moyens adaptateurs (50) sont fournis, conçus pour être fixés mécaniquement et de façon étanche entre ledit assemblage de raccordement (P, 17, 18) et l'échangeur thermique lui-même, lesdits moyens adaptateurs (50) définissant des canaux internes destinés à un raccordement hydraulique avec lesdits orifices d'entrée et lesdits orifices de sortie (8b, 9b, 11b, 12b).
17. Echangeur thermique selon la revendication 16, **caractérisé en ce que** lesdits moyens adaptateurs comportent un ou plusieurs corps adaptateur(s), chaque corps (50) comprenant au moins un passage interne qui s'étend entre deux faces opposées et parallèles (50a, 50b) du corps lui-même, des moyens (51) permettant le positionnement et/ou la fixation mécanique du corps (50) par rapport à la chaudière (1) étant fournis sur une face (50a), et sont prévus, sur l'autre face, des seconds moyens (52) servant au positionnement et/ou à la fixation mécanique de l'échangeur thermique (30) par rapport au corps (50).
18. Echangeur thermique selon la revendication 13, **caractérisé en ce que** lesdits composants comportent au moins un composant d'un premier type (31a, 31b) qui peut être couplé de façon sélective aux composants d'un second type se différenciant les uns des

autres au moins par ce qui concerne la position relative entre lesdits orifices d'entrée et lesdits orifices de sortie (8b, 9b, 11b, 12b).

19. Echangeur thermique selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'enceinte (31) est, au moins en partie, réalisée par moulage, en particulier d'un matériau d'aluminium ou d'un matériau synthétique. 5
20. Echangeur thermique selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les dimensions totales de l'enceinte (31) ne sont pas supérieures, approximativement, à 400 mm en largeur, 120 mm en profondeur et 270 mm en hauteur. 10 15
21. Chaudière d'un type combiné comportant :
- un circuit primaire destiné à un fluide de chauffage ou fluide primaire, comportant au moins : 20
 - un branchement d'alimentation (4) et un branchement de retour (5), conçu pour un raccordement avec une installation servant à chauffer un environnement ; 25
 - un branchement auxiliaire (8, 9) qui raccorde le branchement d'alimentation (4) au branchement de retour (5) ;
 - un échangeur thermique principal (3), de préférence un échangeur thermique avec brûleur à gaz, pour chauffer le fluide primaire ; 30
 - une pompe de circulation disposée le long du circuit primaire ;
 - un circuit secondaire (15, 16) destiné à l'eau sanitaire, ou au fluide secondaire ; 35
 - un échangeur thermique auxiliaire, inséré dans ledit branchement auxiliaire (8, 9) du circuit primaire (4, 5) et prévu pour un échange thermique entre le fluide primaire et le fluide secondaire ; et 40
 - des moyens (23) pour dévier sélectivement la circulation du fluide primaire vers ledit branchement auxiliaire (8, 9) ou vers l'installation destinée au chauffage d'un environnement,
 - la chaudière (1) comprenant, de plus, un ensemble de raccordement (P, 17, 18) destiné à une installation, sur la chaudière elle-même, d'un échangeur thermique du type à plaques, l'ensemble de raccordement comportant au moins : 45 50
 - un premier raccordement et un deuxième raccordement (8, 9) en vue du raccordement de l'échangeur thermique auxiliaire au branchement auxiliaire du circuit primaire ; et
 - un troisième raccordement et un quatrième raccordement (11, 12) en vue d'un raccordement de l'échangeur thermique auxiliaire avec le circuit secondaire, 55

lesdits premier, deuxième, troisième et quatrième raccords (8, 9 et 11, 12) étant, en particulier, du type à échange rapide, ou sans raccords de jonction filetés,

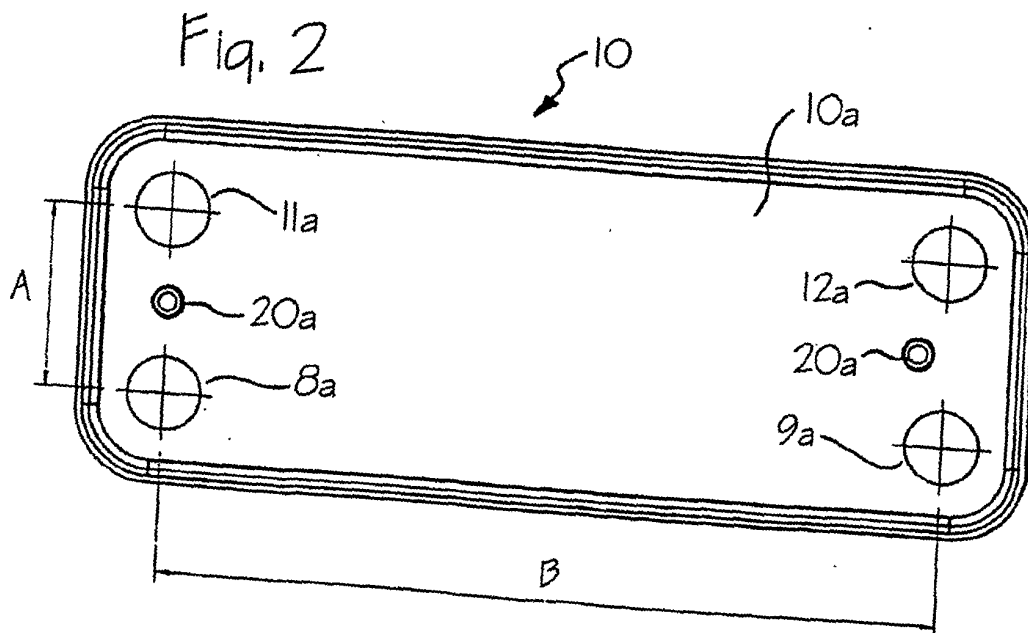
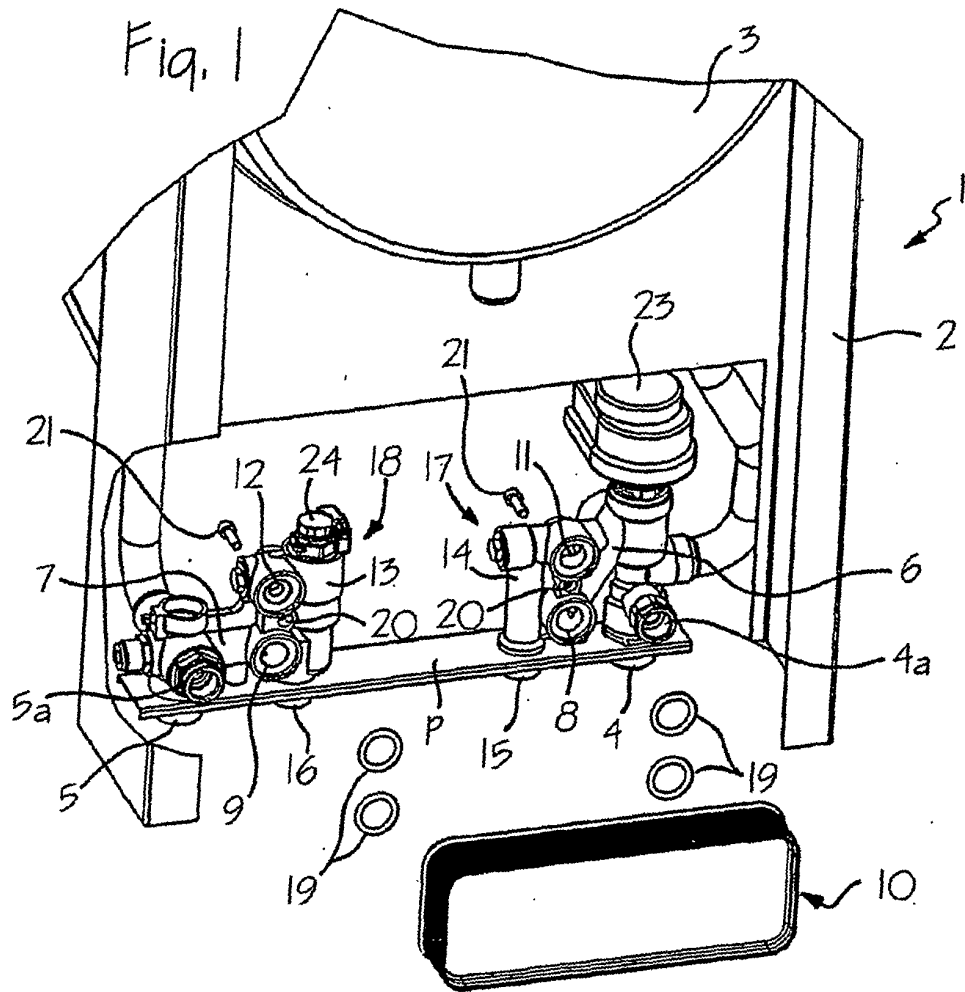
ladite chaudière étant **caractérisée en ce que** ledit échangeur thermique auxiliaire (30) est construit selon l'une ou plusieurs des revendications 1 à 20.

22. Chaudière selon la revendication 21, **caractérisée en ce que** ledit ensemble comprend deux unités de raccordement (17, 18) associées à un seul et même support (P), chaque unité comportant un raccordement respectif (8, 9) à une partie (32) se trouvant à l'intérieur de l'échangeur thermique (30) du branchement auxiliaire du circuit primaire, de même qu'un raccordement respectif (11, 12) à une extension (33) se trouvant à l'intérieur de l'échangeur thermique (30) du circuit secondaire.

23. Chaudière selon la revendication 22, **caractérisée en ce que** chaque unité de raccordement (17, 18) comprend, de plus, au moins l'un de :

- un raccordement respectif (4, 5) à l'installation destinée au chauffage d'un environnement et un raccordement respectif (15, 16) à l'installation destinée à l'eau sanitaire, dans laquelle lesdits raccords supplémentaires (4, 5, 15, 16) s'avancent en-dessous dudit support (P) et comportent des axes respectifs essentiellement parallèles les uns aux autres et perpendiculaires par rapport aux axes desdits premier, deuxième, troisième et quatrième raccords (8, 9 et 11, 12),
- des moyens de positionnement et/ou de fixation mécanique (20, 21) conçus pour coopérer avec des moyens respectifs de positionnement et/ou de fixation mécanique (20b) de l'échangeur thermique (30).

24. Chaudière selon l'une quelconque des revendications 21 à 23, **caractérisée en ce qu'elle** comprend une coque (2) dotée de dimensions totales qui ne sont pas, approximativement, supérieures à 500 mm de large, 400 mm de long et 900 mm de haut.



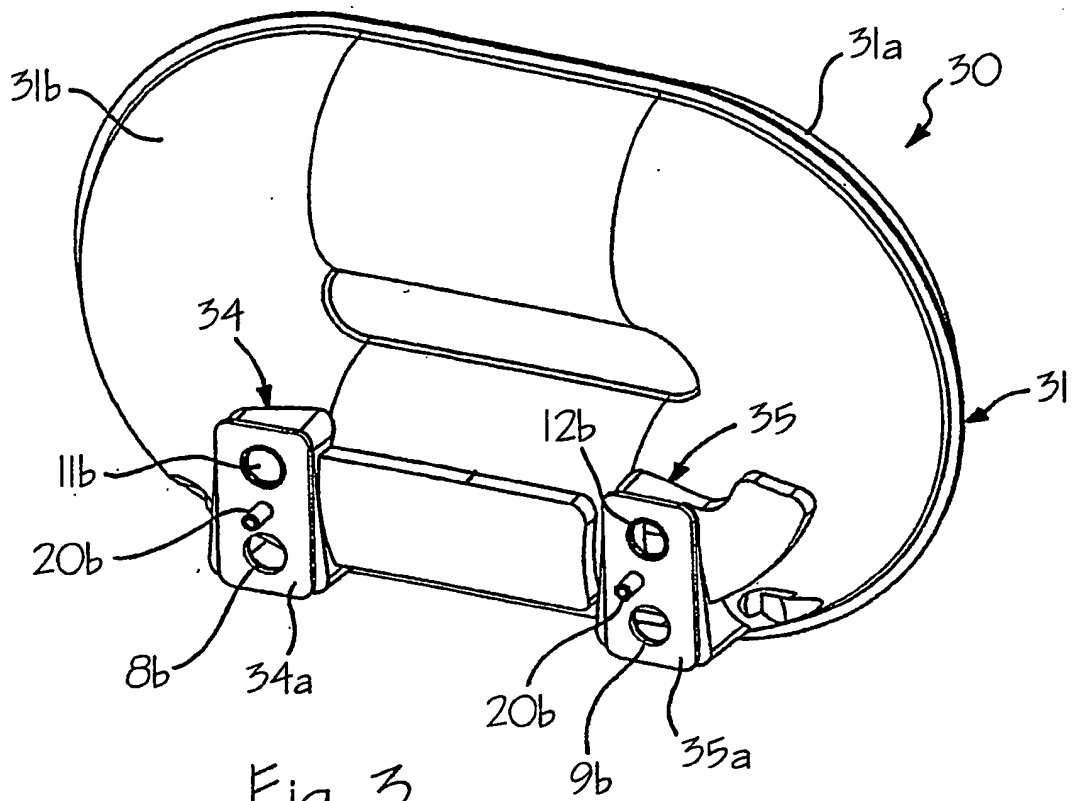


Fig. 3

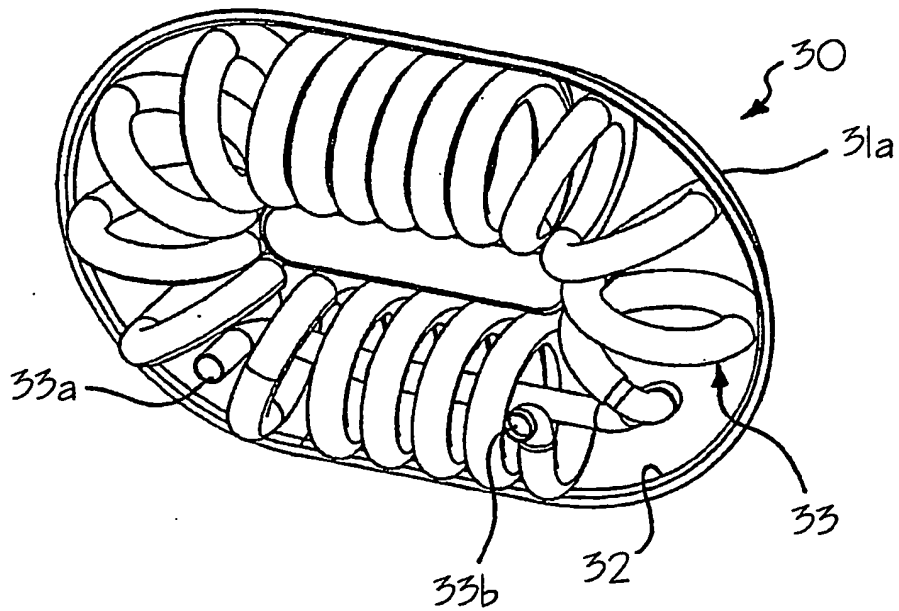


Fig. 4

Fig. 5

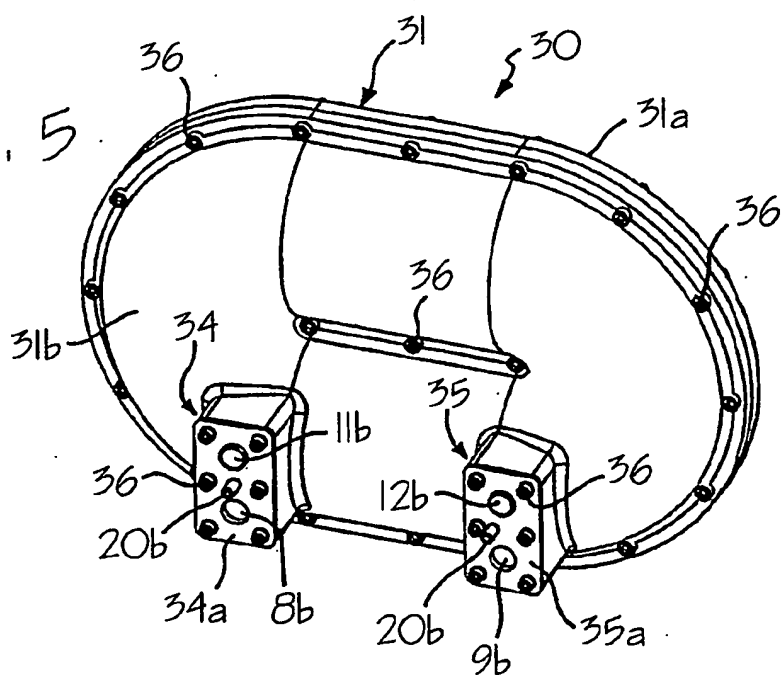
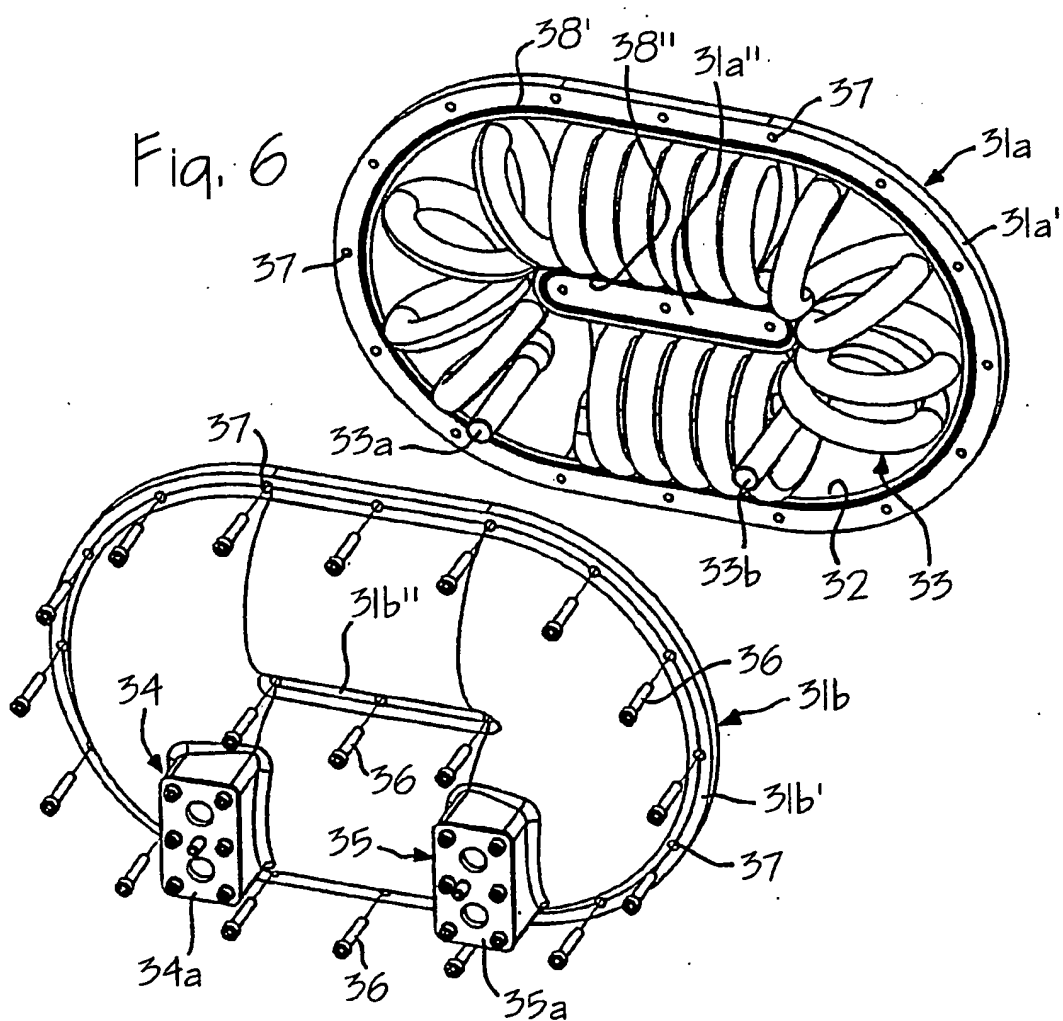


Fig. 6



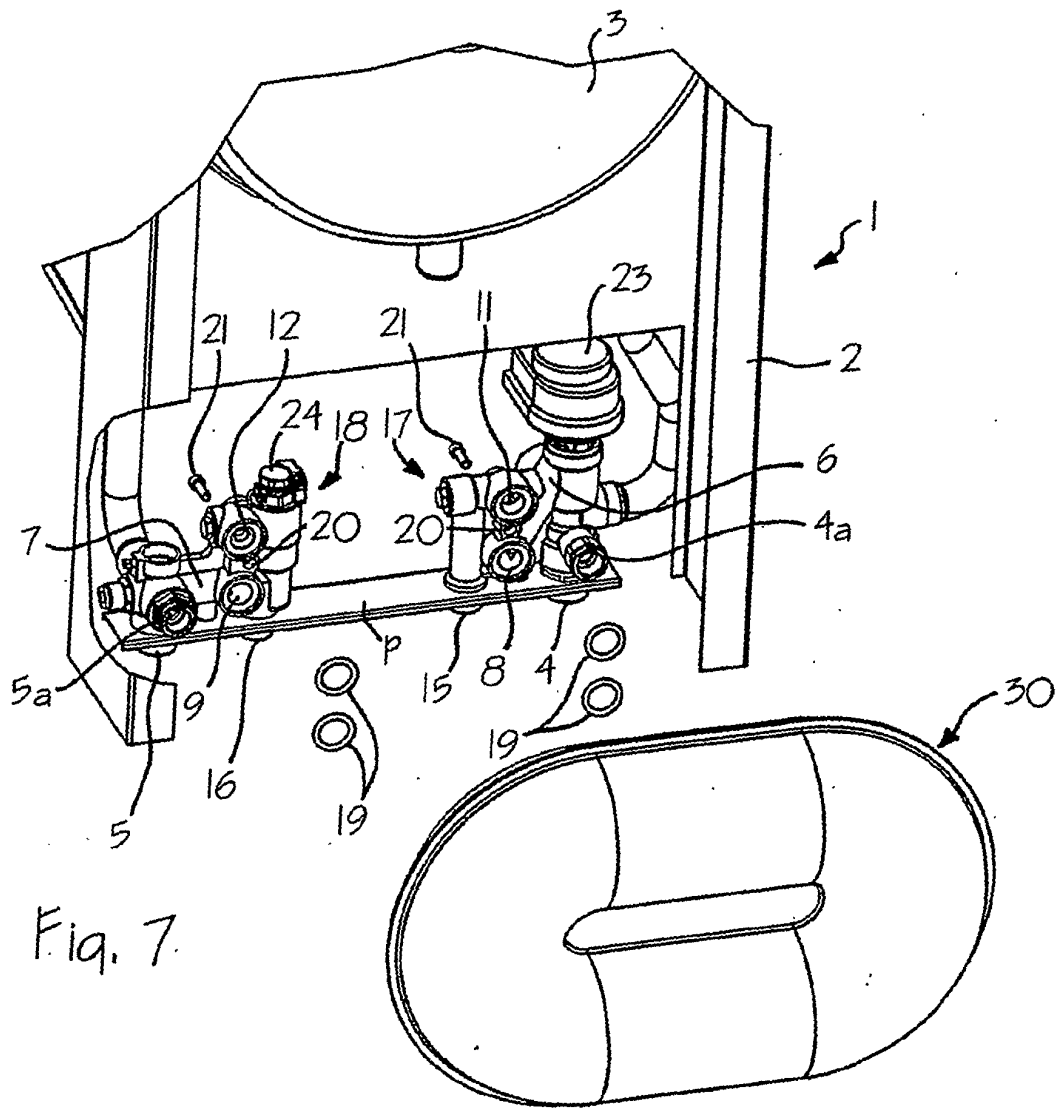


Fig. 7.

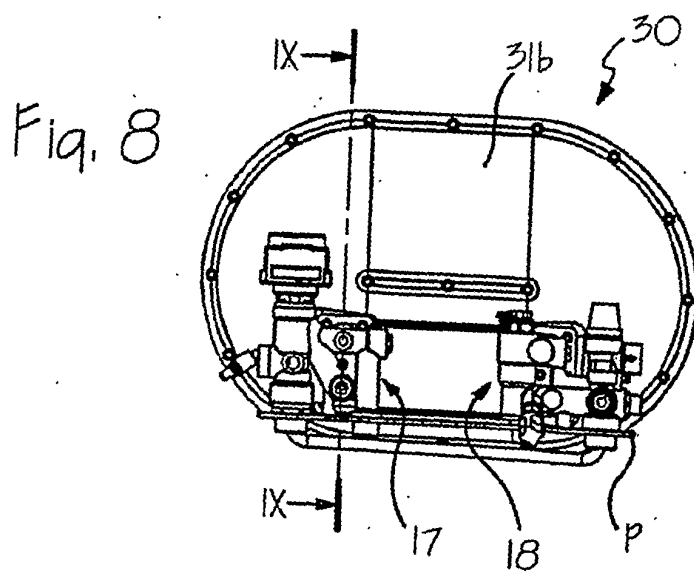


Fig. 8

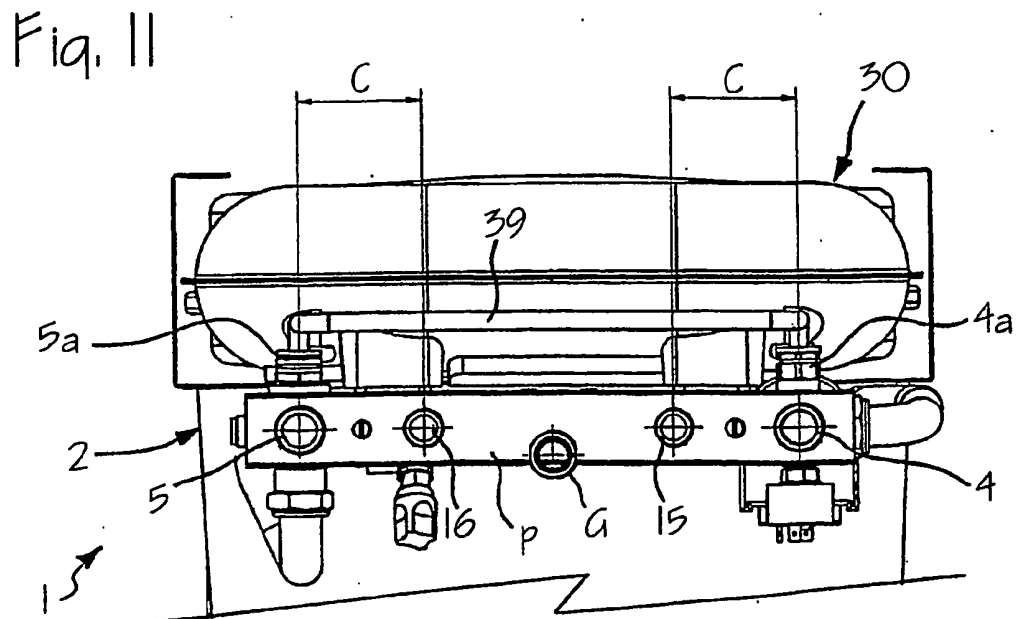
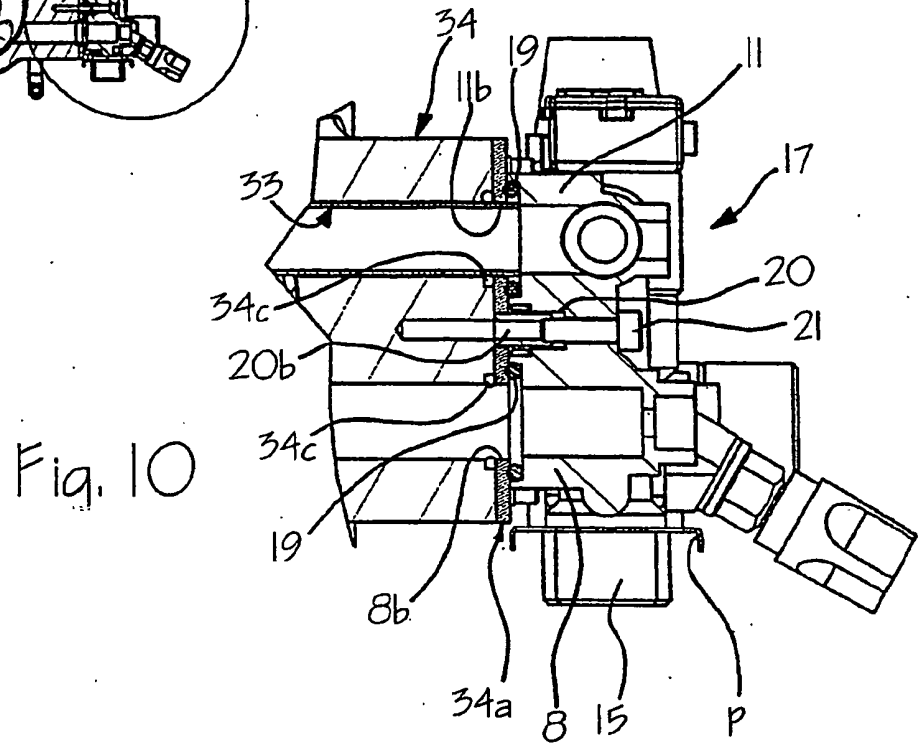
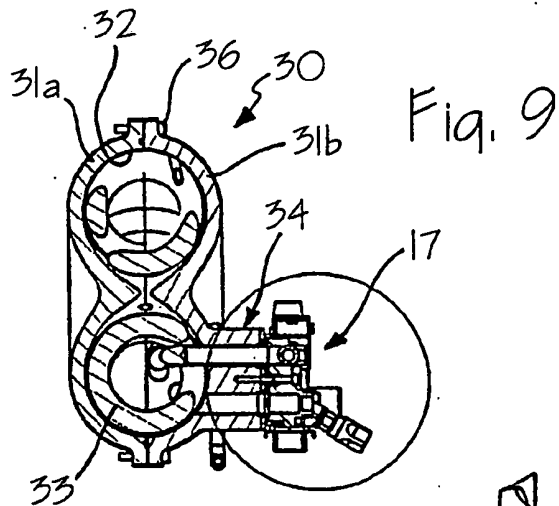


Fig. 12

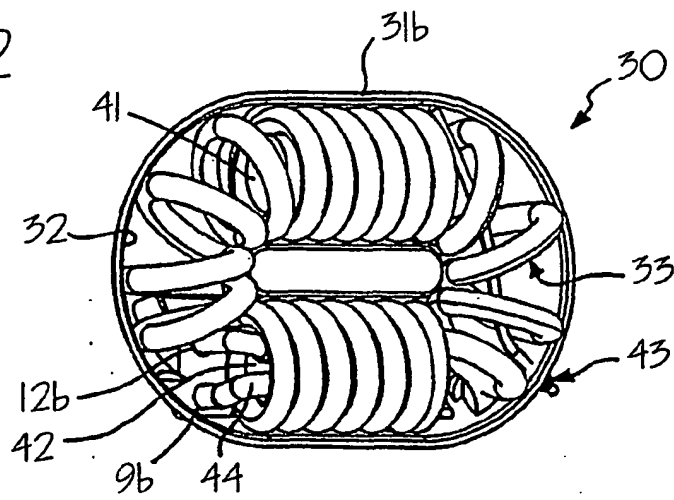


Fig. 13

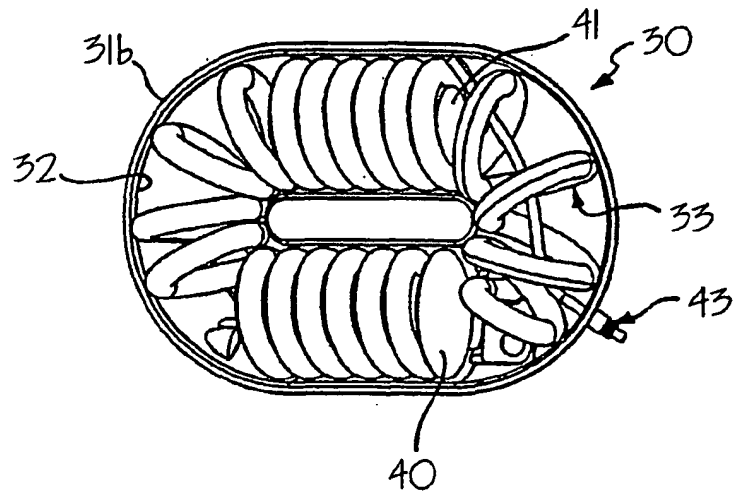


Fig. 14

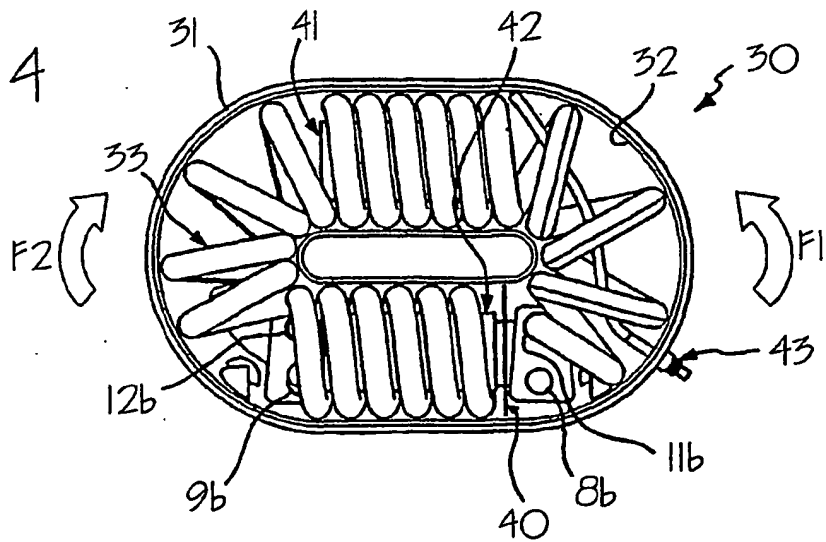


Fig. 15

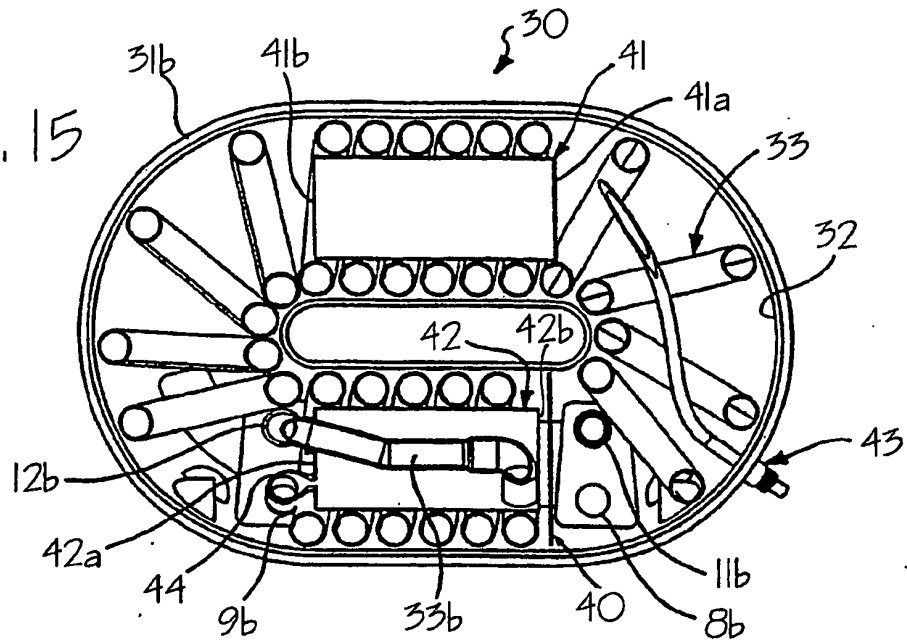
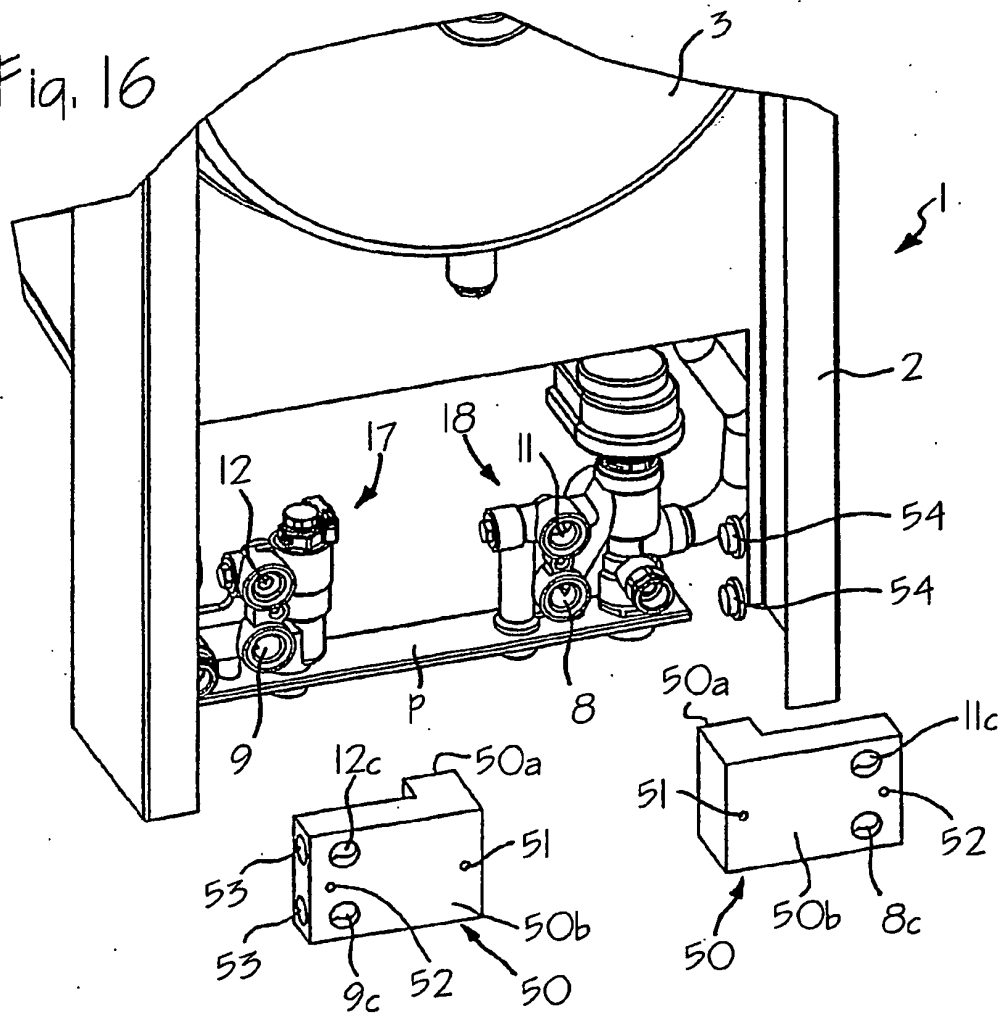


Fig. 16



REFERENCES CITED IN THE DESCRIPTION

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