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(54) Device for heating fluids

(57) A device for heating fluids comprises at least one boiler, at least one inlet line and at least one outlet line for a fluid which crosses the aforementioned boiler and means for pumping the aforementioned fluid. In the device the boiler heats the aforementioned fluid through microwave emission.

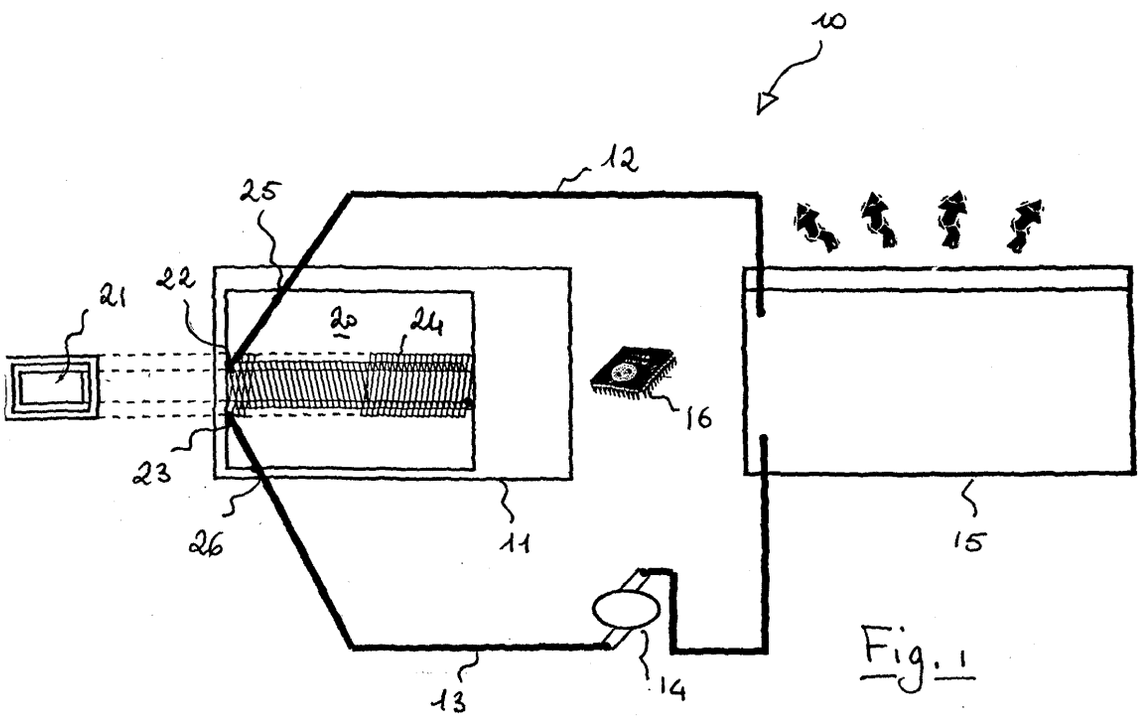

Fig. 1

EP 1 344 993 A2

Description

[0001] The present invention has as its object a device for heating fluids.

[0002] As is known, there are various types of heating units, used in domestic and/or industrial environments.

[0003] Such units take care of heating water or other fluids or gels, using one or more gas-fuelled boilers, or else boilers fuelled by kerosene or even electrically or in general with liquid or gas fossil fuels.

[0004] Each of the known systems has drawbacks, in some cases due to the use of expensive and polluting fuels, or else due to imperfect efficient use of the energy supplied to the unit, with consequent undesired costs.

[0005] The possibility is also known of producing microwaves thanks to a special valve defined as "Magnetron".

[0006] It is used, for example in the construction of radars and in microwave ovens, to heat liquids or gels to be used for the heating of quarters, etc.

[0007] Indeed, the microwaves produced in such a way generate an electromagnetic field capable of making water molecules vibrate and of producing a heating of the element which contains them.

[0008] The purpose of the present invention is that of overcoming the aforementioned drawbacks, realising a unit for heating rooms having particular characteristics of efficiency and cost-effectiveness of use.

[0009] A further purpose of the present invention is that of realising an apparatus for the instant production of hot water to be used in all cases where needed (e.g. shower, sink, washing machine, dishwasher, etc.), reducing hot water production costs.

[0010] The invention is hereafter described in detail, as an example and not for limiting purposes, with reference to the attached diagrams, in which:

- figure 1 shows a diagram of a first embodiment of a device for heating fluids, according to the present invention;
- figure 2 shows a diagram of a second embodiment of a device for heating fluids, according to the present invention;
- figure 3 schematically shows a heating space belonging to the device for heating fluids, according to the present invention; and
- figure 4 shows a detail of an embodiment of the device for heating fluids, according to the present invention.

[0011] The device of the invention is globally indicated, in a first example embodiment thereof, with reference numeral 10, and is illustrated in figure 1.

[0012] In such a device 10 there is a boiler 11, the operation of which shall be described in detail hereafter, at least one inlet line 12 for a fluid and at least one outlet line 13 for a fluid through the boiler 11. A pump 14 and a heating element 15 are also foreseen. The system is adjusted through a microprocessor 16.

[0013] The heating element 15 is generally placed in position such as to supply heat to a room. Many heating elements 15 can be foreseen, arranged in different suitable positions.

[0014] To make things easier in the following description, the heating liquid or gel is called water, without for this reason wishing to exclude the use of other fluids or gels in the device 10.

[0015] The boiler 11 consists of a microwave generator, better illustrated in figure 3, which converts the power supplied by the mains into microwaves and is divided into five parts: a high-voltage transformer, a rectifier diode and a condenser, schematically joined together in block 17, a magnetron 18 and a waveguide 19 towards the heating space 20.

[0016] The microwaves produced by the aforementioned generator are irradiated into the heating space 20. The heating space 20 is made from metal material so as to allow the microwaves to rebound off the walls contained inside of it and it can be realised in different shapes and sizes (for example parallelepiped, cylindrical, spherical, etc.). The space 20 is closed on each side to avoid the microwaves escaping and has one or more partially or totally perforated walls to allow a possible disposal of the heat. The holes must, however have a diameter which is less than the wavelength of the microwaves to avoid them escaping.

[0017] Inside the heating space 20, for example in its centre, a tank 21 made from material which is transparent to microwaves is positioned, which can be realised in different shapes and sizes (for example parallelepiped, cylindrical, spherical, etc.). The tank 21 is fixed, for example, at the ends.

[0018] The tank 21 is refilled with water through the tube 12 at the point 22 with the function of first recipient. A coil 24, made from material which is transparent to microwaves, which partially or totally uses the volume of the heating space 20 is connected to the tank 21, coming out at point 23, the coil being partially or totally wound around the tank 21.

[0019] The heating space 20 is thus bombarded by the microwaves produced by the microwave generator heating the water contained in the tank 21 and the coil 24.

[0020] One or more holes are made at points 25 and 26, in the illustrated example of figure 4 one for the inlet and one for the outlet of the water, to which the ends of the coil 24 are connected. The holes are crossed by a metal grating with meshes with a smaller diameter with respect to the wavelength of the microwaves so as to prevent the microwaves from escaping from the heating area 20.

[0021] An electric pump 14 takes care of circulating the water through the tank 21 and the coil 24 at a speed such as to prevent it from boiling and then also through the heating element 15 (heat convector, radiator, etc.), fed from the tube 13.

[0022] The temperature of the water is constantly monitored by a dedicated electronic circuit 16 which takes care of switching off the microwave boiler and possibly takes care of interrupting the flow when the temperature reaches the predetermined value.

[0023] The aforementioned way of operating is one of the examples of operation and it can be modified, for example in the following ways:

- Absence of the tank 21 and use of just the coil 24.
- Absence of the coil 24 and use of just the tank 21.
- Absence of the tank 21 and the coil 24 and use of one or more tanks of different shapes and sizes (for example parallelepiped, cylindrical, round, oval, etc.).
- Absence of the tank 21 and the coil 24 and use of just a tube with a variable diameter, length and path.
- Use of a microwave boiler of a different shape (for example parallelepiped, cylindrical, round, oval, etc.) and size.

[0024] In all of the cases listed above the speed of the water can undergo variations according to the efficiency of the unit.

[0025] Moreover, at the design stage of new units, each heating element 15 (radiator, heat convector, etc.) can be equipped with a small microwave boiler which can be incorporated into the heating element itself, or else in a space formed in the immediate vicinity. In this way, besides having a clear advantage in zonal heating of the building, there is also a considerable saving in the unit components since it is no longer necessary to connect the individual heating elements with piping, etc., considerably decreasing the installation and design costs.

[0026] Moreover, the unit can be equipped with a series of solar panels for pre-heating the water and with a solar-electric power unit consisting of photovoltaic solar panels, to make the unit totally autonomous.

[0027] The present invention can also be used, with some variants, for heating fluids (for example water), as illustrated with particular reference to the diagram of figure 2, and globally indicated with reference numeral 10'.

[0028] The temperature of the water is constantly monitored by a dedicated electronic circuit which takes care of switching off the microwave boiler when the temperature reaches the predetermined value.

[0029] With such a system an apparatus for instantly producing hot water to be used in all cases where needed (e.g. shower, sink, washing machine, dishwasher, etc.) can be realised, decreasing hot water production costs.

[0030] Such a system, besides numerous components which have already been illustrated with reference to the previous case, foresees a tap 30 for letting out water.

[0031] Indeed, from figure 2 one should note the presence in the device 10' of the microwave boiler 11, of an inlet line 12 and an outlet line 13 for a fluid through the boiler 11, as well as the tank 21 and the coil 24.

[0032] In all of the embodiments, the material which is transparent to microwaves for realising the tank 21 and the coil 24 can be chosen from Pyrex, arcopal, plastic or other materials with analogous technical and thermal characteristics.

[0033] The frequency of the microwaves normally used in a typical microwave generation unit of an oven for food is 2.45 Ghz, but in use in the microwave boiler such a frequency could even undergo variations according to requirements.

[0034] The invention has numerous and important advantages with respect to the prior art.

[0035] The unit 10 can advantageously be used for heating rooms using units with circulation of liquids or gels with a closed circuit and a microwave boiler.

[0036] Since the aforementioned microwave generator is widely used in microwave ovens for food, its use in the present invention gives convenience and practicality to the unit.

[0037] Moreover, at the design stage of new units, each heating element 15 (radiator, heat convector, etc.) can be equipped with a small microwave boiler which can be incorporated into the heating element itself, or else in a space formed in the immediate vicinity.

[0038] In this way, besides having a clear advantage in zonal heating of the building, there is also a considerable saving in the unit components since it is no longer necessary to connect the individual heating elements with piping, etc., considerably decreasing the installation and design costs.

[0039] From that which has been described, it is clear that the inventive concepts expressed are not limited to the illustrated examples of application, but can advantageously be adapted to other analogous applications.

[0040] The present invention is therefore susceptible to numerous modifications and variants all covered by the inventive concept expressed in the attached claims, whereas the technical details can vary according to requirements.

Claims

1. Device for heating fluids comprising at least one boiler, at least one inlet line and at least one outlet line for a fluid which crosses the aforementioned boiler, means for pumping the aforementioned fluid, **characterised in that** the aforementioned boiler heats the aforementioned fluid through microwave emission.

2. Device for heating fluids, according to claim 1, **characterised in that** the aforementioned boiler comprises at least one microwave generator which converts the power supplied by the mains into microwaves and is divided at least into a high-voltage

transformer, a rectifier diode and a condenser, as well as a magnetron and a waveguide facing towards the aforementioned heating space.

3. Device for heating fluids, according to claim 1 or 2, **characterised in that** the aforementioned heating space is made from metal material so as to allow the microwaves to rebound off the walls contained inside of it and it can be realised in different shapes and sizes.

4. Device for heating fluids, according to claim 3, **characterised in that** the aforementioned heating space is closed on each side to avoid the microwaves escaping and has one or more partially or totally perforated walls to allow a possible disposal of the heat.

5. Device for heating fluids, according to claim 4, **characterised in that** the aforementioned holes have a diameter smaller than the wavelength of the microwaves to avoid them escaping.

6. Device for heating fluids, according to claim 1, **characterised in that** inside the aforementioned heating space a tank made from material which is transparent to microwaves is positioned, which can be realised in different shapes and sizes.

7. Device for heating fluids, according to claim 6, **characterised in that** the aforementioned tank is fixed at its ends.

8. Device for heating fluids, according to claim 1, **characterised in that** inside the aforementioned heating space a coil made from material which is transparent to microwaves is positioned.

9. Device for heating fluids, according to one of claims 6 to 8, **characterised in that** the aforementioned coil winds around the aforementioned tank.

10. Device for heating fluids, according to the previous claims, **characterised in that** it foresees holes for the inlet and outlet of water to which the ends of the coil are connected, where the aforementioned holes are crossed by a metal grating with meshes of a smaller diameter with respect to the wavelength of the microwaves so as to prevent the microwaves escaping from the aforementioned heating space.

11. Device for heating fluids, according to the previous claims, **characterised in that** the means for pumping the fluid foresees an electric pump which takes care of circulating the fluid through the aforementioned boiler to prevent it from boiling.

12. Device for heating fluids, according to the previous claims, **characterised in that** the temperature of the fluid is constantly monitored by a dedicated electronic circuit which takes care of switching off the microwave boiler and possibly takes care of interrupting the flow when the temperature reaches the predetermined value.

13. Device for heating fluids, according to claim 1, **characterised in that** it comprises at least one heating element outside of the aforementioned boiler.

14. Device for heating fluids, according to claim 1, **characterised in that** it comprises at least one microprocessor for its adjustment.

15. Device for heating fluids, according to claim 1, **characterised in that** it foresees a tap for letting out the aforementioned fluid.

16. Device for heating fluids, according to the previous claims, **characterised in that** it foresees the use of a single tube of variable diameter, length and path to convey the fluid through the aforementioned boiler.

17. Device for heating fluids, according to the previous claims, **characterised in that** the material which is transparent to microwaves for realising the aforementioned tank and the aforementioned coil can be chosen from Pyrex, Arcopal, plastic or other materials with analogous technical characteristics.

18. Device for heating fluids, according to the previous claims, **characterised in that** the frequency of the microwaves used is that normally used in a typical microwave generation unit of an oven for food.

19. Device for heating fluids, according to the previous claims, **characterised in that** each heating element is equipped with a small microwave boiler which can be incorporated in the heating element itself, or else in a space formed in the immediate vicinity.

20. Device for heating fluids, according to the previous claims, **characterised in that** it foresees a plurality of solar panels for pre-heating the water and a solar-electric power unit consisting of photovoltaic solar panels, in order to make the unit totally autonomous.

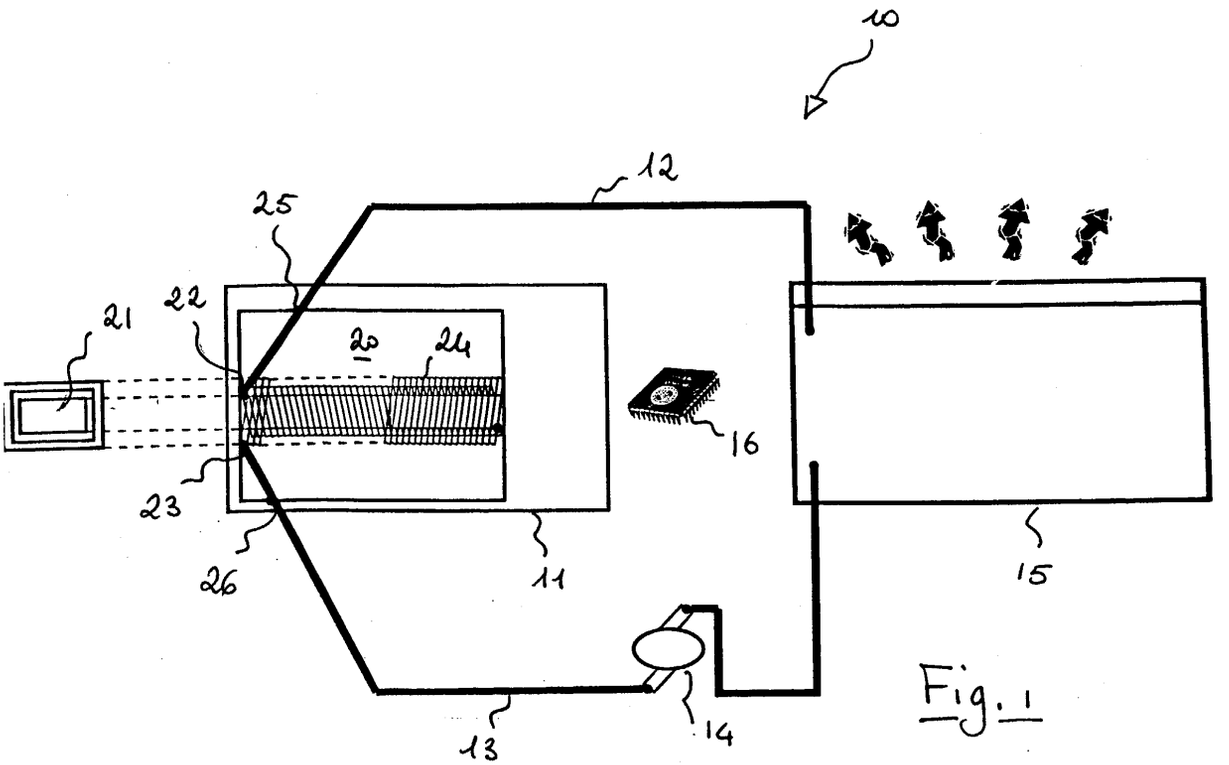
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Fig. 1

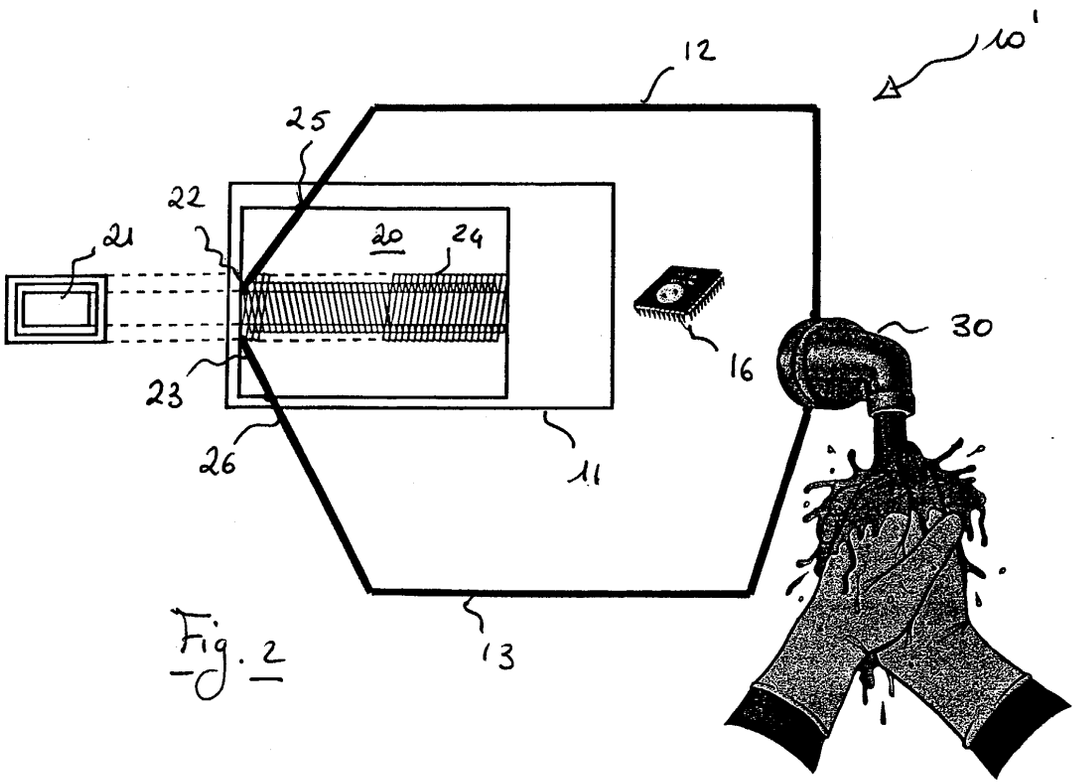
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Fig. 2

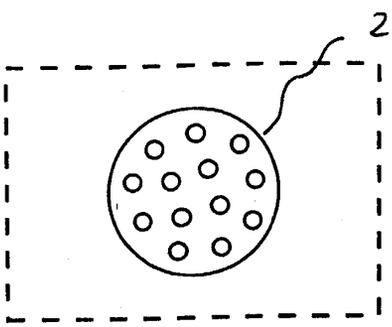

Fig. 4

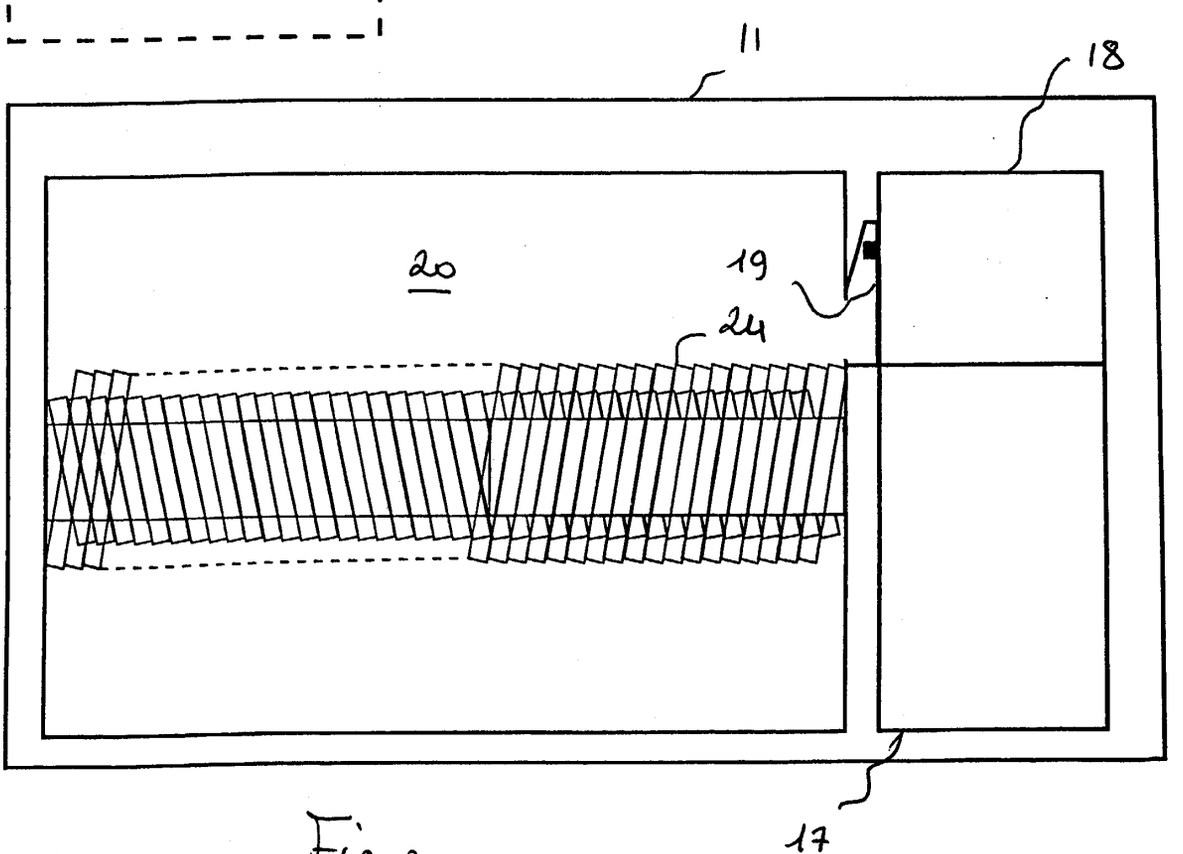

Fig. 3