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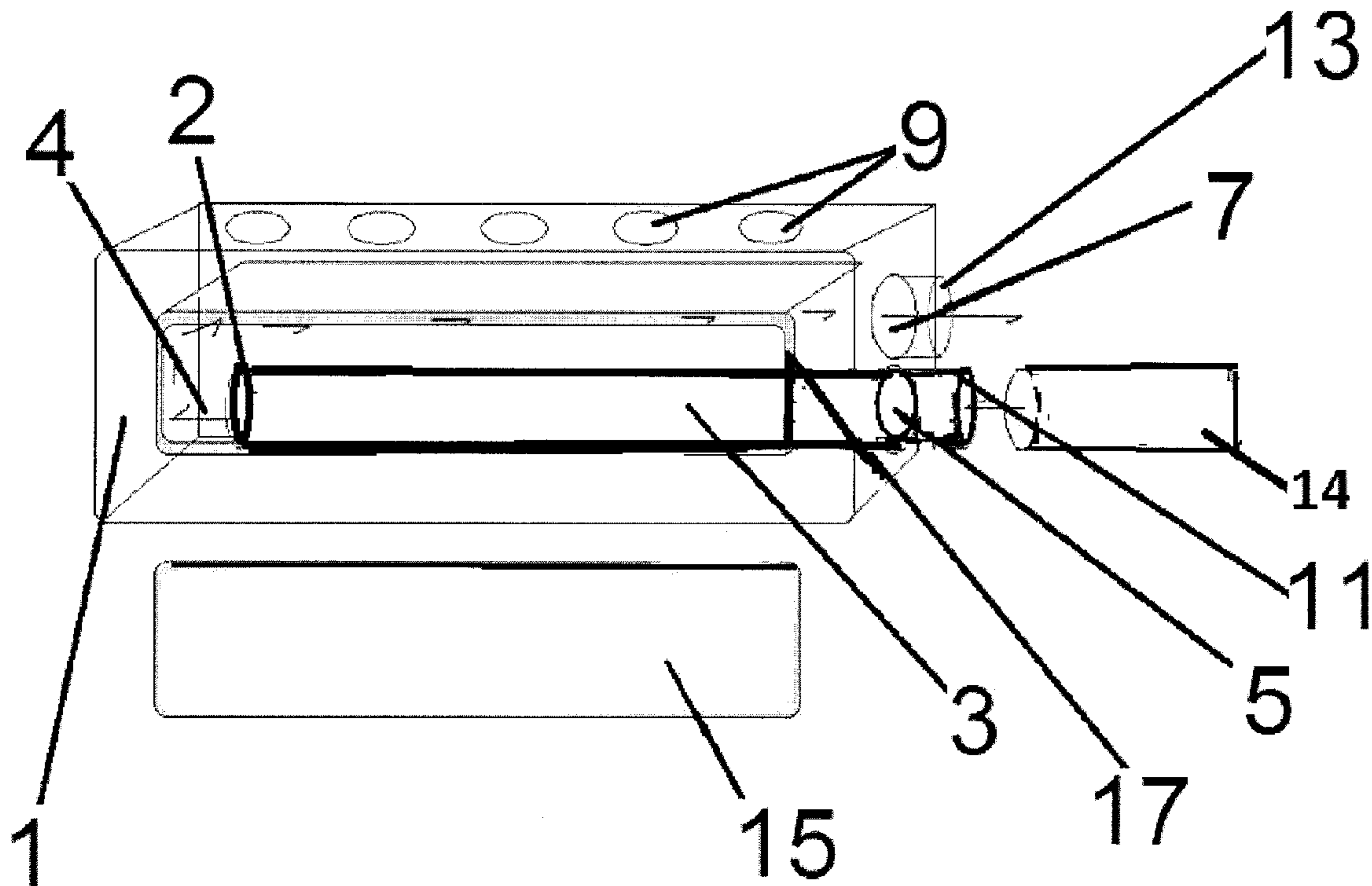
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(54) **Titre : CORPS DE CHAUDIERE POUR SYSTEME DE CHAUFFAGE ELECTROTHERMIQUE**

(54) **Title: BOILER HOUSING FOR ELECTRO-THERMAL HEATING SYSTEM**



(57) **Abrégé/Abstract:**

A housing for an electro-thermal heating system having at least one opening for receiving heating elements, and having an inlet for permitting a flow of coolant into the housing and an outlet for permitting a transfer of coolant heated by the heating element out of the housing. A diameter of the outlet is less than a diameter of the inlet to temporarily retain coolant in the housing longer to allow it to be heated. A heat conductive tube is detachably connected to the inlet, and the opening allows the heating element to project into the interior of the housing to be in adjacent proximity with the tube, so that the tube (and the coolant flowing within) can be additionally heated to allow the temperature of the coolant to be brought up in a faster and more efficient manner. The heating elements can also be removed without disassembly of the housing.

ABSTRACT

A housing for an electro-thermal heating system having at least one opening for receiving heating elements, and having an inlet for permitting a flow of coolant into the housing and an outlet for permitting a transfer of coolant heated by the heating element out of the housing. A diameter of the outlet is less than a diameter of the inlet to temporarily retain coolant in the housing longer to allow it to be heated. A heat conductive tube is detachably connected to the inlet, and the opening allows the heating element to project into the interior of the housing to be in adjacent proximity with the tube, so that the tube (and the coolant flowing within) can be additionally heated to allow the temperature of the coolant to be brought up in a faster and more efficient manner. The heating elements can also be removed without disassembly of the housing.

BOILER HOUSING FOR ELECTRO-THERMAL HEATING SYSTEM

This invention relates generally to a boiler housing, and more particularly to an improved boiler housing for an electro-thermal heating system which is durable and reliable, that is constructed and arranged to receive easily removable or replaceable heating elements, and which can be easily installed.

DESCRIPTION OF THE PRIOR ART

It is well known that, for example, furnaces can be used to heat spaces such as homes.

Traditionally, such furnaces were oil furnaces. However, as the demand for oil has risen sharply in the last decade, the price has correspondingly risen sharply, reducing the ability of such furnaces to be economical to the home or business owner. Recently, gas-fired applications, using natural gas, have been much in demand for homeowners in economically heating their home. However, much as has occurred with oil, natural gas has also seen large price increases in the last couple of years, which has also reduced the economical viability of gas-fired applications.

It is also well known to heat homes or spaces using, for example, electrical baseboards, but, as hydro rates have risen quite sharply recently, and can be expected to continue upwardly in the future, these types of devices are not necessarily economical also. In addition, heating systems such as furnaces can require a large footprint, and take up an inordinate amount of space.

In addition, certain types of pre-heaters have utilized electrical elements internally positioned within the pre-heater, whereby coolant can be heated by an electrical element so as to heat an area. United States Patents Nos. 5,408,960 (Woytowich) and 4,770,134 (Foreman *et al*) are examples of such devices. However, these arrangements feature electrical elements that are internally positioned and firmly set within a tank or chamber, and do not allow for easy removal of the electrical element from the pre-heater without complete disassembly, or destruction, of the pre-heater, should maintenance or replacement of the electrical element be required. In such maintenance or replacement situations, the entire pre-heater would be required to be removed to

access the internal electrical element, thereby making maintenance and replacement of such pre-heater components difficult and complicated.

What is required is a boiler housing for an electro-thermal heating system which is very economical, and which can generate substantial amounts of heat to heat larger spaces, such as in a home or business. Thus, there is a need for an improved environmentally friendly boiler housing for an electro-thermal heating system for heating a space which has a generally uncomplicated and simple design, which may be installed easily, and is durable and reliable, and which possesses easily removable or replaceable heating elements. Further there is a need for a boiler housing for an electro-thermal heating system which possesses a minimal footprint, and which can be utilized in a variety of applications, from heating a home to radiant floor heating.

Finally, there is a need for an improved environmentally friendly boiler housing for an electro-thermal heating system that has a heat conductive tube therein constructed and arranged for detachable connection with an inlet of the tube for permitting the flow of coolant into the housing, the heat conductive tube allowing the temperature of the coolant to be brought up in a faster and more efficient manner. In this regard, the present invention substantially fulfills this need.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved, environmentally friendly boiler housing for an electro-thermal heating system which has a generally uncomplicated and simple design, which possesses a minimal footprint, and which has a housing with an inlet and

outlet for permitting a flow of coolant therein, which can then be interconnected with piping to form a closed fluid flow circuit.

It is another object of the present invention to provide an improved boiler housing for an electro-thermal heating system wherein the housing has openings defined therein whereby easily removable electric heating elements can be inserted to project into the housing and be in direct contact with the coolant to heat it.

It is another object of the present invention to provide an improved boiler housing for an electro-thermal heating system wherein a diameter of the inlet of the housing is greater than a diameter of the outlet, so as to temporarily inhibit and keep coolant in the housing longer to heat it in a faster and more efficient manner.

It is another object of the present invention to provide an improved environmentally friendly boiler housing for an electro-thermal heating system that has a heat conductive tube therein constructed and arranged for detachable connection with an inlet of the tube for permitting the flow of coolant into the housing, the heat conductive tube allowing the temperature of the coolant to be brought up in a faster and more efficient manner.

According to one aspect of the present invention, there is provided a housing for an electro-thermal heating system comprising at least one opening constructed and arranged to receive at least one electric heating element for insertion into the at least one opening, and constructed and arranged to allow removal of the at least one electric heating element without disassembly of the housing; an

inlet for permitting a flow of coolant carried by an inlet pipe into the housing; an outlet constructed and arranged for interconnection with an outlet pipe for permitting a transfer of heated coolant out of the housing, a diameter of the outlet being less than a diameter of the inlet; a tube constructed and arranged for detachable connection with the inlet, a first end of the tube projecting into an interior of the housing and a second end of the tube constructed and arranged for interconnection with the inlet pipe for permitting the flow of coolant into the housing; and at least one access opening in the housing, the access opening being sealed by a selectively detachable plate for covering and sealing the at least one access opening; whereby the at least one opening is constructed and arranged to permit the at least one electric heating element to project into the interior of the housing whereby the at least one electric heating element is in direct contact with the tube.

According to another aspect of the present invention, there is provided a housing for an electro-thermal heating system comprising at least one opening constructed and arranged to receive at least one electric heating element for insertion into the at least one opening, and constructed and arranged to allow removal of the at least one electric heating element without disassembly of the housing; an inlet for permitting a flow of coolant carried by an inlet pipe into the housing; an outlet constructed and arranged for interconnection with an outlet pipe for permitting a transfer of heated coolant out of the housing, a diameter of the outlet being less than a diameter of the inlet; a tube constructed and arranged for detachable connection with the inlet, a first end of the tube projecting into an interior of the housing and a second end of the tube constructed and arranged for interconnection with the inlet pipe for permitting the flow of coolant into the housing, the first end of the tube permitting release of the flow of coolant into the housing to be heated by the at least one electric heating element; a thermostatic control in association with the at least one electric heating element and the coolant in the housing, wherein the thermostatic control is adapted

to turn the at least one electric heating element off when a temperature of the coolant exceeds a pre-determined level; and at least one access opening in the housing, the access opening being sealed by a selectively detachable plate for covering and sealing the at least one access opening; whereby the at least one opening is constructed and arranged to permit the at least one electric heating element to project into the interior of the housing whereby the at least one electric heating element is in direct contact with the tube.

The advantage of the present invention is that it provides an improved, environmentally friendly boiler housing for an electro-thermal heating system which has a generally uncomplicated and simple design, which possesses a minimal footprint, and which has a housing which can circulate and heat a flow of coolant therein. The housing can then be interconnected with piping to form a closed fluid flow circuit, whereby heat from the heated coolant can be used to heat a space remote from the housing. Further, the system can be integrated with pumps, and connected to a power source, whereby the closed fluid flow circuit can be used to circulate and radiate heat in a variety of applications, such as radiant floor heating, home heating, and so forth.

Yet another advantage of the present invention is to provide an improved boiler housing for an electro-thermal heating system wherein the housing has an inlet for permitting a flow of coolant into and throughout the housing and an outlet for permitting a transfer of heated coolant out of the housing, wherein a diameter of the inlet is greater than a diameter of the outlet so as to keep coolant in the housing longer to heat it, therefore heating the coolant in a faster and more efficient manner.

It is another object of the present invention to provide an improved environmentally friendly boiler

housing for an electro-thermal heating system that has a heat conductive tube therein constructed and arranged for detachable connection with an inlet of the tube for permitting the flow of coolant into the housing, the heat conductive tube allowing the temperature of the coolant to be brought up in a faster and more efficient manner.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention is described below with reference to the accompanying drawings, in which:

Figure 1 is a side perspective view of an embodiment of the housing of the electro-thermal heating system of the present invention, illustrating the upper, middle and lower plates for covering and sealing top and bottom surfaces of the housing; and

Figure 2 is a side perspective view of the embodiment of the housing of the electro-thermal heating system shown in Figure 1, and having a heating element inserted therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In overview of operation, as shown in **Figures 1 and 2**, the boiler housing **1** of the present invention is, in an exemplary embodiment, designed for use in an electro-thermal heating system, and is substantially hollow. The housing **1** has an inlet **5** and an outlet **7** for a flow of coolant **4** to enter into and leave the housing **1**, and has at least two or more openings **9** defined therein, for insertion of electric heating elements **8** therein to project into the housing **1** and be in direct contact with the coolant **4** to heat it, as herinafter described.

The housing, as can be seen in **Figure 1**, is hollowed out to allow a length of tube **3** to be inserted through inlet **5** to reside substantially within the interior of the housing **1**. Preferably, the tube **3** is copper, but it will be understood that variations to this are possible. In an exemplary embodiment the material chosen will be suitable for the conduction of heat, and a first end **2** of the tube **3** resides substantially within the interior of the housing **1**, and a second end **11** of the tube **3** resides outside of inlet **5** of the housing **1**.

In this manner, the second end **11** of the tube **3** (which resides outside of inlet **5**) and the outlet **7** can then be interconnected with piping (**14,13**, respectively) to form a closed fluid flow circuit, which can be utilized in a variety of electro-thermal heating applications. Coolant **4** entering the housing **1** through tube **3** exits the first end **2** of the tube **3** to flow freely within the housing **1**, where it comes into contact with the electric heating elements **8** projecting into the housing **1** from the openings **9**, whereby the water is heated by the electric heating elements **8** before exiting the housing **1** via outlet **7** to enter into and circulate within the closed fluid flow circuit. In an exemplary embodiment a diameter of the inlet **5** is greater than a diameter of the outlet **7**, so as to temporarily inhibit and retain coolant **4** in the housing **3** longer to allow it to be heated by the electric heating elements **8** in a faster and more efficient manner.

Further, the electric heating elements **8** projecting into the housing **1** come into close adjacent proximity to the upper surface of the heat conductive tube **3**, as can be seen in **Figure 2**, whereby the tube **3** (and the coolant **4** flowing within) is additionally heated to allow the temperature of the coolant **4** to be brought up in a faster and more efficient manner. Radiator panels (not shown) can

then be connected to the closed fluid flow circuit to radiate the heat from the coolant **4** flowing in the circuit to a space (not shown) to be heated by an electro-thermal heating system. Such a space could be, for example, a home, a room, an office, radiant flooring or a building. If desired, such generated heat can be circulated by means of a conventional fan or blower. A pump (not shown) and a power source (not shown) can be interconnected to the electro-thermal heating system to circulate the coolant **4** in the closed fluid flow circuit.

In terms of describing the individual components of the system in greater detail, and with reference to **Figures 1 and 2**, there is shown an embodiment of the housing **1** of the electro-thermal heating system of the present invention. In an exemplary embodiment, the housing **1** through which coolant **4** may pass through enters by means of inlet **5**. The housing **1** can be made of, for example, metal (such as stainless steel and aluminum), though of course it will be understood that variations to this, such as plastic, are possible, and that other materials could also be utilized, as would be apparent to one skilled in the art. The size of the housing can be varied, such as three to four inches high by four inches to twenty inches long, for example only.

Further, the housing **1**, again with reference to **Figure 1**, is substantially hollow, and possesses an outlet **7** for a flow of heated coolant **4** to leave the housing **1**, as hereinafter described. The inlet **5** and the outlet **7** are constructed and arranged for interconnection with piping to form a closed fluid flow circuit. With reference to **Figure 1**, the inlet pipe, with coolant **4** flowing therethrough, can be seen as “**14**”, and the outlet pipe, with heated coolant flowing therethrough leaving the

housing, can be seen as “13”.

In a still further exemplary embodiment, the housing 1 possesses openings on either side of the housing 1, one of the side openings being shown as “17” in **Figure 1**. The housing 1 has detachable side plates 15 for covering and sealing the side openings 17 of the housing 1. The front plate 15 is preferably secured to the housing 1 with screws or the like). These side openings 17 can be utilized, for example, if electric heating elements 8 need to be replaced, or for inspection purposes, or if the tube 3 also needs to be removed for maintenance or replacement.

Once inlet pipe 14 and outlet pipe 13 are interconnected to the housing 1, a pump and a power source (each not shown) can be interconnected to the system to circulate the coolant 4 in the closed fluid flow circuit, and through the system, it being understood that conventional power sources or pumps could be utilized. For example, in one embodiment, the power source can be an electrical type power source, or a power pack that can be plugged in by means of a power cord (not shown), though it is conceivable that, alternatively, other types of power sources could be utilized, such as solar power cells, A/C power, DC power pack, battery, wind generated power sources or the like, as would be apparent to one skilled in the art. It will be understood that the power source can be activated conventionally, or , for example, by a remote device (not shown), as would be understood by one skilled in the art.

The housing 1, with further reference to **Figure 1**, has openings 9 defined therein, for insertion of electric heating elements 8 therein (shown in **Figure 2**) to project inwardly into the housing 1 and be positioned so as to come into direct contact with the coolant 4 in the housing and in close adjacent proximity to the tube 3 to heat it. The number of electric heating elements 8 which could

be utilized could be varied, depending upon the application of the system, and the size required of the system. For example, as few as two heating elements could be used, or up to twenty, or more.

Preferably, the coolant **4** will be water, though it is conceivable that other fluids could be utilized, as would be apparent to one skilled in the art. Of course, electric heating elements **8** are connected to, and supplied with, power from the power source (not shown) for enabling the electric heating elements **8** to heat the coolant **4**, the coolant of course being circulated throughout the system by the pump. The electrical connection portion (not shown) of electric heating elements **8** can, as an example, be made of Inconel TM, it being understood that this refers to a family of austenitic nickel chromium-based super-alloys, which are typically used in high temperature applications. Common trade names for Inconel TM include: Inconel 625 TM, Chronin 625 TM, Altemp 625 TM, Haynes 625 TM, Nickelvac 625 TM and Nicrofer 6020 TM, for example.

Preferably, any of the electric heating elements **8** are easily removable and replaceable if required from the housing **1**, either by removing them from openings **9** in the housing **1**, or, alternatively, by detaching the side plates **15** from the housing **1** and removing the electric heating elements **8**.

In an exemplary embodiment, a diameter of the inlet **5** is greater than a diameter of the outlet **7**, with a view to temporarily inhibiting the release of coolant **4** from the housing **3**, through outlet **7**, thus keeping coolant **4** in the housing **1** longer so as to be heated by electric heating elements **8**. Further, in an additional embodiment, the tube **3** the tube can be constructed and arranged to extend substantially into the interior of the housing, or, alternatively, the tube can be integrally connected to the inlet of the housing.

As noted previously, radiator panels (not shown) can be connected to the closed fluid flow circuit to radiate the heat from the coolant **4** flowing in the circuit to a space (not shown) to be heated by the electro-thermal heating system. Such a space could be, for example, a home, a room, an office, radiant flooring or a building, or other applications, as could be contemplated by one skilled in the art. If desired, such generated heat can be circulated by means of a conventional fan or blower.

The electro-thermal heating system can be activated by a remote device (not shown) by a user, whereby the power source can be activated to heat the electric heating elements **8**, and the interconnected system, remotely at a distance, and this heat can then be transferred by way of the radiator panels (not shown) into the space to be heated.

In another alternative embodiment of the present invention (not shown), coolant can be omitted, and dry heat, provided from the electric heating elements **8**, can be utilized. In this embodiment (not shown) the housing **1** would preferably have an air passageway extending therethrough for passage of air through the housing **1**. Electric heating elements would be inserted and mounted into the openings **9**, so as to project into the housing whereby the electric heating elements are in direct contact with air in the air passageway. A power source in communication with the electro-thermal heating system would supply the electric heating elements with power, for enabling the electric heating elements to heat the air. An air blower, for example, or other such device, could then direct the heated air device would direct heat to an area external to the electro-thermal heating system, such as a house or other enclosed structure, the air blower being supplied with power from the power source.

In an alternative embodiment, the housing **1** can further comprise a thermostatic control (not shown) in association with the electric heating elements **8** and the coolant in the housing **1**, wherein the thermostatic control is adapted to deactivate the electric heating elements **8** when a

temperature of the coolant **4** exceeds a pre-determined level. Further, the thermostatic control can also thus turn the electric heating elements **8** on when a temperature of the coolant **4** falls below a pre-determined level.

The present invention has been described herein with regard to preferred embodiments. However, it will be obvious to persons skilled in the art that a number of variations and modifications can be made without departing from the scope of the invention as described herein.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A housing for an electro-thermal heating system comprising:

at least one opening constructed and arranged to receive at least one electric heating element for insertion into the at least one opening, and constructed and arranged to allow removal of the at least one electric heating element without disassembly of the housing;

an inlet for permitting a flow of coolant carried by an inlet pipe into the housing;

an outlet constructed and arranged for interconnection with an outlet pipe for permitting a transfer of heated coolant out of the housing, a diameter of the outlet being less than a diameter of the inlet;

a tube constructed and arranged for detachable connection with the inlet, a first end of the tube projecting into an interior of the housing and a second end of the tube constructed and arranged for interconnection with the inlet pipe for permitting the flow of coolant into the housing; and

at least one access opening in the housing, the access opening being sealed by a selectively detachable plate for covering and sealing the at least one access opening;

whereby the at least one opening is constructed and arranged to permit the at least one electric heating element to project into the interior of the housing whereby the at least one electric heating element is in adjacent proximity with the tube.

2. The housing of claim 1, wherein the housing is substantially hollow.

3. The housing of claim 1, wherein the housing further comprises a thermostatic control in association with the at least one electric heating element and the coolant in the housing, wherein the thermostatic control is adapted to turn the at least one electric heating element off when a temperature of the coolant exceeds a pre-determined level.

4. The housing of claim 3, wherein the thermostatic control is adapted to turn the at least one electric heating element on when a temperature of the coolant falls below the pre-determined level.

5. The housing of claim 1, wherein the tube is constructed and arranged to extend substantially into the interior of the housing.

6. The housing of claim 1, wherein the first end of the tube permits release of the flow of coolant into the housing to be heated by the at least one electric heating element.

7. A housing for an electro-thermal heating system comprising:

at least one opening constructed and arranged to receive at least one electric heating element for insertion into the at least one opening, and constructed and arranged to allow removal of the at least one electric heating element without disassembly of the housing;

an inlet for permitting a flow of coolant carried by an inlet pipe into the housing;

an outlet constructed and arranged for interconnection with an outlet pipe for permitting a transfer of heated coolant out of the housing, a diameter of the outlet being less than a diameter of the inlet;

a tube constructed and arranged for detachable connection with the inlet, a first end of the tube

projecting into an interior of the housing and a second end of the tube constructed and arranged for interconnection with the inlet pipe for permitting the flow of coolant into the housing, the first end of the tube permitting release of the flow of coolant into the housing to be heated by the at least one electric heating element;

a thermostatic control in association with the at least one electric heating element and the coolant in the housing, wherein the thermostatic control is adapted to turn the at least one electric heating element off when a temperature of the coolant exceeds a pre-determined level; and

at least one access opening in the housing, the access opening being sealed by a selectively detachable plate for covering and sealing the at least one access opening;

whereby the at least one opening is constructed and arranged to permit the at least one electric heating element to project into the interior of the housing whereby the at least one electric heating element is in adjacent proximity with the tube.

8. The housing of claim 7, wherein the tube is constructed and arranged to extend substantially into the interior of the housing.

FIGURE 1

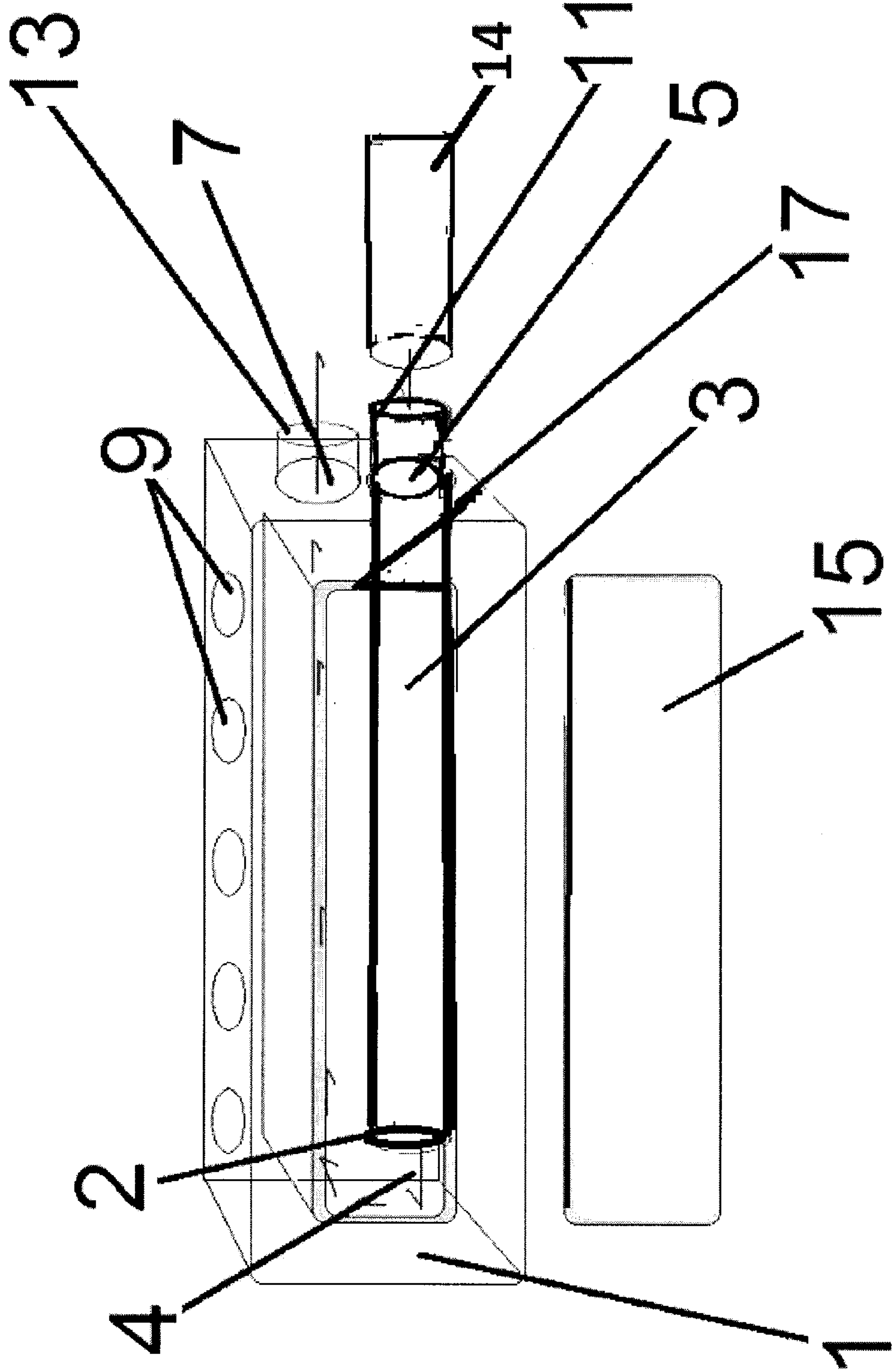


FIGURE 2

