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(54) **Device for heating fluids**

(57) A device for heating fluids, in particular for heating at least a fluid circulating in a heating structure such as a water or oil radiator and/or a heated towel rail, comprising a casing (10) made of conductive material, within which at least one resistive element is placed, said resistive element having respective electric terminals connected to respective electrical conductors, which protrude from said casing (10) passing through a pipe fitting (11), which is placed coaxially with respect to said casing (10) and which is made of thermally conductive material, so that said electrical conductors are connected to an electric and/or electronic power circuit having at least one TRIAC power switch (12), which is connected in turn, on one side, to said at least one resistive element and, on the other side, to said power circuit; in particular, said power switch (12) is placed inside a compartment or duct (16), made internally to said pipe fitting (11) through at least one opening (14) provided at one end of the pipe fitting (11), and said TRIAC power switch (12) is also fixed to at least one portion of the inner walls (13) of the pipe fitting (11).

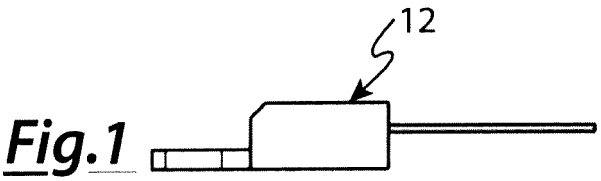

Fig.1

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Description

[0001] The present invention generally relates to a device for heating fluids, in particular water, which are enclosed in sealed and/or watertight containers.

[0002] More particularly, the invention relates to a heating device usable for hot water tanks and/or water or oil radiators and/or heated towel rails.

[0003] A heating device of this type normally includes a resistor or resistive element, which is positioned within a tubular casing made of a thermally conductive material and which is connected to an electrical power circuit through an electronic power switch; alternatively, double-wall heating devices are provided, in which two thermally conductive tubes (and, therefore, two respective resistors) are arranged coaxially one inside the other.

[0004] The outer casing of the heating device is inserted in the fluid contained in the watertight container, while the upper end of the casing is securely fixed, for example by means of a suitable end flange, outside the container, so as to allow the electrical connection of the resistor.

[0005] The terminal flange, inside which the heating resistor is placed, can be made with a thermally conductive material and a switch of the electrical power circuit (usually a TRIAC) can be placed in a suitable cavity of said flange, so that the flange's structure allows heat dissipation, during the TRIAC functioning, through the walls of the outer casing.

[0006] Said structure allows to reduce substantially the electric power dissipation and therefore the excessive heating of the TRIAC; however, to achieve this purpose, it is necessary to made on purpose the end flange of the heating device and it is also necessary to provide a suitable thickness of said flange so as to place the TRIAC, thus causing large overall dimensions of the whole structure, high costs and problems when making electrical connections which would be desirable to remove and at least to reduce.

[0007] It is also known to use heating devices with resistors which are enclosed within an insulating material and which are connected to a power source through a temperature sensor; said sensor is placed inside the insulating material and is able to break off the electrical power supply to the resistor on the basis of the temperature's values that are detected.

[0008] However, said embodiments cannot be used to limit the power and heat dissipation of the electrical power supply circuit which is connected to the heating element, since the temperature sensor must be able to detect a temperature's value very close to the temperature's value of the resistor and, therefore, there is no need for dissipating electric power and/or heat near said sensor element.

[0009] An object of the present invention is therefore to obviate the above mentioned drawbacks of the prior art and, in particular, to provide a device for heating fluids which circulate inside radiators and/or heated towel rails, which allows a suitable electric power dissipation and a subsequent dissipation of the heat generated by the electrical power switch (TRIAC) which is connected to the power supply circuit of the resistor, which is in turn placed within a casing made of a thermally conductive material.

Another object of the invention is to provide a device for heating fluids, in particular for radiators and/or towel rails, which allows to obtain a compact structure with small size, with respect to the prior art.

[0010] Another object of the invention is to provide a device for heating fluids, which is particularly effective, reliable, handy and cheap, with respect to the prior art, during assembly and installation of the electrical connections. These and other objects are achieved by a device for heating fluids, in particular for radiators and/or heated towel rails, according to the appended claim 1; further technical detailed features of the heating device of the invention are also set forth in the corresponding dependent claims. Advantageously, according to the present invention, the TRIAC switch of the electric power circuit is placed within a specific fitting or connector, made of thermally conductive material and connected to the tubular container of the heating resistor.

[0011] Therefore, a complete mechanical protection of the TRIAC switch is obtained, as well as the contact between the switch and the internal walls of the fitting allows an efficient dissipation of electric power and heat when the TRIAC and the whole electrical power circuit is on.

[0012] Moreover, the physical connection between the fitting and the radiant surface of the heating apparatus allows to obtain a considerable power and heat dissipation, since said surface is very large.

[0013] Finally, the use of the connector allows to have a highly protective function of the TRIAC, both from mechanical and electrical point of view, as well as the electrical connections are extremely easier.

[0014] It is therefore possible to increase the average life of operation of the TRIAC and of the whole electrical power circuit, with respect to the prior art.

[0015] Further objects and advantages of the present invention will become more clear from the following description, which relates to a preferred embodiment of the device for heating fluids of the invention, and from the enclosed drawings, in which:

- figures 1 and 3 are side views of a power switch and, in particular, of a TRIAC, which is used in the device for heating fluids according to the present invention;
- figure 2 is a top plan view of the TRIAC of figures 1 and 3, according to the present invention;
- figure 4 is a partial section view of the device for heating fluids according to the present invention;
- figure 5 is a top plan view of the device for heating fluids according to the present invention.

[0016] Firstly, even if the description and the enclosed drawings refer to a single resistive element or resistor, which is able to heat a fluid circulating inside a heating structure, such as a water or oil radiator and/or a heated

towel rail, the invention is similarly extended to the use of more resistive elements or resistors, of any shape and possibly connected one to each other.

[0017] Referring to the above mentioned figures, the heating device which is the object of the present invention comprises a reinforced electrical resistor, which includes a tubular casing 10, made of electrically conductive material and, in particular, of metallic material, within which a resistive element (not shown in the attached figures) is inserted.

[0018] The resistive element is usually placed inside a powder or an electrically insulating compound, which is compacted inside the casing 10, and has two electrical terminals, connected to respective electrical conductors, which protrude from the casing 10, passing through a pipe fitting or connector 11, made of thermally conductive material, in order to be connected to an electric and/or electronic power circuit placed outside the heating device.

[0019] The switch of the electrical power circuit is constituted by a TRIAC 12, which is connected, on one side, to the resistive element and, on the other side, to the electrical power circuit through suitable cables.

[0020] In particular, according to the present invention, the TRIAC 12 is inserted within an opening 14, preferably oval-shaped or oblong-shaped, which is provided in a central region of the fitting 11, so that said TRIAC 12 contacts one of the inner walls 13 of the fitting 11 (as viewed in detail in the enclosed figures 4 and 5).

[0021] In order to maintain the contact of the lower surface of the TRIAC 12 with the inner wall portion 13 of the fitting 11, the TRIAC 12 is advantageously inserted through the opening 14 and inside the compartment or inner duct 16 of the fitting 11, together with a spring or an elastic or elastomeric element 15, which is inserted between the TRIAC 12 and the duct's 16 inner wall, opposite to the wall 13, thus obtaining a great stability of the TRIAC 12, which is wedged and forced to maintain its lower surface into contact with the inner walls 13 of the fitting 11.

[0022] The TRIAC 12 and the elastomeric or elastic element 15 may also be enclosed within a thermally and electrically insulating thin sheet or sheath, in order to increase the electrical insulation between said power switch (the TRIAC 12) and the resistive element contained inside the tubular casing 10.

[0023] The installation process is thus extremely simple, fast and practical, as well as safe for the operator.

[0024] In fact, the TRIAC 12, already coupled to the elastic element 15 and possibly surrounded by insulation, can be simply inserted into the shaped opening 14 of the fitting 11.

[0025] Said insertion automatically causes the electrical connection of the TRIAC 12 to the resistive element which is placed inside the tubular casing 10, as well as a stable positioning of said TRIAC 12 in correspondence of a portion of the inner walls 13 of the fitting 11, so as to ensure an effective dissipation of the heat generated by the TRIAC 12 during its functioning, directly through the outer peripheral wall of the fitting 11.

[0026] The features of the device for heating fluids, which is the object of the present invention, are therefore clear from the above description, as well as the advantages of the invention are also clear.

[0027] Finally, it is clear that other variations may be made to the heating device of the invention, without departing from the principles of novelty inherent in the inventive idea as claimed in the appended claims, as well as it is clear that the materials, shapes and dimensions of the technical details which are illustrated in the present invention may be any according to the technical requirements.

[0028] Where the technical features mentioned in the appended claims are followed by reference numbers or signs, said reference signs have been introduced with the sole purpose of increasing the intelligibility of said claims and, consequently, they do not have any limiting effect on the interpretation of each technical element identified by said reference signs.

Claims

1. Device for heating fluids, in particular for heating at least a fluid circulating in a heating structure such as a water or oil radiator and/or a heated towel rail, comprising at least one casing (10) made of conductive material, within which at least one resistive element is placed, said resistive element having respective electric terminals connected to respective electrical conductors, which protrude from said casing (10) passing through a pipe fitting (11), which is placed coaxially with respect to said casing (10) and which is made of thermally conductive material, so that said electrical conductors are connected to an electric and/or electronic power circuit having at least one power switch (12), which is connected in turn, on one side, to said at least one resistive element and, on the other side, to said power circuit, **characterized in that** said power switch (12) is placed inside at least one compartment or duct (16), made internally to said pipe fitting (11), through at least one opening (14) that is provided at one end of the pipe fitting (11), and **in that** said power switch (12) is also fixed to at least one portion of the inner walls (13) of said pipe fitting (11).

2. Heating device according to claim 1, **characterized in that** said opening (14) has an oblong and/or oval shape.

3. Heating device according to at least one of the preceding claims, **characterized in that** said at least one resistive element is embedded in a powder or insulating compound, that is compacted within said casing (10).

4. Heating device according to at least one of the preceding claims, **characterized in that** said power switch (12) is constituted by an electronic device, such as a TRIAC.

5. Heating device according to at least one of the preceding claims, **characterized in that** said power switch (12) is coupled to at least one elastomeric or elastic element (15), which is inserted between said power switch (12) and an inner wall of said compartment or duct (16) of the pipe fitting (11), so that said power switch (12) is wedged inside the duct (16), thus keeping its surface into contact with said inner walls (13) of said pipe fitting (11).

6. Heating device according to at least one of the preceding claims, **characterized in that** said power switch (12) and said elastic or elastomeric element (15) are enclosed within at least one thermally and electrically insulating sheath, so as to increase the electrical insulation between said power switch (12) and said at least one resistive element.

7. Heating device according to at least one of the preceding claims, **characterized in that** said power switch (12) is able to effectively dissipate the heat generated during its operation, from said compartment or duct (16), directly through at least one portion of an outer peripheral wall of said pipe fitting (11).

8. Heating device according to at least one of the preceding claims, **characterized in that** said opening (14) is provided in a substantially central region of said pipe fitting (11).

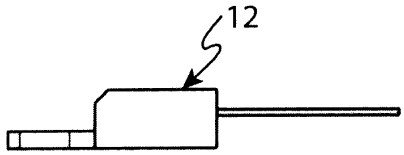

Fig.1

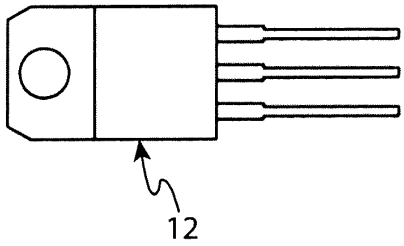

Fig.2

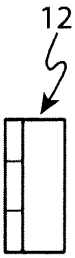

Fig.3

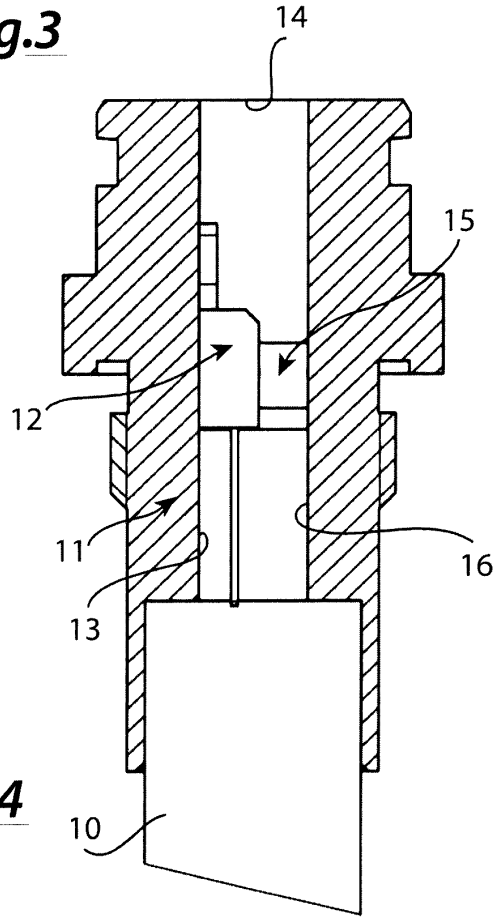

Fig.4

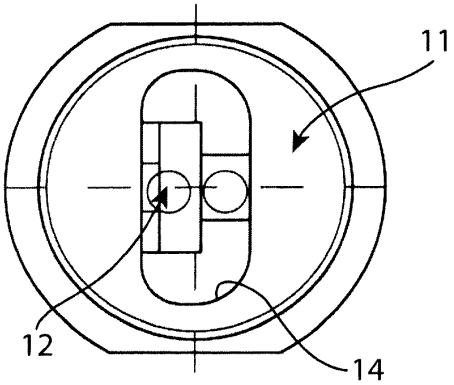

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 13 42 5054

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 278 400 A2 (JEDAC [FR]) 22 January 2003 (2003-01-22) * abstract * * paragraphs [0001], [0002], [0013], [0015] - [0017], [0024], [0026] * * figures 1,3,4,5,6 * -----	1-8	INV. H05B3/48 H05B1/02 F24H9/18
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X	EP 1 655 546 A1 (BORELLI LUIGI [IT]) 10 May 2006 (2006-05-10) * abstract * * paragraphs [0002], [0003], [0005], [0011], [0028], [0036], [0037], [0038], [0041], [0043] * * figures 6,6a,9 * -----	1-5,7	
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A	WO 97/12182 A1 (STOKES AUSTRALASIA [AU]; STOKES PAUL WYBORN [AU]; HANCOCK PHILIP TIMOT) 3 April 1997 (1997-04-03) * abstract * * page 2, lines 18-28 * * page 5, lines 7-31 * * figures 2,5 * -----	1-8	H05B F24H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 June 2013	de la Tassa Laforgue

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 42 5054

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