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(54) Title: Electric convector heater of the inverter type

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ELECTRIC CONVECTOR HEATER OF THE INVERTER TYPE

The invention relates to electrical technology, and specifically to heaters of domestic and office accommodation such as living accommodation, offices, summer cottages and locker cabins of construction and installation organizations.

A convector heater with air as the heat carrier is known, consisting of a boxlike body frame inside which, in the lower part, is placed at least one electric resistive heating element and which has holes in the lower part for the inflow of air and holes in the upper part for the outflow of air, and also thermoregulators and devices to protect from overheating, while on top of the electric resistive heating element is placed a minimum of one heat-retaining element, for which materials consisting of fireclay or of a mixture of materials containing fireclay are used (patent RU No. 136138, 2013 and priority application DE 202012005137.7).

As stated by the authors, the known electric convector heater at a lower switch-on frequency ensures a uniform temperature in the accommodation and can be manufactured with lower outlays. At the same time, the known convector does not ensure the possibility of power regulation.

Heating devices for water heaters and for the water heater of a shower, washing machine, dishwasher or kettle with power regulation are known that incorporate a vessel for heating liquid and an electric heating element designed for heating part of the vessel. The heating element incorporates a thick-film resistive heating circuit with a fusible insertion placed in the thick film. In addition, the document describes a power regulator of the triac type, mounted directly on the heating element and acting as a heat sink for this triac. Also described are a thermoresistor, a temperature transducer formed in the thick film, a fusible insertion, a flow-rate control valve for continuous regulation of the flow rate through the heater, a means of regulating the flow rate, and a means of regulating the temperature. These electric components are combined with a control block that can be remote or formed as part of the dielectric layer of the thick film at a point located alongside the inlet nozzle where the metallic support base of the heater is maintained in a cold state by the supply of cold water (EP 0485211, DE 10322034, DE 19732414 and DE 19737694).

The known heating devices cannot be used as convectors and do not ensure smooth power regulation.

A thermoblock that incorporates a temperature transducer and an electric heater is known. The temperature transducer and heater are combined with a printed circuit board with a controller; the electric current is supplied to the heater through a triac, said triac being placed on the printed circuit board and being controllable by the controller (FR 2799630). The known thermoblock is designed for use in a machine for preparing espresso.

Also known is an electric device for heating accommodation, in the form of an electric calorifier that contains a body frame with inlet and outlet holes for air, said holes being located at opposite ends of the body frame, a ventilator, and electric heating elements placed inside the body frame and electrically connected to a control block set up on the outer side of the body frame. The technical result, consisting in the automatic maintenance of a specified temperature and a specified humidity inside the accommodation, is achieved thanks to the fact that the electric calorifier also contains a device for controlling the humidity and temperature, set up on the body frame and electrically connected to the control block of the electric calorifier (patent RU No. 124773, 2013).

The possibility of automatic temperature control does not solve the problem of smooth power regulation.

The electric convector closest to the one proposed is one that contains a body frame made from thin sheet steel with air-inlet holes located at the bottom and with air-outlet horizontal holes located in the upper part of the body frame, and contains a front heat-radiating panel, a heating element made from a tubular electric heater, an electronic thermoregulator, a mounting bracket on the outer side of the back part for fixing to a wall, a current supply, a thermal cutout switch and securing elements; the electronic thermoregulator consists of a body frame, a protective cover plate, a clamping band with labyrinth-style ducts for the passage of air, and an electronic circuit board; the body frame of the thermoregulator is plastic, with an airtight transparent viewing screen and airtight buttons on the face side. The control block for the appliance was constructed in such a way that use of the convector was as convenient and simple as possible (patent RU 133594, 2013).

The known electric convector does not make it possible to ensure smooth power regulation. In the known device, if the temperature is lower than the temperature specified by the user, then full (or partial) electric power is supplied to the heating element and it begins to be heated and transfers heat to the air passing through it. When the temperature needed is reached, the heating element is switched off completely. In the existing convectors step-by-step power regulation is used or there is no power regulation at all. The given principle does not permit automatically smooth regulation of the electric power of the heating element depending on the area of the accommodation and the temperature of the surroundings.

Frequent switching on and off of the heating element leads to uneconomic use of energy (the presence of starting currents), to the inaccurate maintenance of the specified temperature in the accommodation, to the constant switching on and off of the heating element, to the reduction in the service lifetime of the heating element as opposed to its passible service lifetime, to the negative effect of strong voltage jumps in the entire electric circuit of the flat (house) during the switching on and off, and to the appearance of burnt deposits on the electric contacts.

The object of the invention is to ensure automatic, smooth power regulation.

The technical result is elimination of the appearance of burnt deposits on the electric contacts and elimination of the negative effect of strong voltage jumps in the electric circuit as a result of the absence of starting currents.

The problem posed is solved by the fact that the claimed electric convector heater of the inverter type contains a body frame with air-inlet holes located at the bottom and with air-outlet holes located in the upper part of the body frame, and contains a front heat-radiating panel, a heating element made from a tubular electric heater, a control block with a switch-on button, and a current supply, wherein the control block consists of a body frame inside which is located an electric circuit board, characterized in that a temperature transducer is installed on the body frame and an actuating element and a control element which are connected to each other are located on the electric circuit board, wherein the actuating element is

electrically connected to the heating element while the control element is electrically connected to the temperature transducer.

A thyristor is advantageously used as the actuating element, for example, but not limited to, that of the brand BTA24-600BW, or other analogous models.

A processor, microprocessor, microcontroller or controller can be used as the control element, for example, but not limited to, MC80F7708 microprocessor or the MC80F7708Q processor, or other analogous models.

For example, but not limited thereto, the WE50220TB638 thermosensor, or analogous temperature-transducer models, can be used as the temperature transducer.

A display with control elements is located on the body frame of the control block.

On the body frame of the convector heater mounting elements on the outer side of the back part can be located for fixing to a vertical surface (wall), or the body frame can be equipped with legs for placing on a horizontal surface.

The given aim, of automatic, smooth power regulation, is achieved by the smooth supply of electric power to the heating element, implemented by an actuating element made, for example, in the form of a thyristor and connected to a control element in, for example, the form of a microprocessor or processor that receives a signal from a temperature transducer that measures the temperature of the surrounding air. This ensures automatic, smooth regulation of the electric power supplied to the heating element, depending on the surrounding temperatures.

Smooth regulation of the power in the claimed electric convector is implemented automatically, and makes it possible to regulate the power of the heating element within broad limits, and consequently to regulate the heat generation of the convector.

The claimed electric convector is explained by the following schematic drawings:

Fig. 1 depicts the general form of the claimed convector;

Fig. 2 depicts the claimed convector in side view;

Fig. 3 depicts the claimed convector viewed from the top;

Fig. 4 shows the electric-connection circuit of the heating element, temperature transducer, actuating element and control element;

Fig. 5 depicts the circuit block connecting the control block, containing the electric circuit board, with control element and actuating element, to the heating element, switch-on button and display.

The claimed convector consists of a body frame 1 with air-inlet holes 2 located at the bottom and with air-outlet holes 3 located in the upper part of the body frame 1, and consists of a front heat-radiating panel 4 and a heating element 5, made from a tubular electric heater. On the body frame 1 is installed a control block, located in the body frame of a control block 6 with a switch-on button 7 and display 8, mounting elements 9 on the outer side of the back part for fixing to a wall, a temperature transducer 10 and a current supply (not shown). Inside the body frame of the control block 6 is located an electric circuit board containing an actuating element 11 and a control element 12, connected to each other, wherein the actuating element 11 is electrically connected to the heating element 5 while the control element 12 is electrically connected to the temperature transducer 10.

The claimed convector of the inverter type works as follows. After the claimed convector is switched on, the user specifies by means of the display 8 the desired temperature in the accommodation, for example 25°C. The temperature transducer 10 measures the temperature of the surroundings. When the temperature of the surroundings reaches 25°C a signal arrives at the control element 12, where gathering and analysis of data occur, and a signal arrives at the actuating element 11, which changes the magnitude of the electric current passing through the heating element 5.

When the specified temperature is reached in the accommodation, the actuating element 11 gradually lowers the voltage supplied to the heating element 5. When the temperature of the accommodation becomes lower, the actuating element 11 raises the voltage supplied to the heating element 5. Readings are taken from the temperature transducer 10 by the control element 12 at equal time intervals. If the temperature measured by the temperature transducer remains at 25°C, the next lowering of the power does not occur. After a certain time the temperature transducer again measures the temperature, and if it has become lower than 25°C there is an automatic raising of the electric power, the magnitude of which is determined by the control element 12. Thus, lowering or raising of the voltage at the heating element 5 occurs smoothly depending on the temperature of the surrounding air and the difference between the temperature specified by the user and the temperature of the surroundings. The temperature transducer 10 delivers a signal to the control element 12, which after processing of the input signal delivers a corresponding signal to the actuating element 11. The latter delivers a signal to the heating element 5, changing the magnitude of the electric current and, as a consequence, smoothly changing the power of the heating element 5.

As a consequence of the claimed construction, in comparison with existing models the electric convector becomes more economical in its consumption of electrical energy; it ensures more flexible and more accurate maintenance of the temperature in the accommodation being heated; it permits rational use of the convector in places of accommodation of different area; frequent switching on and off of the heating element is absent, leading to an increase in the service lifetime of the heating element; the specified temperature for the accommodation is maintained with maximum accuracy, i.e. temperature drops are excluded and constant climate control is maintained; strong voltage jumps in the electric circuit are excluded, and the appearance of burnt deposits on the electric contacts is excluded, since starting currents are absent, i.e. the claimed technical result is achieved.

Claims

1. Electric convector heater of the inverter type, containing a body frame with air-inlet holes located at the bottom and with air-outlet holes located in the upper part of the body frame, and containing a front heat-radiating panel, a heating element, a control block with a switch-on button, and a current supply, wherein the control block consists of a body frame inside which is located an electric circuit board, characterized in that a temperature transducer is installed on the body frame, and an actuating element and a control element which are connected to each other are located on the electric circuit board, wherein the actuating element is electrically connected to the heating element while the control element is electrically connected to the temperature transducer.

2. Electric convector heater of the inverter type according to Claim 1, characterized in that a thyristor is used as the actuating element.

3. Electric convector heater of the inverter type according to Claim 1, characterized in that a processor is used as the control element.

4. Electric convector heater of the inverter type according to Claim 1, characterized in that a microprocessor is used as the control element.

5. Electric convector heater of the inverter type according to Claim 1, characterized in that the body frame of the control block contains a display.

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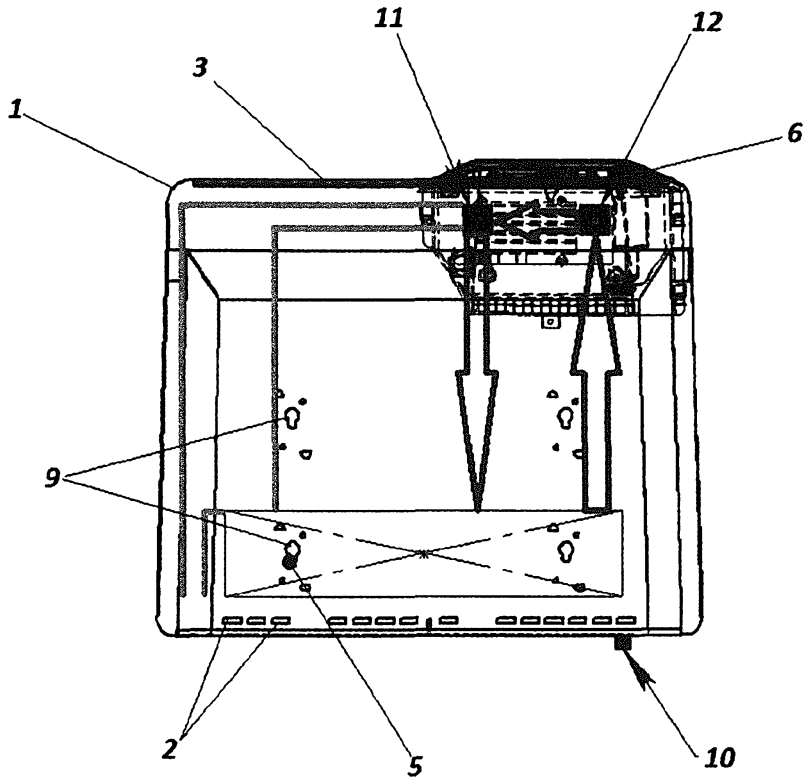

Fig. 1

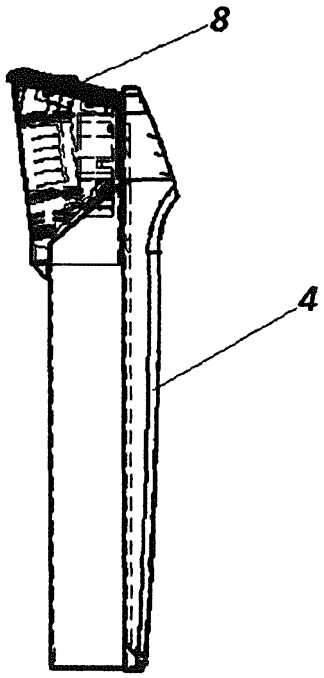

Fig. 2

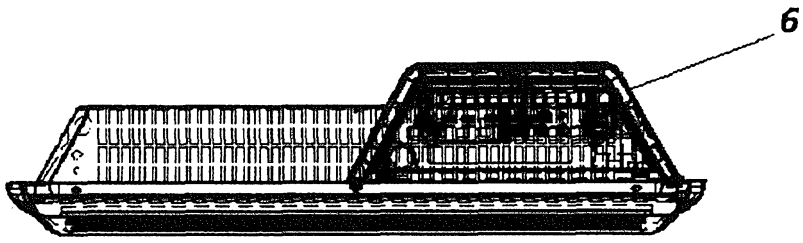

Fig. 3

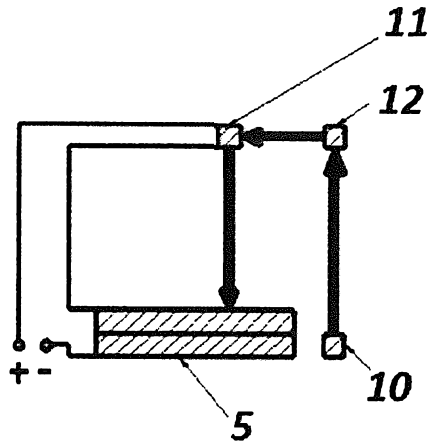

Fig. 4

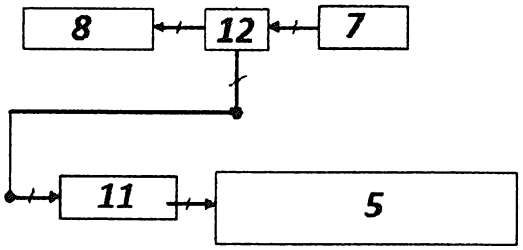

Fig. 5