Title: MANUFACTURING METHOD HEATING APPARATUS FOR THERMAL INSULATING IN ROOM TEMPERATURE

Abstract: Disclosed herein is a heating apparatus for maintaining the temperature of a room by a method of manufacturing a temperature-maintaining heating apparatus. The heating apparatus includes an electric heating plate, an electric heating cable, a bimetal, first and second contact terminals, a temperature sensor, heat insulating material, glass wool, a frame, a triangular support plate, and a control unit. The control unit is configured to control the supply of power though a pair of lead wires, and is also configured to receive temperature data, which is detected by the temperature sensor, through the lead wires of the temperature sensor and control radiant heat temperature. Thus, a room can kept warm, and fires, attributable to overheating, can be prevented from occurring.
MANUFACTURING METHOD HEATING APPARATUS FOR THERMAL INSULATING IN ROOM TEMPERATURE

[Technical Field]

The present invention relates generally to a method of manufacturing a temperature-maintaining heating apparatus and, more particularly, to a method of manufacturing a temperature-maintaining heating apparatus for maintaining the temperature of a room, which can keep a room warm, can be easily handled because it is thin and light, and can prevent fires, attributable to overheating, from occurring and, in addition, which can promote blood circulation in the human body using far infrared rays radiated from a ceramic coating layer, which is coated with a material, which is obtained by mixing platinum powder having a nanoparticle size, silver powder having a nanoparticle size, and a photocatalyst along with mineral material, such as ceramic, when the ceramic coating layer is heated, can remove bad odors in a room by radiating negative ions, and can kill bacteria that are harmful to the human body.

[Background Art]

A prior art heating apparatus for maintaining the temperature of a room, which is widely used, is disclosed in Korean Unexamined Pat. No. 10-2002-54687 (which was published on July 8, 2002).

In the heating apparatus for maintaining the temperature of a
room, which is disclosed in Korean Unexamined Pat. No. 10-2002-54687, a liquid-powder mixture is manufactured by manufacturing crushed rock by crushing a white stone or a white rock, adding crushed gemstones, which are obtained by crushing gemstones, to the crushed rock, and mixing the powder with an aqueous solution.

This liquid-powder mixture is charged into a prepared moldbase to a height about half that of the panel that is desired to be manufactured, and thus a lower panel 12 is formed. Thereafter, a piece of fiberglas 20 is disposed on the lower panel 12 in order to prevent the panel from cracking. Thereafter, a heating cable 30 is placed on the fibreglass 20 before the liquid-powder mixture is solidified.

Subsequently, another piece of fiberglas 20 is disposed on the heating cable 30. Thereafter, an upper panel 14 is manufactured by charging the liquid-powder mixture to the height of the panel that is desired to be manufactured so as to cover the fibreglass 20 and solidifying the charged liquid-powder mixture. Thereafter, when the solidified panel 10 is separated from the moldbase, a final electric floor-heating panel, in which the heating cable 30 is completely and integrally buried, is manufactured.

The prior art electric floor-heating panel is advantageous in that the strength thereof is high, and in that the upper panel 14 and the lower panel 12 are manufactured using the crushed gemstones, to which the crushed rock, which is obtained by crushing white stone or white rock, is added, so that far infrared rays can be radiated when power is applied to the heating cable 30, therefore blood circulation can be promoted and harmful waste material in the human
body can also be discharged to the outside, but is problematic in that the upper panel 14 and the lower panel 12 are manufactured using the crushed rock, so that it is difficult to handle because it is heavy.

Furthermore, the prior art electric floor-heating panel is problematic in that the manufacturing process is complicated, and thus a high manufacturing cost is required, and in that, if overheating beyond a predetermined temperature occurs, power applied thereto cannot be interrupted, and thus fires cannot be prevented.

[Disclosure of Invention]

The present invention is directed to a method of manufacturing a temperature-maintaining heating apparatus, which can keep a room warm.

Furthermore, the present invention is directed to a method of manufacturing a temperature-maintaining heating apparatus, which can be easily handled because it is thin and light.

Furthermore, the present invention is directed to a method of manufacturing a temperature-maintaining heating apparatus, which can prevent fires, attributable to overheating, from occurring.

Furthermore, the present invention is directed to a method of manufacturing a temperature-maintaining heating apparatus, which can promote blood circulation in the human body using far infrared rays radiated from a ceramic coating layer, which is coated with a material, which is obtained by mixing platinum powder having a nanoparticle size, silver powder having a nanoparticle size, and
photocatalyst along with mineral material, such as ceramic, when the ceramic coating layer is heated, can remove bad odors in a room by radiating negative ions, and can kill bacteria that are harmful to the human body.

Furthermore, the present invention is directed to a method of manufacturing a temperature-maintaining heating apparatus, which has a simple structure and can reduce the manufacturing cost.

In order to accomplish the above objects, the present invention provides a method of manufacturing a temperature-maintaining heating apparatus, including: a first cutting step of cutting a long piece of aluminum chassis material into predetermined lengths; a second cutting step of cutting aluminum chassis parts, which are obtained by cutting the long piece of aluminum chassis material to have the predetermined lengths at the first cutting step, such that both ends of each of the aluminum chassis parts are inclined inwards at 45 degrees to manufacture first and second transverse aluminum chassis parts and first and second longitudinal aluminum chassis parts; a first bracket insertion step of inserting first ends of first 7-shaped brackets into respective through-holes, which are formed in respective ends of the first transverse aluminum chassis, which is cut at a 45 degree incline at the second cutting step, and inserting second ends of the first 7-shaped brackets, the first ends of which are inserted into the through-holes formed in the respective ends of the first transverse aluminum chassis part, into respective through-holes, which are formed in first ends of the first and second longitudinal aluminum chassis parts; a first coupling step of, after the first transverse aluminum chassis part and the first and second
longitudinal aluminum chassis parts are assembled to have a reverse U-shape at the first bracket insertion step, coupling the second ends of the first brackets to the respective first ends of the first and second longitudinal aluminum chassis parts by threading screws into screw holes, which are formed close to the respective ends of the first transverse aluminum chassis part in the rear thereof, screw holes, which are formed close to the respective first ends of the first and second longitudinal aluminum chassis parts in the rear thereof; an electric heating plate/heat insulating material/glass wool insertion step of pushing an electric heating cable, which is adhered to one surface of an electric heating plate using aluminum adhesive tape, heat insulating material and glass wool into an opening, which is formed by the first transverse aluminum chassis part and the first and second longitudinal aluminum chassis parts, which are coupled to have the reverse U-shape at the first coupling step, and inserting them into a concave groove in the first transverse aluminum chassis part and concave grooves in the first and second longitudinal aluminum chassis parts; a second bracket insertion step of, after the electric heating plate/heat insulating material/glass wool insertion step, inserting first ends of second L-shaped brackets into respective through-holes, which are formed in the second ends of the first and second longitudinal aluminum chassis parts, and inserting second ends of the second brackets into through-holes, which are formed in respective ends of the second transverse aluminum chassis part; a second coupling step of coupling the second ends of the second brackets to the respective ends of the second transverse aluminum chassis by threading screws into screw
holes, which are formed close to respective ends of the second transverse aluminum chassis part in the rear thereof, and screw holes, which are formed close to respective second ends of the first and second longitudinal aluminum chassis parts in the rear thereof; and a heat-resistant paint layer forming step of, after the second coupling step, forming a heat-resistant paint layer by applying heat-resistant paint to the first and second transverse aluminum chassis parts, the first and second longitudinal aluminum chassis parts, and the ceramic coating layer of the electric heating plate.

[Brief Description of Drawings]

The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view schematically showing a prior art heating apparatus for maintaining the temperature of a room;

FIG. 2 is a perspective view schematically showing the external appearance of the front of a heating apparatus for maintaining the temperature of a room according to an embodiment of the present invention;

FIG. 3 is a perspective view schematically showing the external appearance of the rear of the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention;

FIG. 4 is a longitudinal sectional view schematically showing
the structure of an electric heating plate, to the rear surface of which an electric heating cable is adhered using aluminum adhesive tape, in the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention;

FIG. 5 is a view schematically showing the state in which the electric heating cable is adhered to the electric heating plate using aluminum adhesive tape in the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention, illustrating the installation of heat insulating material and glass wool;

FIG. 6 is a view schematically illustrating the assembly of a frame, in the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention;

FIG. 7 is a plan view showing parts of the frame of FIG. 6;

FIG. 8 is a perspective view schematically showing the structure of the electric heating cable, which is applied to the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention;

FIG. 9 is a perspective view schematically showing the insertion of the electric heating plate, the heat insulating material and the glass wool in the state in which one side of the frame is not assembled, in the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention;

FIG. 10 is a longitudinal sectional view taken along line A-A of FIG. 2; and

FIG. 11 is a block diagram schematically showing a control unit.
for controlling the overall operation of the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention.

FIG. 12 is a flowchart illustrating the method of manufacturing a temperature-maintaining heating apparatus, according to the present invention.

< Brief Description of codes >

100: electric heating plate 101: nonferrous metal plate
102: adhesive layer 103: ceramic coating layer
110: electric heating cable 111: copper wire
112: first teflon layer 113: silicon insulating layer
114: heating element 115: second teflon layer
116: insulating layer 112: aluminum double-sided adhesive tape
120: bimetal 132: lead wire
134: lead wire 142: first contact terminals
144: second contact terminals 150: temperature sensor
152: lead wire 154: lead wire
160: heat insulating material 170: glass wool
20 172: through-holes 180: frame
181: screw 182: first transverse aluminum chassis
182a: first transverse aluminum chassis 182c: through-holes
183: second transverse aluminum chassis 183c: through-holes
184a: through-holes 185: bracket
185a: first longitudinal aluminum chassis 185c: through-holes
186a: second longitudinal aluminum chassis 186c: through-holes
[Best Mode for Carrying Out the Invention]

A heating apparatus for maintaining the temperature of a room according to an embodiment of the present invention is described in detail with reference to the accompanying drawings below.

As shown in FIGS. 2 to 11, the heating apparatus for maintaining the temperature of a room according to the embodiment of the present invention includes an electric heating plate 100 which is configured to block electromagnetic waves and groundwater waves and improve heat transmission efficiency, an electric heating cable 110 which is adhered to the rear surface of the electric heating plate 100 using aluminum adhesive tape so that far infrared rays are radiated from the electric heating plate 100 when AC power is applied, a bimetal 120, which is connected to the intermediate portion of the electric heating cable 110 to prevent overheating, and is configured so as to be switched off at a temperature greater than a predetermined temperature and be switched on (enter an electrically connected state) at a temperature equal to or less than
the predetermined temperature, first and second contact terminals 142 and 144, which are used to connect the respective ends of the electric heating cable 110 to a pair of lead wires 132 and 134, a temperature sensor 150, which is mounted between the first and second contact terminals 142 and 144 to detect temperature, heat insulating material 160 which is placed on the electric heating cable 110 to prevent heat from radiating from the rear surface of the electric heating plate 100, glass wool 170, which is mounted on the heat insulating material 160 to fix the location of the heat insulating material 160, a frame 180, which is configured to surround the electric heating plate 100, the heat insulating material 160 and the glass wool 170, a triangular support plate 190, which is mounted at both the corner of the rear surface of the frame 180 and the rear surface of the glass wool 170, and is configured to enable both the pair of lead wires 132 and 134 and the pair of lead wires 152 and 154 of the temperature sensor 150 to be pulled both through a through-hole 162, which is formed in the heat insulating material 160, and through a through-hole 172, which is formed in the glass wool 170, and to support the pulled lead wires 132, 134, 152 and 154, and a control unit 200, which is configured to control the supply of power though the pair of lead wires 132 and 134, and is also configured to receive temperature data, which is detected by the temperature sensor 150, through the lead wires 152 and 154 of the temperature sensor 150 and control radiant heat temperature.

In order to block the electromagnetic waves and the groundwater waves and improve the heat transmission efficiency, the electric heating plate 100 includes a nonferrous metal plate 101 having a
thickness of 0.5 ~ 3 mm, an adhesive layer 102 applied on the upper surface of the nonferrous metal plate 101, and a ceramic coating layer 103 layered on the adhesive layer 102 so as to promote the circulation of blood through the radiation of far infrared rays, remove bad odors in a room through the radiation of negative ions, and kill bacteria that are harmful to a human body.

The nonferrous metal plate 101 may be formed using any plate selected from among a copper plate, a zinc plate, an aluminum plate, a gold plate, a silver plate and a phosphor bronze plate. Furthermore, the nonferrous metal plate 101 may be formed by depositing copper, zinc, aluminum, gold, silver or phosphor bronze on the aluminum plate in a vacuum using a sputtering method, may be formed using a chemical plating method, or may be formed using a Galvalume steel sheet, which is formed by plating a cold heat steel sheet with aluminum.

It is preferred that an acryl-based thermosetting adhesive agent be used for the adhesive layer 102. Furthermore, it is preferred that acryl-based resin or epoxy melanin be used for the adhesive layer 102 and that it be applied on the nonferrous metal plate 101 using a sprayer or a rubber roller so as to form a film having a thickness ranging from 20 μm to 50 μm.

The ceramic coating layer 103 is formed in such a way as to form a ceramic mixed material by uniformly stirring 17 Wt% colloidal silica (SiO2·H2O), 34 Wt% potassium silicate, 34 Wt% ethyl alcohol, 8.3 Wt% fused silica, 4.2 Wt% aluminum powder, 1 Wt% germanium powder, 0.7 Wt% magnesium oxide powder, 0.3 Wt% photocatalyst, 0.3 Wt% platinum powder, and 0.3 Wt% silver powder in a stirrer for 20
minutes to 30 minutes, and to apply a ceramic powder-containing coating liquid, which is obtained by mixing the ceramic mixed material with alumina soda at a ratio of 3:7, on the adhesive layer 102 using a sprayer or a rubber roller so as to form a film having a thickness ranging from 50 μm to 150 μm.

Furthermore, in order to form the ceramic coating layer 103, a ceramic powder-containing coating liquid, which is obtained by mixing a mixed material, which is obtained by mixing Tourmaline powder, alumina, and yellow soil powder at a ratio of 4:3:3 in the stirrer, with alumina soda at a ratio of 3:7, may be applied on the adhesive layer 102 using a sprayer or a rubber roller so as to form a film having a thickness ranging from 50 μm to 150 μm.

When receiving heat, such as that from solar radiation, having a wavelength of 1240/Eg, the photocatalyst has antibacterial activity against colon bacillus "O-157," Staphylococcus aureus bacteria, etc. and an anti-fouling function against tobacco nicotine, dead microbes in a room, etc. by causing a photocatalyst reaction. In addition, the photocatalyst performs both a function of removing bad odors in a room (for example, tobacco odors, ammonia odors, etc.) and a function of eliminating volatile organic compounds (for example, toluene, ethylene, formaldehyde, methane gas, etc.), and also performs a function of killing mold in a room.

Furthermore, it is preferred that any one selected from among ZnO, CdS or TiO₂ be used for the photocatalyst.

It is preferred that the particle size of platinum powder and silver powder be in a range of 100 nm to 500 nm.

A heat-resistant paint layer 104 is formed by applying heat-
resistant paint to the entire surface (upper surface) of both the ceramic coating layer 103 and the frame 180.

As shown in detail in FIG. 8, in a winding machine (not shown), the electric heating cable 110, which is applied to the heating apparatus for maintaining the temperature of a room according to the present invention, includes a plurality of strands of twisted copper wire 111, a first Teflon layer 112, which is configured to have a predetermined working voltage and is layered around the copper wire 111, a silicon insulating layer 113, which is layered on the outer circumferential surface of the first Teflon layer 112 to increase the working voltage of the first Teflon layer 112 using silicon, a heating element 114, which is configured to absorb a magnetic field, which is radiated from the copper wire 111 when power is applied thereto, and is helically wound around the silicon insulating layer 113 so as to radiate heat, a second Teflon layer 115, which is layered around the heating element 114 using Teflon so as to fix the location of the heating element 114 and, at the same time, block a portion of the heat radiated from the heating element 114, and an insulating layer 116, which is formed by extrusion molding insulating material (for example, synthetic rubber, silicon rubber or the like) on the second Teflon layer 115 in order to realize insulation.

The copper wire 111 is a twisted pair of wires that are manufactured using five to ten strands of wire, having a diameter of 0.2 mm to 0.5 mm. It is preferred that the outer circumferential surface of the copper wire 111 be plated with tin, and that the insulating layer 116 be formed by extrusion molding silicon rubber.
It is preferred that the heat insulating material 160 be made of any one selected from among ceramic fiber, rock wool and glass fiber.

It is preferred that the glass wool 170 be manufactured by melting silica and glass and using a TEL process.

It is preferred that the frame 180 be formed of an aluminum chassis, which is formed through extrusion molding of molten aluminum.

The frame 180 includes a pair of a first and a second transverse aluminum chassis 182a and 183a which are spaced apart from each other at a predetermined interval and are parallel to each other; a pair of a first and a second longitudinal aluminum chassis 185a and 186a which are spaced apart from each other at a predetermined interval and are parallel to each other; T-shaped brackets 185 which are configured such that a first bracket is inserted into either of a pair of through-holes 184a, which are formed in one end of the first transverse aluminum chassis 182a, and either of a pair of through-holes 187a, which are formed in one end of the first longitudinal aluminum chassis 185a, thus coupling the first transverse aluminum chassis 182a with the first longitudinal aluminum chassis 185a, such that a second bracket is inserted into either of a pair of through-holes 184a, which are formed in the remaining end of the first transverse aluminum chassis 182a, and either of a pair of through-holes 187a, which are formed in one end of the second longitudinal aluminum chassis 186a, thus coupling the first transverse aluminum chassis 182a with the second longitudinal aluminum chassis 186a, such that a third bracket is inserted into
either of a pair of through-holes 184a, which are formed in one end of the second transverse aluminum chassis 183a, and either of a pair of through-holes 187a, which are formed in the remaining end of the first longitudinal aluminum chassis 185a, thus coupling the second transverse aluminum chassis 183a with the first longitudinal aluminum chassis 185a, and such that a fourth bracket is inserted into either of a pair of through-holes 184a, which are formed in the remaining end of the second transverse aluminum chassis 183a, and either of a pair of through-holes 187a, which are formed in the remaining end of the second longitudinal aluminum chassis 186a, thus coupling the second transverse aluminum chassis 183a with the second longitudinal aluminum chassis 186a; and a plurality of screws 181, which is configured such that a first screw passes through a screw hole 188a, which is formed close to one end of the first transverse aluminum chassis 182a in the rear thereof, and is threadedly coupled with one end of the bracket, which is inserted into the through-hole 184a in the first transverse aluminum chassis 182a, and a second screw passes through a screw hole 189a, which is formed close to one end of the first longitudinal aluminum chassis 185a in the rear thereof, and is threadedly coupled with the remaining end of the bracket, which is inserted into the through-hole 187a in the first longitudinal aluminum chassis 185a, thus fastening the first transverse aluminum chassis 182a and the first longitudinal aluminum chassis 185a to each other in a perpendicular arrangement, such that a third screw passes through a screw hole 188b, which is formed close to the remaining end of the first transverse aluminum chassis 182a in the rear thereof, and is threadedly coupled with one end of
the bracket 185, which is inserted into the through-hole 184a in the
first transverse aluminum chassis 182a, and a fourth screw passes
through a screw hole 189a, which is formed close to one end of the
second longitudinal aluminum chassis 186a in the rear thereof, and
is threadedly coupled with the remaining end of the bracket 185,
which is inserted into the through-hole 187a in the second
longitudinal aluminum chassis 186a, thus fastening the first
transverse aluminum chassis 182a and the second longitudinal
aluminum chassis 186a to each other in a perpendicular arrangement,
such that a fifth screw passes through a screw hole 188a, which is
formed close to one end of the second transverse aluminum chassis
183a in the rear thereof, and is threadedly coupled with one end of
a bracket 185, which is inserted into the through-hole 184a in the
second transverse aluminum chassis 183a, and a sixth screw passes
through a screw hole 189b, which is formed close to the remaining
end of the first longitudinal aluminum chassis 185a in the rear
thereof, and is threadedly coupled with the remaining end of the
bracket 185, which is inserted into the through-hole 187a in the
first longitudinal aluminum chassis 185a, thus fastening the second
transverse aluminum chassis 183a and the first longitudinal aluminum
chassis 185a to each other in a perpendicular arrangement, and such
that a seventh screw passes through a screw hole 188b, which is
formed close to the remaining end of the second transverse aluminum
chassis 183a in the rear thereof, and is threadedly coupled with one
end of the bracket 185, which is inserted into the through-hole 184a
in the second transverse aluminum chassis 183a, and an eighth screw
passes through a screw hole 189b, which is formed close to the
remaining end of the second longitudinal aluminum chassis 185a in the rear thereof, and is threadedly coupled with the remaining end of the bracket 185, which is inserted into the through-hole 187a in the second longitudinal aluminum chassis 186a, thus fastening the second transverse aluminum chassis 183a and the second longitudinal aluminum chassis 186a to each other in a perpendicular arrangement, with a result that the screws are fastened so as to form a frame.

Through-holes 182c and 183c may be formed in the first and second transverse aluminum chassis 182a and 183a at regular intervals so as to be installed to a support, which is provided with a wall or a ceiling, or the through-holes 185c and 186c may be formed in the first and second longitudinal aluminum chassis 185a and 186a at regular intervals so as to be installed to a support, which is provided with a wall or a ceiling.

The control unit 200 includes a main switch 201 for switching the output of power applied by an AC power unit 210, a DC power unit 202 for receiving the power from the AC power unit 210 and converting the received power into DC power when the main switch 201 is switched on, a microprocessor 203 for receiving the DC power, which is output from the DC power unit 202, as operational power and controlling the overall operation of the apparatus, a temperature setting means 204 for setting the radiant heat temperature of the electric heating plate 100 in the microprocessor 203, Random Access Memory (RAM) 205 for receiving temperature data, which is set using the temperature setting means 204, through the microprocessor 203 and storing the received temperature data, a relay coil RYL, excited by a control signal (control current), which is output from the
microprocessor 203, and electrically connecting an actuation contact a to a stationary contact b so that current is applied to the electric heating plate 100 according to the temperature data set using the temperature setting means 204, and an Analog/Digital (A/D) converter 206 for converting analog temperature data about the heat, which is radiated from the electric heating plate 100, into digital temperature data and outputting the digital temperature data to the microprocessor 203, the analog temperature data being detected by a temperature sensor 150 and being received through the lead wires 152 and 154.

The temperature setting means 204 may be a selector switch or a push button switch, through the manipulation of which the temperature is increased or decreased in increments of 5°C. Furthermore, the temperature setting means 204 may be a slide switch.

Next, the operation and advantages of the heating apparatus for maintaining the temperature of a room according to the present invention, which is constructed as described above, are described below.

First, when the main switch 201 of the control unit 200 is switched on, AC power is applied from the AC power unit 210 to the DC power unit 202. The DC power unit 202 converts the AC power into DC power (rectification), and supplies the DC power to the microprocessor 203 as operational power.

When the temperature of the electric heating plate 100, which is a desired radiant heat temperature, is set through the temperature setting means 204 while the operational power is
supplied to the microprocessor 203, set temperature data is input to the microprocessor 203. The input set temperature data is stored in the RAM 205 of the microprocessor 203, and is also output from the microprocessor 203 to the relay coil RY1 in the form of a control signal (current).

Subsequently, the relay coil RY1 is excited, so that the actuation contact a is electrically connected to the stationary contact b, therefore current, which is output from the AC power unit 210 via the main switch 201, flows through the lead wire 132, the electric heating cable 110 and the lead wire 134. Accordingly, the heat starts to be radiated from the electric heating cable 110, and thus the electric heating plate 100 is heated to a predetermined temperature.

In this manner, when the electric heating plate 100 is heated to the temperature set using the temperature setting means 204, the temperature sensor 150, which is mounted between the first and second contact terminals 142 and 144, detects the temperature of the electric heating plate 100, and outputs the detected temperature to the A/D converter 206.

The analog temperature data input to the A/D converter 206 is converted into digital temperature data and is then input to the microprocessor 203. Subsequently, the microprocessor 203 compares the detected temperature with the set temperature, which is stored in the RAM 205. In this case, when the detected temperature is higher than the temperature set using the temperature setting means 204, no control signal (current) is output to the relay coil RY1 by the microprocessor 203, so that the relay coil RY1 is not excited,
therefore the actuation contact a is separated from the stationary contact b. Accordingly, no current flows to the electric heating cable 110, and thus the occurrence of fires, attributable to overheating, can be prevented.

Meanwhile, in the case where the electric heating plate 100 is overheated due to a malfunction of the temperature sensor 150, the bimetal 120, which is mounted in the intermediate portion of the electric heating cable 110, opens a circuit, and thus the occurrence of fires can be prevented.

In the present invention, the reason for mounting the temperature sensor 150 between the first and second contact terminals 142 and 144 is to prevent fires, attributable to overheating, from occurring by causing the temperature sensor 150 to detect the heat, which is generated due to sparks caused by poor contact between the lead wires 132 and 134, which are connected to the respective first and second contact terminals 142 and 144, and the electric heating cable 110, and to output the detection results to the A/D converter 206.

Furthermore, in the case where a selector switch or a push button switch is used for the temperature setting means 204, the temperature is increased or decreased in increments of 5°C, so that the temperature can be very easily set. In addition, in the case where a slide switch is used for the temperature setting means 204, the temperature can be more easily set.

As shown in FIG. 8, the electric heating cable 110 that is used in the heating apparatus for maintaining the temperature of a room according to the present invention is configured such that the first
Teflon layer 112 and a silicon insulating layer 113 sequentially cover a plurality of strands of twisted copper wire 111, so that a working voltage of more than 2000 VAC at 10 mA AC is generated by the first Teflon layer 112, and a working voltage of 2000 VAC at 10 mA AC is generated again by the silicon insulating layer AC, so that the electric heating cable 110 can withstand a total working voltage of about 4000 V.

Furthermore, the second Teflon layer 115 is wound around the heating wire 114, which is helically wound around the silicon insulating layer 113, and the second Teflon layer 115 prevents the heating wire 114, which is formed of Nichrome wire, from moving, so that, when the heating wire 114 is covered with insulation material, such as silicon rubber, through extrusion molding, a phenomenon in which the heating wire 114, which is helically wound around the silicon insulating layer 113, is pushed to one side by the extrusion force is prevented, therefore the occurrence of defective products can be prevented when the electric heating cable 110 is manufactured, and thus the production yield can be improved. In addition, the heat, which is radiated from the heating wire 114, is indirectly transmitted to the insulating layer 116 through the second Teflon layer 115, so that the insulating layer 116 can be prevented from being deteriorated by the heat, and the lifetime of the electric heating cable 110 can be elongated.

Furthermore, the heating wire 114 is helically wound around the silicon insulating layer 113, so that, even when power is applied between the copper wire 111 and the heating wire 114, the electromagnetic waves, which are radiated from the copper wire 111,
are absorbed by the heating element 114, and thus the electromagnetic waves, which are harmful to the human body, are not emitted to the outside.

The heat insulating material 160 is any one selected from among ceramic fiber, rock wool and glass fiber, and the glass wool 170 is layered on the heat insulating material 160, so that the heat, which is radiated from the electric heating cable 110, can be blocked so that it is not radiated to the outside through the rear of the heating apparatus for maintaining the temperature of a room according to the present invention, by which heat loss can be prevented.

Furthermore, in the heating apparatus for maintaining the temperature of a room according to the present invention, the frame 180 is formed of the aluminum chassis, which is formed by extrusion molding molten aluminum, so that cutting to a predetermined size and assembly are very easy, with the result that the structure of the heating apparatus is greatly simplified and the manufacturing cost can also be greatly reduced.

The heating apparatus for maintaining the temperature of a room according to the present invention has a structure in which respective ends of the brackets 185 are inserted into through-holes 184a, which are formed in the ends of the first and second transverse aluminum chassis 182a and 183a, the respective remaining ends of the bracket 185 are inserted into the through-holes 187a, which are formed in the ends of the first and the second longitudinal aluminum chassis 185a and 186a, the screws 181 are inserted into the respective screw holes 188a and 188b, which are
formed in the rear of the frame 180, in greater detail, which are formed close to the ends of the first and second transverse aluminum chassis 182a and 183a in the rear thereof and are threadedly coupled with the respective ends of the brackets 185, and the screws 181 are inserted into the respective screw holes 189a and 189b, which are formed close to the ends of the first and second longitudinal aluminum chassis 185a and 186a and are threadedly coupled with the respective remaining ends of the brackets 185. Accordingly, the frame 180 can be securely assembled.

Furthermore, in the heating apparatus for maintaining the temperature of a room according to the present invention, the through-holes 182c and 183c, which are spaced apart from each other and into which bolts (not shown) are inserted, are formed in the first and second transverse aluminum chassis 182a and 183a, or the through-holes 185c and 186c, which are spaced apart from each other and into which bolts (not shown) are inserted, are formed in the first second longitudinal aluminum chassis 185a and 186a, so that the heating apparatus for maintaining the temperature of a room according to the present invention can be easily installed to a support, which is provided on a wall or a ceiling.

Next, a method of manufacturing a temperature-maintaining heating apparatus according to the present invention, is described with reference to FIG. 12.

FIG. 12 is a flowchart illustrating the method of manufacturing a temperature-maintaining heating apparatus, according to the present invention.

As shown in FIG. 12, a long piece of aluminum chassis material
is cut to predetermined lengths (first cutting step), pieces of the aluminum chassis material, which are obtained by cutting the long piece of aluminum chassis material into the predetermined lengths at the first cutting step, are cut such that both ends of each piece of the aluminum chassis are inclined inwards at 45 degrees to manufacture the first and second transverse aluminum chassis parts 182a and 183a and the first and second longitudinal aluminum chassis parts 185a and 186a (second cutting step). First ends of first Τ-shaped brackets 185 are inserted into the respective through-holes 184a, which are formed in respective ends of the first transverse aluminum chassis part 182a, which is cut at a 45 degree incline at the second cutting step, second ends of the first Τ-shaped brackets 185, the first ends of which are inserted into the through-holes 184a formed in the respective ends of the first transverse aluminum chassis part 182a, are inserted into respective through-holes 187a, which are formed in first ends of the first and second longitudinal aluminum chassis parts 185a and 186a (first bracket insertion step).

After the first transverse aluminum chassis part 182a and the first and second longitudinal aluminum chassis parts 185a and 186a are assembled to have a reverse U-shape at the first bracket insertion step, the second ends of the first brackets 185 are coupled to respective first ends of the first and second longitudinal aluminum chassis parts 185a and 186a by threading screws 181 into screw holes 188a, which are formed close to respective ends of the first transverse aluminum chassis part 182a in the rear thereof, and screw holes 189a, which are formed close to respective first ends of the first and second longitudinal aluminum
chassis parts 185a and 186a in the rear thereof (first coupling step).

The electric heating cable 110, which is adhered to one surface of the electric heating plate 100 using the aluminum adhesive tape 112, the heat insulating material 160 and the glass wool 170 are pushed into an opening, which is formed by the first transverse aluminum chassis part 182a and the first and second longitudinal aluminum chassis parts 185a and 186a, which are coupled to have the reverse U-shape at the first coupling step, are inserted into the concave groove 182d in the first transverse aluminum chassis part 182a and the concave grooves 185d and 186d in the first and second longitudinal aluminum chassis parts 185a and 186a (electric heating plate/heat insulating material/glass wool insertion step).

After the electric heating plate/heat insulating material/glass wool insertion step, first ends of second T-shaped brackets 185 are inserted into respective through-holes 187a, which are formed in the second ends of the first and second longitudinal aluminum chassis parts 185a and 186a, and second ends of the second brackets 185 are inserted into the through-holes 184a, which are formed in respective ends of the second transverse aluminum chassis part 183a (second bracket insertion step).

The second ends of the second brackets 185 are coupled to the respective ends of the second transverse aluminum chassis 183a by threading screws 181 into screw holes 188a and 188b, which are formed close to respective ends of the second transverse aluminum chassis part 182a in the rear thereof, and screw holes 189b, which are formed close to respective second ends of the first and second
longitudinal aluminum chassis parts 185a and 186a in the rear thereof (second coupling step).

After the second coupling step, a heat-resistant paint layer 104 is formed by applying heat-resistant paint to the first and second transverse aluminum chassis parts 182a and 183a, the first and second longitudinal aluminum chassis parts 185a and 186a, and the ceramic coating layer 103 of the electric heating plate 100 (heat-resistant paint layer forming step).

Accordingly, the heating apparatus for maintaining the temperature of a room, which is manufactured using the method of manufacturing a temperature-maintaining heating apparatus according to the present invention can keep a room warm, can be easily handled because it is thin and light, and can prevent fires, attributable to overheating, from occurring.

Furthermore, when the ceramic coating layer is heated, the heating apparatus can promote blood circulation in the human body through the radiation of far infrared rays.

Furthermore, when the electric heating plate is plated with silver or when the coating is performed using ceramic powder, which constitutes the ceramic coating layer and to which tourmaline and alumina are added, the heating apparatus can remove bad odors in a room by radiating negative ions.

Furthermore, the heating apparatus can kill bacteria that are harmful to the human body, and can be inexpensively and easily manufactured.

Furthermore, the heating apparatus for maintaining the temperature of a room according to the present invention has various
advantages in that it can promote blood circulation in the human body using far infrared rays radiated from a ceramic coating layer, which is coated with a material, which is obtained by mixing platinum powder having a nanoparticle size, silver powder having a nanoparticle size, and photocatalyst along with a mineral material, such as ceramic, when the ceramic coating layer is heated, can remove bad odors in a room by radiating negative ions, can kill bacteria that are harmful to the human body, has a simple structure, and has a low manufacturing cost.

Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

[Industrial Applicability]

This brand new invented appliance in home heating system is valuable efficiency for easy handling by thin, not heavy and protecting from fire even in over usage.

The coated ceramic in the new heating system made with mixed special materials such as nano size of white gold powder, silver powder and luster catalyst is much helpful to men to improve the circulation of men's blood by far irfraded rays when its; heat and to sterilize those ill smelling indoor by the positive ion. and, further more, this system is very effective merit by low manufacturing cost because of simple factions.
CLAIMS

1. Manufacturing method heating apparatus for thermal insulating in room temperature which is characterized by comprising:

a first cutting step of cutting a long piece of aluminum chassis material into predetermined lengths;

a second cutting step of cutting aluminum chassis parts, which are obtained by cutting the long piece of aluminum chassis material to have the predetermined lengths at the first cutting step, such that both ends of each of the aluminum chassis parts are inclined inwards at 45 degrees to manufacture first and second transverse aluminum chassis parts and first and second longitudinal aluminum chassis parts;

a first bracket insertion step of inserting first ends of first T-shaped brackets into respective through-holes, which are formed in respective ends of the first transverse aluminum chassis, which is cut at a 45 degree incline at the second cutting step, and inserting second ends of the first T-shaped brackets, the first ends of which are inserted into the through-holes formed in the respective ends of the first transverse aluminum chassis part, into respective through-holes, which are formed in first ends of the first and second longitudinal aluminum chassis parts;

a first coupling step of, after the first transverse aluminum chassis part and the first and second longitudinal aluminum chassis parts are assembled to have a reverse U-shape at the first bracket insertion step, coupling the second ends of the first brackets to the respective first ends of the first and second longitudinal
aluminum chassis parts by threading screws into screw holes, which are formed close to the respective ends of the first transverse aluminum chassis part in a rear thereof, screw holes, which are formed close to the respective first ends of the first and second longitudinal aluminum chassis parts in a rear thereof; an electric heating plate/heat insulating material/glass wool insertion step of pushing an electric heating cable, which is adhered to one surface of an electric heating plate using aluminum adhesive tape, heat insulating material and glass wool into an opening, which is formed by the first transverse aluminum chassis part and the first and second longitudinal aluminum chassis parts, which are coupled to have the reverse U-shape at the first coupling step, and inserting them into a concave groove in the first transverse aluminum chassis part and concave grooves in the first and second longitudinal aluminum chassis parts; a second bracket insertion step of, after the electric heating plate/heat insulating material/glass wool insertion step, inserting first ends of second 7-shaped brackets into respective through-holes, which are formed in the second ends of the first and second longitudinal aluminum chassis parts, and inserting second ends of the second brackets into through-holes, which are formed in respective ends of the second transverse aluminum chassis part; a second coupling step of coupling the second ends of the second brackets to the respective ends of the second transverse aluminum chassis by threading screws into screw holes, which are formed close to respective ends of the second transverse aluminum chassis part in a rear thereof, and screw holes, which are formed close to
respective second ends of the first and second longitudinal aluminum chassis parts in a rear thereof; and
a heat-resistant paint layer forming step of, after the second coupling step, forming a heat-resistant paint layer by applying heat-resistant paint to the first and second transverse aluminum chassis parts, the first and second longitudinal aluminum chassis parts, and a ceramic coating layer of the electric heating plate.
[FIG. 12]

First Cutting Step

Second Cutting Step

First Bracket Insertion Step

First Coupling Step

Electric Heating Plate
Heat Insulating Material
Glass Wool
Insertion Step

Second Bracket Insertion Step

Second Coupling Step

Heat-Resistant Paint Layer Forming Step