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(54) **INFRARED ELECTROTHERMAL RAISED FLOOR PIECE AND FLOOR COMPRISING THE SAME**

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E04B 5/48	(2006.01)
E04F 15/024	(2006.01)
E04F 15/02	(2006.01)

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USPC ..... 237/67, 70, 76; 250/504 R, 495.1; 432/225, 227, 231, 232

See application file for complete search history.

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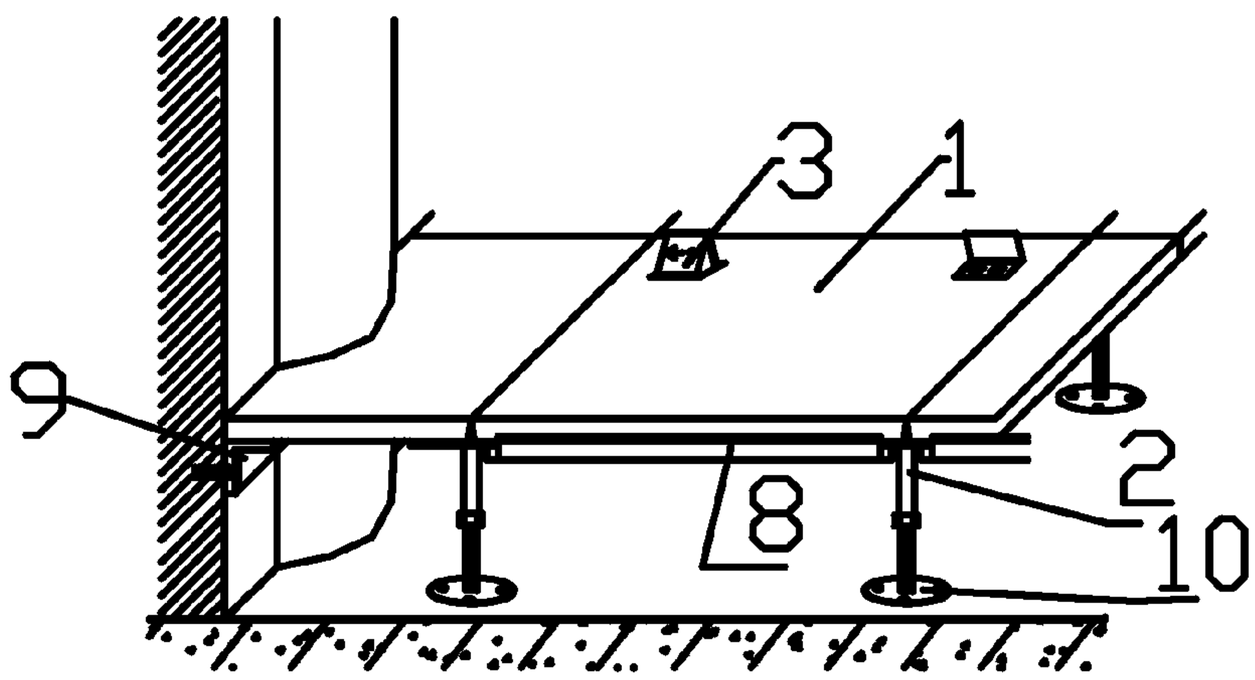
(57) **ABSTRACT**

Provided is an infrared electrothermal raised floor piece, comprising a faceplate layer, a carbon fiber far-infrared heat layer, a force support structure layer, at least a pair of electrodes and a plurality of power line connection terminals; wherein the electrodes are connected to the carbon fiber far-infrared heat layer; and the power line connection terminals are connected to the electrode. Also provided is an infrared electrothermal raised floor, comprising a plurality of infrared electrothermal raised floor pieces each comprising a plurality of power line connection terminals, and a supporter; wherein the infrared electrothermal raised floor pieces are transversely or lengthwisely arranged and flexibly installed on the supporter.

7 Claims, 2 Drawing Sheets



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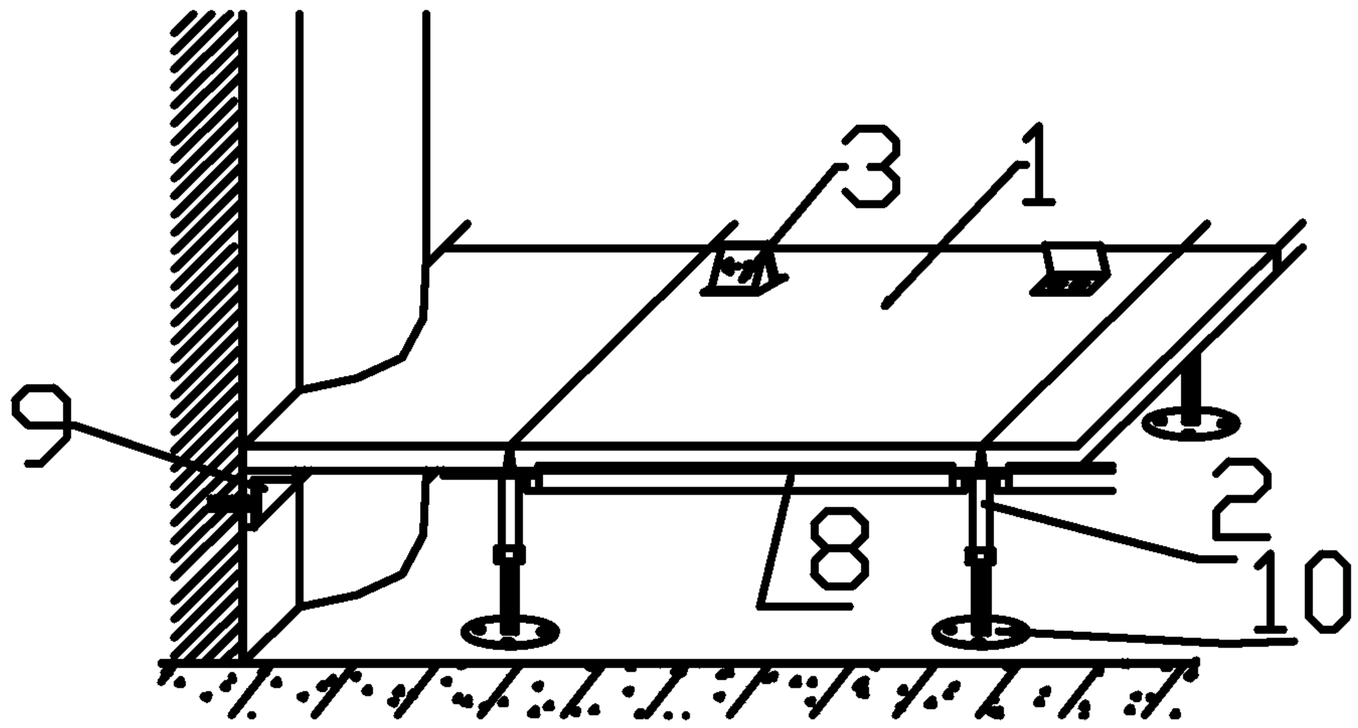

Fig. 1

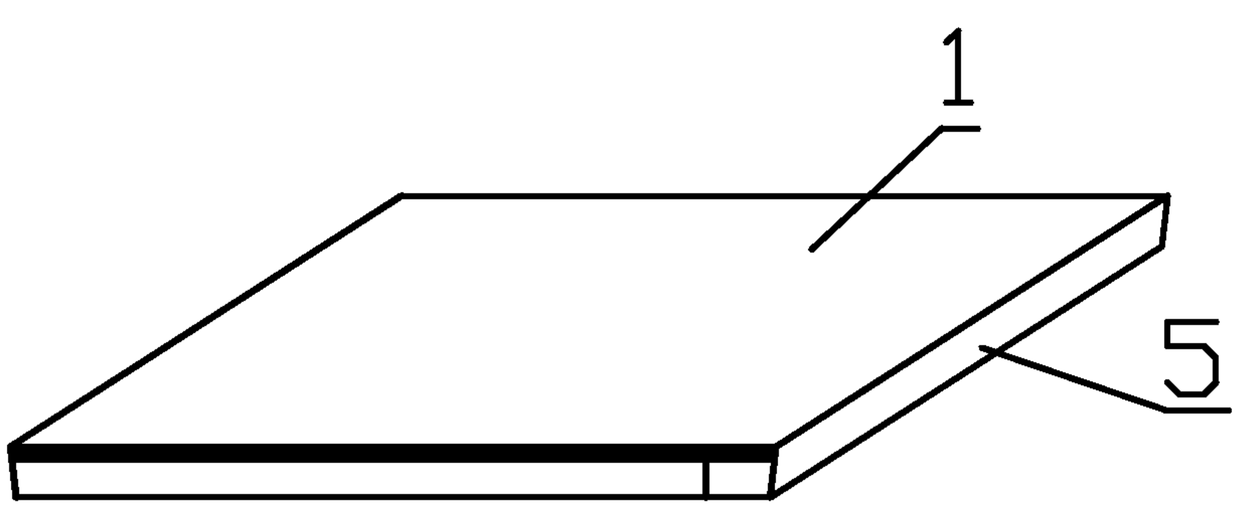

Fig. 2

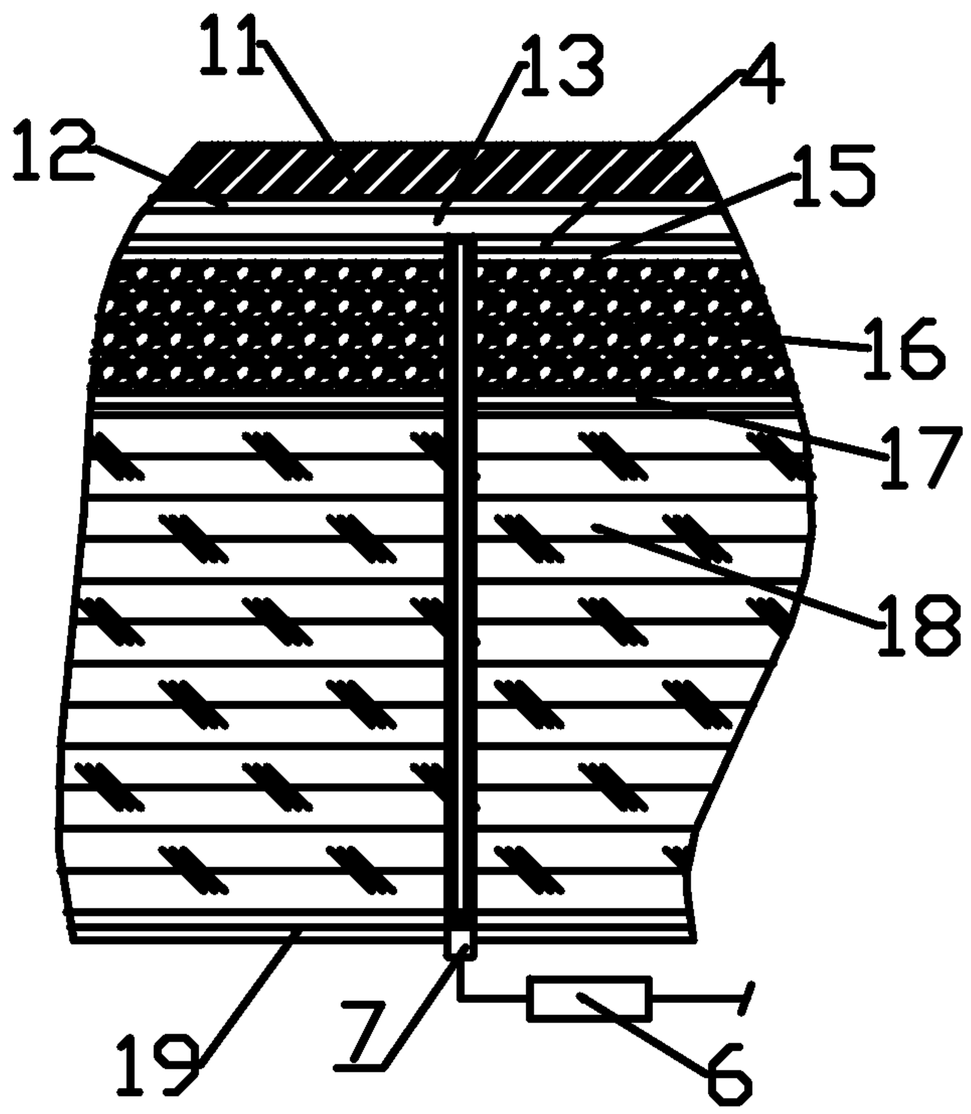

Fig. 3

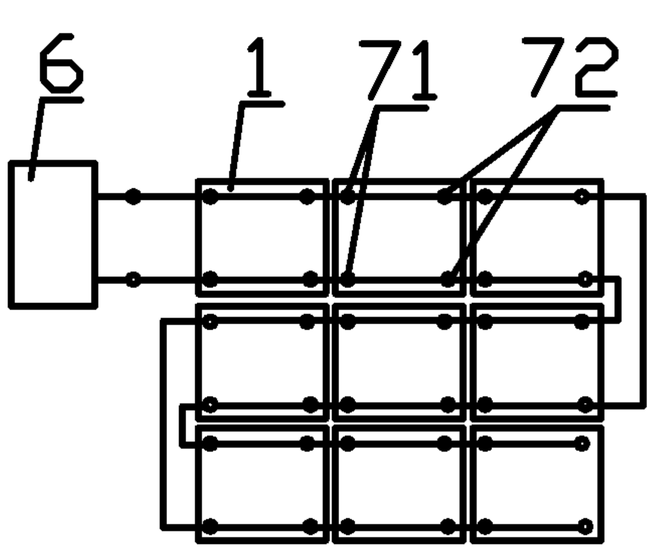

Fig. 4

INFRARED ELECTROTHERMAL RAISED FLOOR PIECE AND FLOOR COMPRISING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to Chinese Patent Application No. 200710026658.X filed on Feb. 1, 2007, the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a floor piece and a floor comprising the same, and particularly to an infrared electrothermal raised floor piece and an infrared electrothermal raised floor comprising the same.

2. Description of the Related Art

Conventionally, various heating equipments, such as coal stoves, coal-fired boilers, oil-fired boiler, gas-fired boiler, electric heaters and air-conditioners are widely used. However, disadvantages of the coal stoves and boilers comprise complex structure, huge volume, inconvenient adjustment of temperature, high power consumption and high pollution. As for the electric heaters and the air-conditioners, although they are convenient for temperature adjustment, low heat efficiency, high electricity consumption, small heat radiating area, occupation of limited indoor space are non-neglectable problems to be solved, moreover, many people feel uncomfortable since heat is provided via air convection.

In view of the above problems, China patent number 01248023.1 disclosed an infrared electrothermal floor comprising a plurality of calcium silicate cement guard plate and a carbon fiber infrared heat component disposed therebetween. This kind of floor realizes convenient adjustment of temperature, low power consumption and environmental protection, needs no fuel, saves indoor space, and is capable of supplying heat from a sole of a foot to the indoor space.

However, there are some problems with the above-mentioned floor: firstly, the floor is laid along with electric wire to facilitate integral forming, which causes great difficulty in construction and low efficiency, moreover, once the floor is damaged, it is difficult to fix and maintain, and dangerous electric leakage often takes place. Secondly, the carbon fiber infrared heat component is not efficiently utilized since it is embedded under the bottom of the calcium silicate cement guard plate, which severely affects penetrability of infrared ray, and leads to attenuation in thermal infrared radiation and loss of health functions. Thirdly, the floor is globally electrified, and it is impossible to flexibly implement local control of electricity as required, which causes unnecessary heat loss and influences energy-saving effect. Fourthly, the floor is disposable, once failure occurs, the floor as a whole will be damaged, which causes high using cost and environmental pollution. Fifthly, a top of the floor is only a cement guard plate, and a decoration layer needs to be laid on the bottom thereof, which increases a thickness of the floor and brings about extra burden to a user. Finally, due to attenuation in thermal infrared radiation and slow heat conduction, temperature rise of the floor is very slow and time-consuming, which decreases heat efficiency and influences heating effect.

SUMMARY OF THE INVENTION

In view of the above-described problems, it is one objective of the invention to provide an infrared electrothermal raised floor piece that is environment-friendly, power saving, convenient for maintenance, easy for laying, cost-effective, safe, reliable and comfortable, and features with good infrared health protection effect, free global/local control of temperature and fast temperature rise.

Another objective of the invention is to provide an infrared electrothermal raised floor that is environment-friendly, power saving, convenient for maintenance, easy for laying, cost-effective, safe, reliable and comfortable, and features with good infrared health protection effect, free global/local control of temperature and fast temperature rise.

To achieve the above objectives, in accordance with one embodiment of the invention, provided is an infrared electrothermal raised floor piece, comprising a faceplate layer, a carbon fiber far-infrared heat layer, a force support structure layer, at least a pair of electrodes and a plurality of power line connection terminals; wherein the electrodes are connected to the carbon fiber far-infrared heat layer; and the power line connection terminals are connected to the electrode.

In certain classes of this embodiment, the force support structure layer is a calcium sulfate plate, a wood fiber plate or a combination thereof.

In certain classes of this embodiment, an insulation support structure layer is disposed between the force support structure layer and the carbon fiber far-infrared heat layer.

In certain classes of this embodiment, the insulation support structure layer is fixed on the force support structure layer via a connection layer.

In certain classes of this embodiment, the electrode is disposed on a side of the carbon fiber far-infrared heat layer opposite to the insulation support structure layer.

In certain classes of this embodiment, a far-infrared reflection layer is disposed between the carbon fiber far-infrared heat layer and the insulation support structure layer.

In certain classes of this embodiment, the face plate layer is a fireproof decorative faceplate or a wood plate fixed on the carbon fiber far-infrared heat layer via an adhesive layer.

In certain classes of this embodiment, a protection layer is disposed at the bottom of the force support structure layer.

In certain classes of this embodiment, a seal is disposed around the infrared electrothermal raised floor piece.

In certain classes of this embodiment, the faceplate layer, the seal and the protection layer are made of anti-electrostatic materials.

In certain classes of this embodiment, the power line connection terminal is connected to an external power supply via a temperature adjustment and control device.

In certain classes of this embodiment, a power socket is disposed on the infrared electrothermal raised floor piece.

In certain classes of this embodiment, the power line connection terminals comprise a pair of power line inlet connection terminals and a pair of power line outlet connection terminals.

In accordance with another embodiment of the invention, also provided is an infrared electrothermal raised floor, comprising a plurality of infrared electrothermal raised floor pieces each comprising a plurality of power line connection terminals, and a supporter; wherein the infrared electrothermal raised floor pieces are transversely or lengthwisely arranged and flexibly installed on the supporter.

In certain classes of this embodiment, the supporter comprises a cross beam, a longitudinal beam and a supporting pedestal.

In certain classes of this embodiment, the power line connection terminals comprise a pair of power line inlet connection terminals and a pair of power line outlet connection terminals.

In certain classes of this embodiment, the infrared electrothermal raised floor pieces are connected to each other via the power line inlet connection terminals and the power line outlet connection terminals.

Advantages of the invention are as follows:

Comfortable Heating Supply

The invention implements low-power and large-area heating supply in a manner of low-temperature radiation instead of air heating, and prevents drying and dust caused by convective heating supply. Heat radiates and dissipates from the ground and acts on a sole and a body of a user, and makes the user feel comfortable and relaxed. A mechanism of the low-temperature radiation is to make human body and indoor objects absorb energy first, and temperature thereof will rise, and then to make them radiate energy, and indoor temperature will uniformly rise. In this situation, actual temperature of human body is higher than air temperature, and thus the user may feel warm and comfortable. Moreover, all rooms are equipped with independent temperature controllers, users are capable of adjusting indoor temperature as required, and thus personalized requirement of the users are realized.

Healthy Heating Supply

In a power-on state, the floor of the invention generates far-infrared light wave with a wavelength centralized between 6 to 16 μm, so as to cause human deep cells to moderately resonate. If a user stays in this environment for a long period of time, his human microcirculation will be improved, metabolism will be promoted, cell vitality will be strengthened and nervous and endocrine systems will be adjusted. Moreover, the invention is also capable of promoting blood flow to smooth meridians and collaterals and improving human immunity.

Safe Heating Supply

The floor of the invention uses materials with good insulation characteristics, a surface resistance and a volume resistance of the floor are greater than 1 MΩ, and electrical breakdown strength thereof is greater than 500V, which make the floor very safe and reliable. Even if electric leakage occurs in use, there will be no electric shock accident.

Environment-Protection Heating Supply

The floor of the invention does not generate noise during operation. By using electricity as a clean energy, air pollution caused by traditional boilers is prevented. By way of electron impact and friction heat, high light or electromagnetic pollution is not generated.

Economic and Energy Saving

Since an electric heat conversion rate of the floor of the invention is above 99% and heating materials are close to the surface of the floor, heat may be adequately dissipated to a room. Average power consumption of the floor is 15-25 W/m2 (architectural area). By way of an intelligent temperature controller, the floor is capable of switching on or off heating at any time in divided periods or rooms, or common movable raised floors may be used in certain unnecessary places, thus operation cost will be significantly reduced.

Convenient Installation

The floor of the invention is easy and convenient for installation. Since heating materials are integrated with the floor, heating and decoration effects are reached after construction, and thus cumbersome processes caused by separated construction of heating resources and floorings are eliminated. An installation process of the floor of the invention is the same as that of a common movable raised floor except for connection of electric appliances and wires.

Fast Heating

2-3 minutes after being powered on, the floor begins heating and heat is quickly dissipated into a room. In cold weather, when people go home, they do not need to wait and will feel warm soon.

Space Saving and Reduced Construction Cost

The floor of the invention integrates a heating function with a decoration function and traditional flues and radiators are no longer needed, which increases usable are of a room, makes the room easy for decoration and reduces cost spent on decoration. Meanwhile, since no heating facility (such as a boiler or a pipe) is used, a storey height of a building can be decreased by 5-6 cm, and thus construction cost is correspondingly reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described below in conjunction with accompanying drawings.

FIG. **1** is a schematic view of an infrared electrothermal raised floor of the invention;

FIG. **2** is a schematic view of an infrared electrothermal raised floor piece (with a seal) of the invention;

FIG. **3** is a partial sectional view of an infrared electrothermal raised floor piece of the invention; and

FIG. **4** illustrates electric parallel connection between infrared electrothermal raised floor pieces of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Detailed description will be given below with reference to accompanying drawings.

As shown in FIGS. **1** and **2**, in a first embodiment of the invention, an infrared electrothermal raised floor comprises tens of infrared electrothermal raised floor pieces **1** and a supporter **2**. The infrared electrothermal raised floor pieces **1** are transversely or lengthwisely disposed on the supporter **2**. The supporter **2** comprises a cross beam **8**, a longitudinal beam **9** and a supporting pedestal **10**. The cross beam **8** and the longitudinal beam **9** are transversely interconnected with each other, and the supporting pedestal **10** is capable of changing a supporting height.

As shown in FIGS. **2** and **3**, from top to bottom, the infrared electrothermal raised floor piece **1** comprises a faceplate layer **11**, a carbon fiber far-infrared heat layer **13**, a force support structure layer **18** and a plurality of power line connection terminals **7**.

The faceplate layer **11** is a fireproof decorative faceplate or a wood plate fixed on the carbon fiber far-infrared heat layer **13** via an adhesive layer **12**. Alternatively, compound carpet may be laid on the faceplate layer **11**.

The force support structure layer **18** is a calcium sulfate plate, a wood fiber plate or a combination thereof.

The power line connection terminal **7** is fixed at the bottom of the infrared electrothermal raised floor piece **1**.

A plurality of electrodes **4** are disposed on one side of the carbon fiber far-infrared heat layer **13** opposite to the insulation support structure layer **16**. In this embodiment, two pairs of electrodes **4** are used. It should be noted that in other embodiment, one or more pairs of electrodes **4** are possible. The power line connection terminal **7** is led out of the infrared electrothermal raised floor piece **1** via the electrode **4**, and connected to an external power supply via a temperature adjustment and control device **6**. In this embodiment, the temperature adjustment and control device **6** is a well-known temperature controller.

As shown in FIG. **4**, the power line connection terminals **7** comprise a pair of power line inlet connection terminals **71**

and a pair of power line outlet connection terminals **72**, and the infrared electrothermal raised floor pieces **1** are electrically-connected with each other via the power line inlet connection terminals **71** and the power line outlet connection terminals **72**, which realizes time-saving, labor-saving and convenient installation and repairing.

A socket **3** is disposed on the infrared electrothermal raised floor piece **1**.

In a second embodiment of the invention, an insulation support structure layer **16** is disposed between the force support structure layer **18** and the carbon fiber far-infrared heat layer **13**, and is fixed on the force support structure layer **18** via a connection layer **17**. A protection layer **19** is disposed at the bottom of the force support structure layer **18**.

A far-infrared reflection layer **15** is disposed between the carbon fiber far-infrared heat layer **13** and the insulation support structure layer **16**, so as to prevent heat from radiating towards the ground.

In a third embodiment of the invention, a seal **5** is disposed around the infrared electrothermal raised floor piece **1**. The faceplate layer **11**, the seal **5** and the protection layer **19** are made of anti-electrostatic PVC materials.

While particular embodiments of the invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects, and therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. An infrared electrothermal raised floor piece (**1**) comprising:

a bottom protection layer (**19**);

a plurality of power line connection terminals (**7**);

a force support structure layer (**18**);

a connection layer (**17**);

an insulation support structure layer (**16**);

a far-infrared reflection layer (**15**);

at least a pair of electrodes (**4**);

a carbon fiber far-infrared heat layer (**13**);

an adhesive layer (**12**); and

a faceplate layer (**11**);

wherein the force support structure layer (**18**) is sandwiched between the bottom protection layer (**19**) and the connection layer (**17**); the insulation support structure layer (**16**) is fixed on the force support structure layer (**18**) via the connection layer (**17**); the far-infrared reflection layer (**15**) is sandwiched between the electrodes (**4**) and the insulation support structure layer (**16**); the electrodes (**4**) are connected to the carbon fiber far-infrared heat layer (**13**) and sandwiched between carbon fiber far-infrared heat layer (**13**) and the far-infrared reflection layer (**15**); the faceplate layer (**11**) is adhered to the carbon fiber far-infrared heat layer (**13**) by the adhesive layer (**12**); and

wherein one end of the power line connection terminals (**7**) is connected to the electrodes (**4**) by penetrating through the protection layer (**19**), the force support structure layer (**18**), the connection layer (**17**), the insulation support structure layer (**16**) and the far-infrared reflection layer (**15**); and another end of the power line connection terminals (**7**) is connected to an external power supply via a temperature adjustment and control device (**6**).

2. The infrared electrothermal raised floor piece (**1**) of claim **1**, wherein the power line connection terminals (**7**) comprise a pair of power line inlet connection terminals (**71**) and a pair of power line outlet connection terminals (**72**).

3. The infrared electrothermal raised floor piece (**1**) of claim **1**, further comprising a seal (**5**) being disposed around a peripheral of the infrared electrothermal raised floor piece (**1**).

4. The infrared electrothermal raised floor piece (**1**) of claim **3**, wherein the faceplate layer (**11**), the seal (**5**) and the protection layer (**19**) are made of anti-electrostatic materials.

5. The infrared electrothermal raised floor piece (**1**) of claim **1**, wherein the force support structure layer (**18**) is a calcium sulfate plate, a wood fiber plate or a combination thereof.

6. The infrared electrothermal raised floor piece (**1**) of claim **1**, wherein the faceplate layer (**11**) is a fireproof decorative faceplate or a wood plate.

7. An infrared electrothermal raised floor comprising:

a plurality of infrared electrothermal raised floor pieces (**1**);

a supporter (**2**) comprising:

a cross beam (**8**);

a longitudinal beam (**9**); and

a supporting pedestal (**10**);

wherein each of the infrared electrothermal raised floor pieces (**1**) comprises

a bottom protection layer (**19**);

a plurality of power line connection terminals (**7**) comprising a pair of power line inlet connection terminals (**71**) and a pair of power line outlet connection terminals (**72**);

a force support structure layer (**18**);

a connection layer (**17**);

an insulation support structure layer (**16**);

a far-infrared reflection layer (**15**);

at least a pair of electrodes (**4**);

a carbon fiber far-infrared heat layer (**13**);

an adhesive layer (**12**); and

a faceplate layer (**11**);

wherein the force support structure layer (**18**) is sandwiched between the bottom protection layer (**19**) and the connection layer (**17**); the insulation support structure layer (**16**) is fixed on the force support structure layer (**18**) via the connection layer (**17**); the far-infrared reflection layer (**15**) is sandwiched between the electrodes (**4**) and the insulation support structure layer (**16**); the electrodes (**4**) are connected to the carbon fiber far-infrared heat layer (**13**) and sandwiched between carbon fiber far-infrared heat layer (**13**) and the far-infrared reflection layer (**15**); the faceplate layer (**11**) is adhered to the carbon fiber far-infrared heat layer (**13**) by the adhesive layer (**12**);

wherein one end of the power line connection terminals (**7**) is connected to the electrodes (**4**) by penetrating through the protection layer (**19**), the force support structure layer (**18**), the connection layer (**17**), the insulation support structure layer (**16**) and the far-infrared reflection layer (**15**); another end of the power line connection terminals (**7**) is connected to an external power supply via a temperature adjustment and control device (**6**);

wherein the infrared electrothermal raised floor pieces (**1**) are transversely or longitudinal arranged and flexibly installed on the supporter (**2**); and

wherein the infrared electrothermal raised floor pieces (**1**) are connected to each other via the power line inlet connection terminals (**71**) and the power line outlet connection terminals (**72**).

* * * * *