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(54) **ELECTRIC HEATING FURNACE**

(57) Disclosed is an electric heating furnace having a furnace body provided on its base. The furnace body comprises more than two vertical supporting posts, between which a protective mesh is mounted. A supporting stand is fixedly provided in the furnace body. A lower supporting plate is provided on the supporting stand, an upper supporting plate provided on the upper portion of the furnace body. A reflector with more than two reflective surfaces is fixedly mounted between the upper and lower supporting plates. The reflective surfaces are distributed radially around the center of the reflector. Heating tubes are fixedly mounted in front of each reflective surface. A switch control corresponding to each heating tube is provided in the supporting stand. The supporting posts are provided at positions corresponding to an end of each reflective surface of the reflector, between which and ends of the reflective surfaces heat insulation gaps are formed.

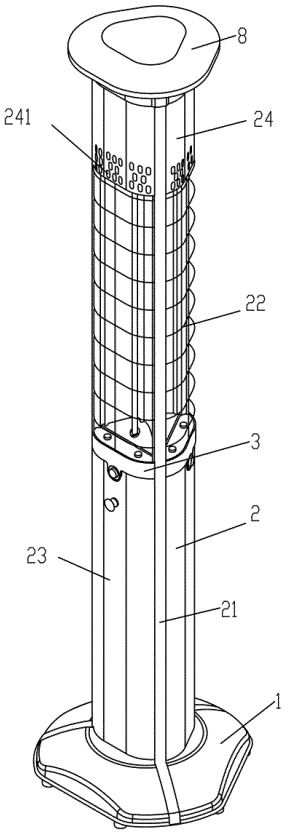


Fig 1

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## Description

### FIELD OF TECHNOLOGY

**[0001]** The present invention relates to a heating apparatus used indoors or outdoors, and particularly, to an electric heating furnace.

### BACKGROUND

**[0002]** A heating furnace used outdoors usually needs to provide a heating effect in all directions. Currently, there are two types of common heating furnaces, i.e. gas heating furnaces and electric heating furnaces. The use and production of the gas heating furnace have been limited gradually, because it emits a lot of carbon dioxide in use, which increases carbon emission in environments and does not meet the requirement of environmental protection; while the existing indoor electric heating furnace merely realizes unidirectional heating usually, and the heating direction is merely changed by moving the heating furnace. Another type is an omnidirectional furnace, used outdoors usually, which is structured by providing one high-power heating tube in the middle of the furnace body and providing a protective mesh on a support outside the heating tube. Thermal radiation of its heating tube is emitted toward 360 degrees around in use. Directional heating can not be realized according to the requirement of heating direction. Therefore, a lot of heat will be wasted once it is turned on, which is not only unfavorable for energy saving and environmental protection, but also causes security problems of components close to the heating tube such as high temperature and high heat under high heat due to great power needed by a single heating tube. Furthermore, in order to reduce the heating intensity per unit area, usually the product is relatively large, which avoids high heat caused by heat concentration. Additional process or fabrication needs to be performed for the heating tube or the surrounding components heated if necessary, thereby increasing the manufacture difficulty and process requirements for the products.

### SUMMARY OF THE INVENTION

**[0003]** To overcome the drawbacks of the prior art, the present invention provides an energy-saving and environmental electric heating furnace with a simple and compact structure, which can realize omnidirectional or directional heating, suitable for both indoor and outdoor use.

**[0004]** The solution of the present invention is:

> An electric heating furnace, comprising a base, a furnace body being provided on the base, the furnace body comprising more than two vertical supporting posts, a protective mesh being mounted among the vertical supporting posts, a supporting stand being fixedly provided in the furnace body. A lower supporting plate is provided on the supporting stand, an upper supporting plate is provided on the upper portion of the furnace body, a reflector with more than two reflective surfaces is fixedly mounted between the upper and lower supporting plates, the reflective surfaces are distributed radially around the center of the reflector, and heating tubes are fixedly mounted in front of each reflective surface; a switch control device corresponding to each heating tube is provided in the supporting stand; the vertical supporting posts are provided at positions corresponding to an end of each reflective surface of the reflector, between which and the ends of the reflective surfaces heat insulation gaps are formed.

**[0005]** As an improvement to the above technical solution, the vertical supporting posts are hollow, in which connecting wires of the heating tubes are placed. An upper baffle provided at the upper portion of the protective mesh is mounted among the vertical supporting posts, and radiating holes are provided in the upper baffle. Air holes are provided at the upper and lower portions of an inner wall of the vertical supporting posts respectively. The cross sections of the vertical supporting posts are inverted trapezoidal or triangular, on an outer wall of which several longitudinal and strip-shaped radiating teeth are provided.

**[0006]** As a further improvement to the above technical solutions, a longitudinal through hole is provided in the center of the reflector. Reflective plates are provided over and below the heating tubes. The base is formed by splicing several splicing plates. The seams of the splicing plates and the vertical supporting posts are in a same plane, and junction plates provided at bottoms of the vertical supporting posts fix every two splicing plates while fixing the vertical supporting posts to the base. A roof cover is provided at a top portion of the furnace body, and a light body is provided at an inner surface of the roof cover, and a heat insulation plate is provided between the light body and the upper supporting plate.

**[0007]** The effects of the present invention are: two or more reflective surfaces distributed radially along the center of the reflector are provided in the furnace body in the product, and the heating tubes are fixedly mounted in front of each reflective surface, thereby evenly dividing a heating space into heating spaces in a plurality of directions. Furthermore, each heating tube can be controlled independently, enabling a user to select directional heating in certain direction or omnidirectional heating according to actual requirements, which achieves energy saving, environmental protection and effective energy utilization. In another aspect, since a conventional single high-power heating tube is replaced by power overlapping of a plurality of low-power heating tubes in the product, susceptible aging or damaging of surrounding components caused by high heat of the single heating tube is prevented, and manufacturing requirements of the

heating tube and the surrounding components are greatly reduced. Meanwhile, because the heating intensity per unit area is reduced, the profile of the product can also be made smaller and more compact. And its controllability is suitable for indoor and outdoor use.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0008]** The present invention is further described in combination with accompanying drawings and embodiments below.

Fig.1 is a schematic diagram of a structure of the present invention;

Fig.2 is a schematic exploded diagram of the structure of the present invention;

Fig.3 is a schematic diagram of an upper structure of a furnace body of the present invention;

Fig.4 is a schematic exploded diagram of the upper structure of the furnace body of the present invention;

Fig.5 is a schematic diagram of a structure of a vertical supporting post of the present invention;

Fig.6 is a schematic diagram of a connection structure of a base, a vertical supporting post and an enclosing board of the present invention.

## EMBODIMENTS OF THE INVENTION

**[0009]** With reference to Fig.1-Fig.4, an electric heating furnace comprises a base 1 and a furnace body 2 provided on the base 1. The furnace body 2 comprises a plurality of vertical supporting posts 21, and a protective mesh 22 is mounted among the vertical supporting posts 21. A supporting stand 3 is fixedly provided in the furnace body; a lower supporting plate 41 is provided on the supporting stand 3, and an upper supporting plate 42 is provided on the upper portion of the furnace body. A reflector 5 with a plurality of reflective surfaces is fixedly mounted between the upper and lower supporting plates 41, 42. The plurality of reflective surfaces are distributed radially around the center of the reflector. Heating tubes 6 are fixedly mounted in front of each reflective surface, and reflective plates 7 are provided over and below the heating tubes 6. The reflective plates 7 are fixed to the upper and lower supporting plates 41, 42 respectively. The design enables the heat generated by the heating tubes 6 to be effectively radiated by the reflective plates 7 and the reflector 5. A switch control device 31 corresponding to each heating tube 6 is provided in the supporting stand 3. The switch control device 31 may be a manual switch, a remote control switch or an inductive switch, by which each heating tube 6 may be turned on separately. The heat generated by the heating tubes 6 is radiated to a position at which heat is needed by the reflective surfaces of the reflector 5, thereby saving energy. A overturn switch 32 is provided in the supporting stand 3, which may cut off power automatically when the heating furnace turns over, making the use safer.

**[0010]** The furnace body 2 comprises the equal number of the vertical supporting posts 21 as the reflective surfaces of the reflector 5. The protective mesh 22 is mounted among the vertical supporting posts 21 at the upper portion of the furnace body 2. An enclosing board 23 is mounted among the vertical supporting posts 21 at the lower portion of the furnace body 2. The vertical supporting post 21 may have separated structure, which is assembled from an upper vertical supporting post and a lower vertical supporting post, thereby reducing the packaging volume of the product. The vertical supporting posts 21 are provided at positions corresponding to an end of each reflective surface of the reflector 5, between which and the ends of the reflective surfaces heat insulation gaps are formed, which may insulate the vertical supporting posts 21 from the high-temperature reflector 5 conducting heat directly. This prevents the vertical supporting posts 21 from excess temperature when the product is used for a long time. In the present embodiment, the vertical supporting posts 21 are hollow, in which connecting wires of the heating tubes are placed, which not only utilizes space reasonably to make the structure of the product more scientific and compact, but also overcomes problems of wires aging or damaging caused by high-temperature heating for a long time due to placement in a heating section in the center of the reflector in conventional products. A longitudinal through hole 51 is provided in the center of the reflector 5, which enables that a convective space is formed in the middle of the reflector 5, thereby lowering the temperature of the reflector 5 and reducing heat conducted to other components from the reflector 5.

**[0011]** With reference to Fig.5, the cross sections of the vertical supporting posts 21 may be designed as inverted trapezoid or triangle, on an outer wall of which several longitudinal and strip-shaped radiating teeth 211 may be provided, which can increase the contact area between the vertical supporting posts 21 and outside air, aiming to cool down the vertical supporting posts 21. Meanwhile, due to the small contact area between the strip-shaped teeth and a human body, scald caused by a large contact area may also be prevented when a user contacts the vertical supporting posts 21 accidentally. An upper baffle 24 is further provided at an upper portion of the protective mesh 22 in the present product, which is mounted among the vertical supporting posts 21. Radiating holes 241 are provided at a lower end of the upper baffle 24, and air holes 212 are provided at the upper and lower portion of an inner wall of the vertical supporting posts 21 respectively. This structure enables cold air from the bottom of the electric heating furnace to enter from the lower air holes 212 and be vented from the ra-

diating holes 241 of the upper baffle 24 through the upper air holes, thereby forming air convection effectively, and further lowering the temperature of the vertical supporting posts 21.

**[0012]** With reference to Fig.6, the base is formed by splicing several splicing plates 11, effectively reducing the packaging volume of the product for easy transportation. The seams of the splicing plates 11 and the vertical supporting posts 21 are in a same plane. L-shaped junction plates 10 with corners are provided at bottoms of the vertical supporting posts 21. One end of the corner is fixedly connected to the vertical supporting post 21, and the other end fixes two splicing plates 11. The junction plates 10 fix every two splicing plates 11 while fixing the vertical supporting posts 21 to the base 1. The structure design is smart and the connection is simple and compact, in which the junction plates 10 with multiple functions realize the fixing of the vertical supporting posts 21 and the base 1 as well as the splicing of the base 1. Further, the fixing of the enclosing board 23 may also be realized by the L-shaped junction plates in the embodiment, that is, one end of the L-shaped corner of the junction plate is fixed to the enclosing board 23 as well as the vertical supporting posts 21 by a plurality of screw holes, which is more convenient and makes the structure design more simple and compact. Meanwhile, the L-shaped junction plates are provided at the inside of the furnace body, which makes all connecting screws invisible from the outside and make the entire product appearance neat and aesthetic.

**[0013]** Additionally, a roof cover 8 is provided at a top portion of the furnace body 2 in the product, and a light body is provided at the inner surface of the roof cover 8, thereby making the product used both for heating and lighting. To avoid the heat of the heating tubes 6 influencing the use of the light body and excess temperature of the upper baffle 24, a heat insulation plate 9 is provided between the light body and the upper supporting plate 42. Meanwhile, the radiating holes 241 of the upper baffle and the heat insulation plate 9 can also effectively guide hot air to the outside space of the furnace body, thereby lowering the temperature of the upper baffle 24.

**[0014]** Two or more reflective surfaces distributed radially along the center of the reflector are provided in the furnace body in the product, and the heating tubes are fixedly mounted in front of each reflective surface, thereby evenly dividing a heating space into heating spaces in a plurality of directions. Furthermore, each heating tube can be controlled independently, enabling a user to select directional heating in certain direction or omnidirectional heating according to actual requirements, which achieves energy saving, environmental protection and effective energy utilization. In another aspect, since a conventional single high-power heating tube is replaced by power overlapping of a plurality of low-power heating tubes in the product, susceptible aging or damaging of surrounding components caused by high heat of the single heating tube is avoided, greatly reducing manufacturing requirements of the heating tube and the surrounding components. Meanwhile, because the heating intensity per unit area is reduced, the profile of the product can also be made smaller and more compact. To realize effective heat dissipation of the heating furnace in the product, a plurality of structures are designed, which avoids heat conduction and are favorable for heat dissipation. Compared to conventional products, great improvement from both technology and structure design aspects are achieved.

## Claims

1. An electric heating furnace, comprising a base (1), a furnace body (2) provided on the base (1), the furnace body (2) comprising more than two vertical supporting posts (21), a protective mesh (22) being mounted among the vertical supporting posts (21), a supporting stand (3) being fixedly provided in the furnace body, **characterized in that**, a lower supporting plate (41) is provided on the supporting stand (3), an upper supporting plate (42) is provided on an upper portion of the furnace body, a reflector (5) with more than two reflective surfaces is fixedly mounted between the upper and lower supporting plates (41, 42), the reflective surfaces are distributed radially around the center of the reflector, and heating tubes (6) are fixedly mounted in front of each reflective surface; a switch control device (31) corresponding to each heating tube (6) is provided in the supporting stand (3); the vertical supporting posts (21) are provided at positions corresponding to an end of each reflective surface of the reflector (5), between which and the ends of the reflective surfaces heat insulation gaps are formed.

2. The electric heating furnace according to Claim 1, **characterized in that**, the vertical supporting posts (21) are hollow, in which connecting wires of the heating tubes are placed.

3. The electric heating furnace according to Claim 1, **characterized in that**, the cross sections of the vertical supporting posts (21) are inverted trapezoidal or triangular, on an outer wall of which several longitudinal and strip-shaped radiating teeth (211) are provided.

4. The electric heating furnace according to Claim 1, **characterized in that**, a longitudinal through hole (51) is provided in the center of the reflector (5).

5. The electric heating furnace according to Claim 1, **characterized in that**, an upper baffle (24) provided at an upper portion of the protective mesh (22) is mounted among the vertical supporting posts (21), and radiating holes (241) are provided in the upper

baffle (24).

**6.** The electric heating furnace according to Claim 1, **characterized in that**, reflective plates (7) are provided over and below the heating tubes (6).

**7.** The electric heating furnace according to Claim 1, 2, 3, 4, 5 or 6, **characterized in that**, air holes (212) are provided at an upper and lower portion of an inner wall of the vertical supporting posts (21) respectively.

**8.** The electric heating furnace according to Claim 1, 2, 3, 4, 5 or 6, **characterized in that**, the base (1) is formed by splicing several splicing plates (11).

**9.** The electric heating furnace according to Claim 8, **characterized in that**, the seams of the splicing plates (11) and the vertical supporting posts (21) are in a same plane, and junction plates (10) provided at bottoms of the vertical supporting posts (21) fix every two splicing plates (11) while fixing the vertical supporting posts (21) to the base (1).

**10.** The electric heating furnace according to Claim 1, 2, 3, 4, 5, 7, or 9, **characterized in that**, a roof cover (8) is provided at a top portion of the furnace body (2), and a light body is provided at an inner surface of the roof cover (8), and a heat insulation plate (9) is provided between the light body and the upper supporting plate (42).

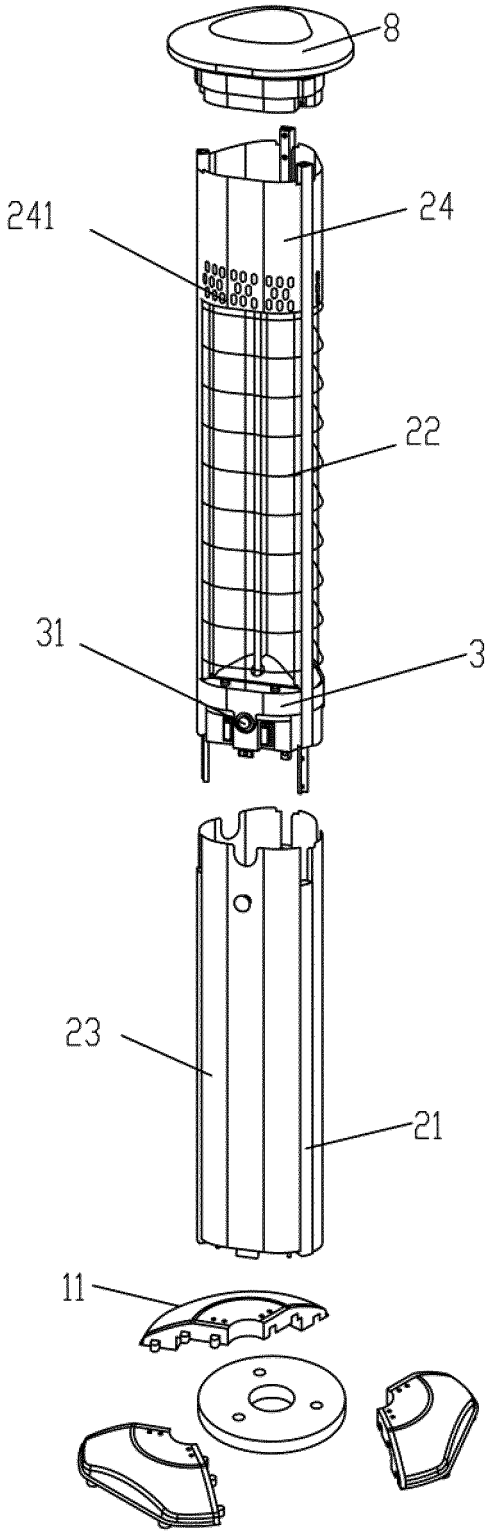


Fig 2

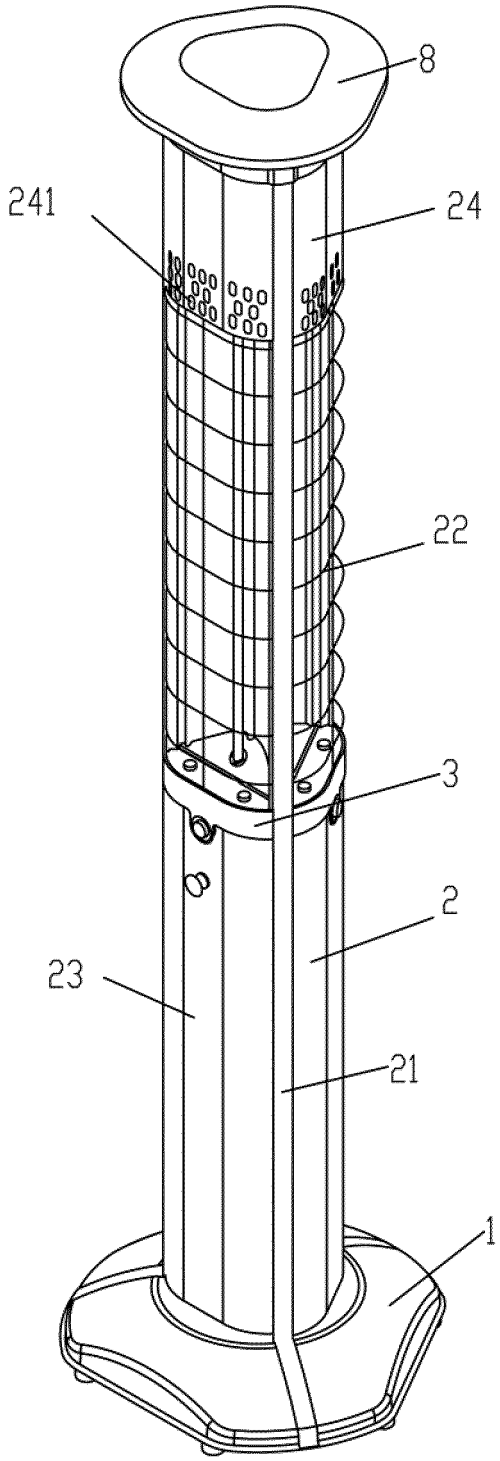


Fig 1

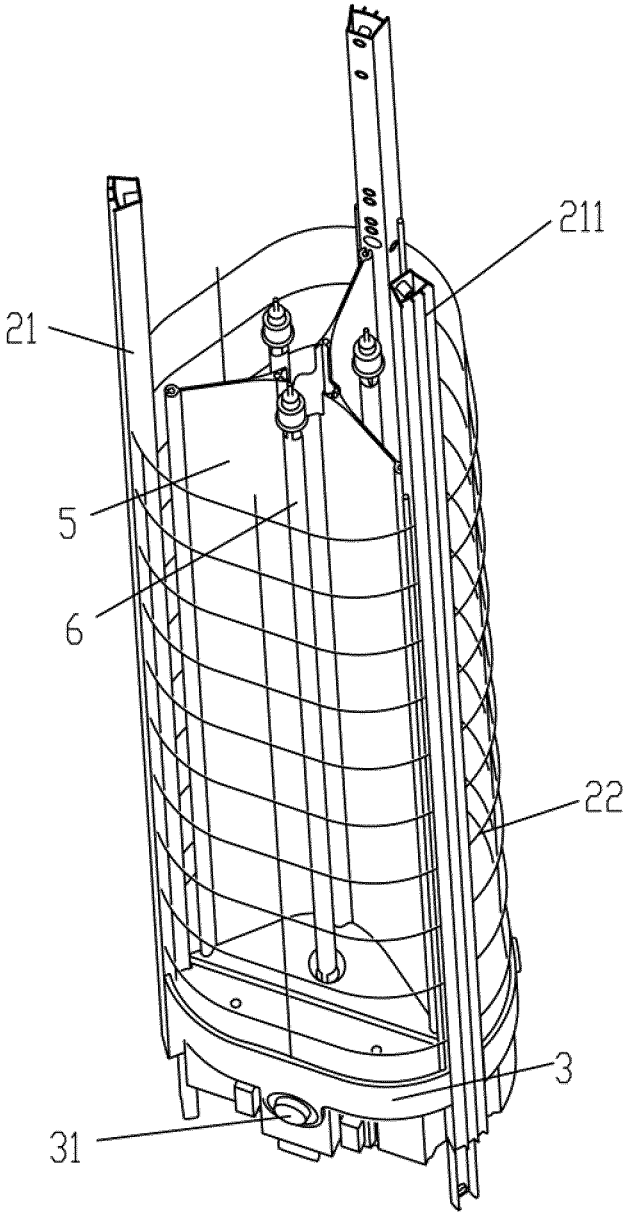


Fig 3

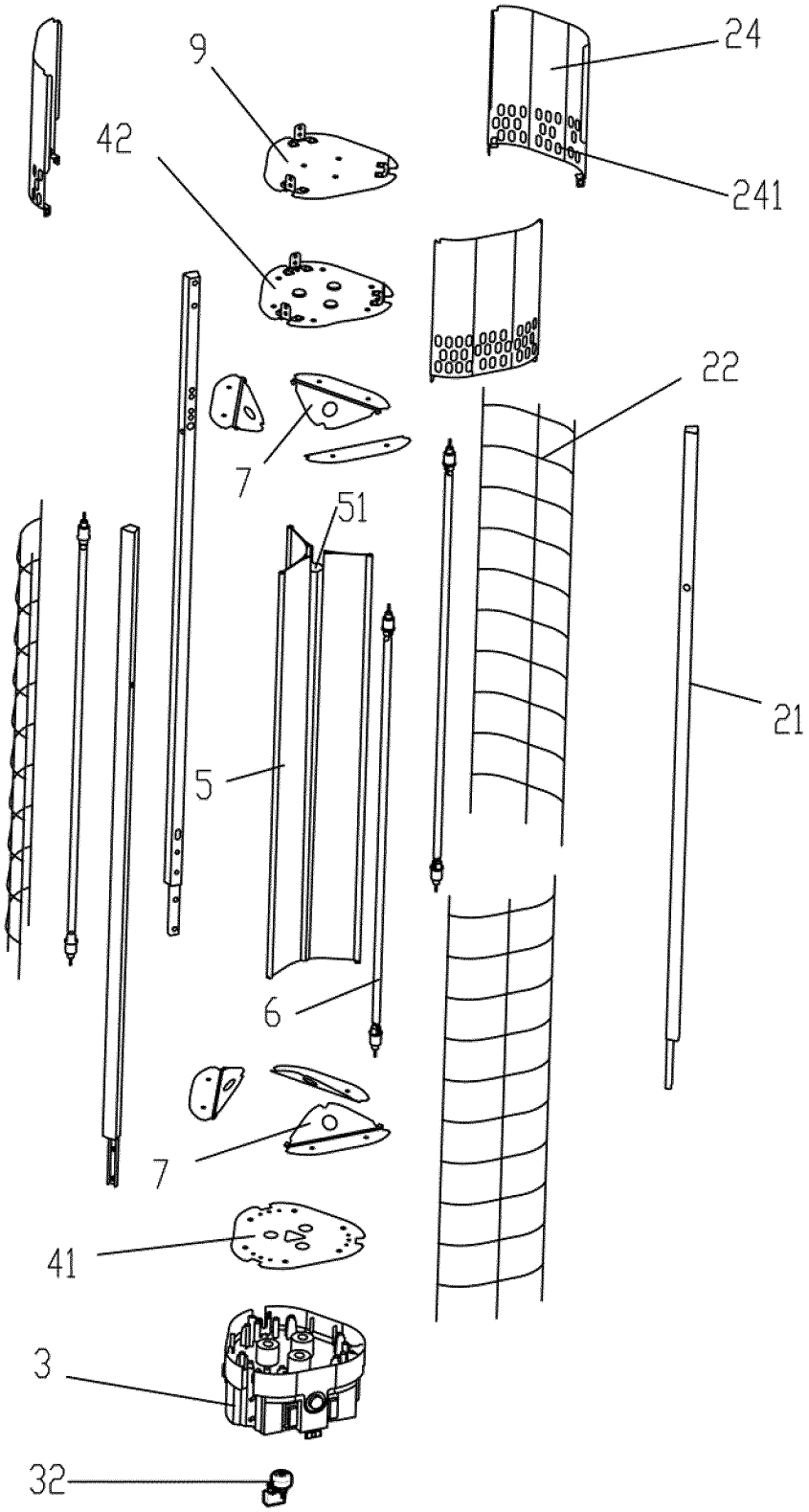


Fig 4

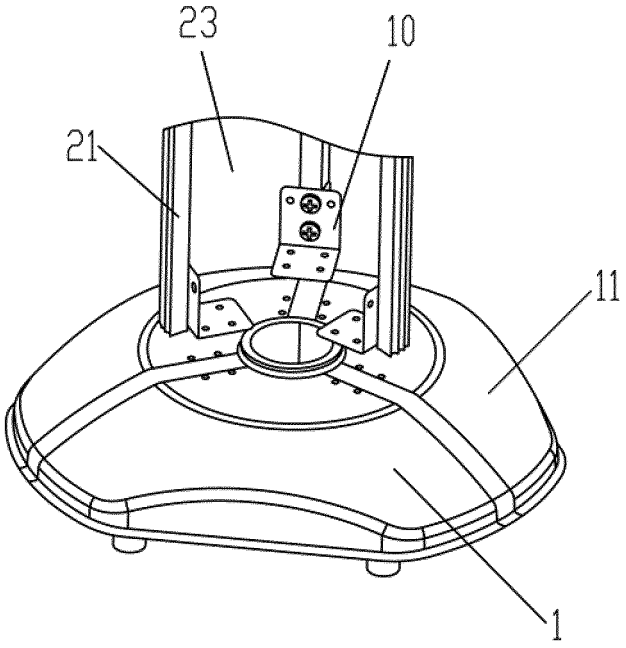


Fig 6

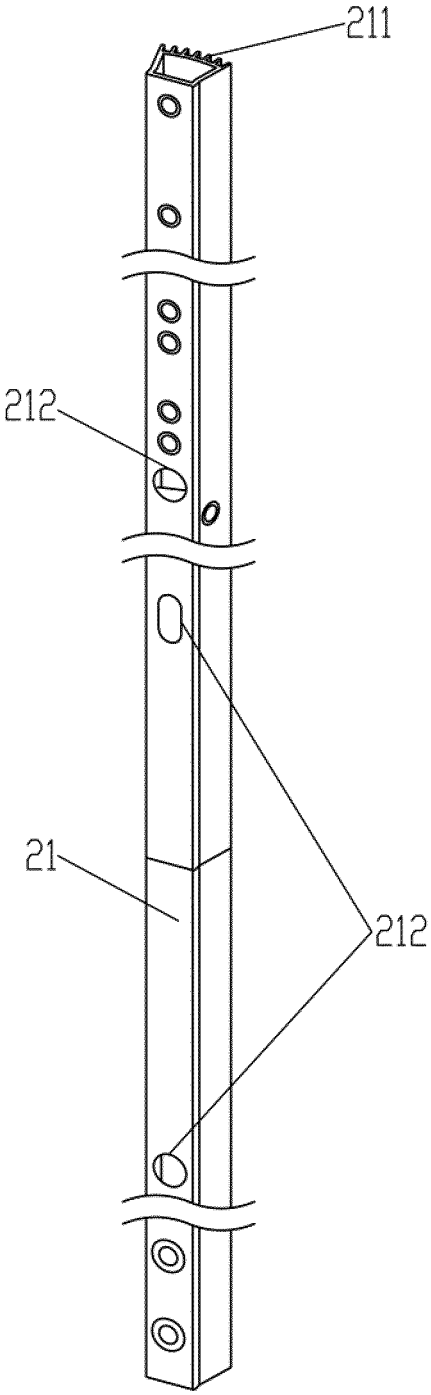


Fig 5

# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2011/079444**

**A. CLASSIFICATION OF SUBJECT MATTER**

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC: F24D, F24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, CNPAT, CNKI: radiation, electric heating, electric, heat+, oven, stove, radiant, reflect+, control

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | CN 201448924 U (LIAO, Yuewei), 05 May 2010 (05.05.2010), description, paragraphs [0022]-[0028], and figures 1-7 | 1-10 |
| Y | CN 2751246 Y (DENG, Zhenggang), 11 January 2006 (11.01.2006), description, page 2, the first paragraph, and figures 1-2 | 1-10 |
| Y | CN 2771684 Y (LU, Hua), 12 April 2006 (12.04.2006), description, page 2, lines 9-18, and figures 1-2 | 1-10 |
| Y | CN 201360712 Y (ZHANG, Bin), 16 December 2009 (16.12.2009), description, page 3, the first paragraph, and figure 2 | 5 |
| A | US 5437001 A (MARVIN MFG CO W B), 25 July 1995 (25.07.1995), the whole document | 1-10 |
| A | JP 10073261 A (MATSUSHITA DENKI SANGYO KK et al.), 17 March 1998 (17.03.1998), the whole document | 1-10 |

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 13 April 2012 (13.04.2012) | **03 May 2012 (03.05.2012)** |
| Name and mailing address of the ISA/CN:<br>State Intellectual Property Office of the P. R. China<br>No. 6, Xitucheng Road, Jimenqiao<br>Haidian District, Beijing 100088, China<br>Facsimile No.: (86-10) 62019451 | Authorized officer<br>**CHANG, Mengyuan**<br>Telephone No.: (86-10) **62084961** |

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# INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
**PCT/CN2011/079444**

| Patent Documents referred in the Report | Publication Date | Patent Family | Publication Date |
|---|---|---|---|
| CN 201448924 U | 05.05.2010 | None | |
| CN 2751246 Y | 11.01.2006 | None | |
| CN 2771684 Y | 12.04.2006 | None | |
| CN 201360712 Y | 16.12.2009 | None | |
| US 5437001 A | 25.07.1995 | US 6351602 B1 | 26.02.2002 |
| JP 10073261 A | 17.03.1998 | JP 3750210 B2 | 01.03.2006 |

Form PCT/ISA/210 (patent family annex) (July 2009)

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2011/079444

**A. CLASSIFICATION OF SUBJECT MATTER**

F24D 13/02 (2006.01) i

F24C 7/04 (2006.01) i

Form PCT/ISA/210 (extra sheet) (July 2009)