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(54) **ENERGY SAVING ELECTRIC HEATING FAN AND THE MAKING METHOD OF ITS ELECTRIC HEATING ELEMENT**

(57) An energy-saving electrothermal blower and a method for manufacturing the electrothermal element of the energy-saving electrothermal blower. The energy-saving electrothermal blower is composed of: a fan and a motor for driving it fixed in the shell (1); an insulating plate with the electrothermal element in the shell, and a connecting circuit for connection of the electrothermal element with a power supply. Mica is used as the basic material of the said electrothermal element (2) and is coated or screen printed with a thin layer of high temperature resistant strong glue and heating film and electrode.

The main raw material of the slurry of the heating film is one or more of silicon oxide, alumina, silicon carbide, calcium, and potassium; the slurry is made by said main raw material, which is sintered at a high temperature and then broken into pieces and screened to powder and then mixed with a high temperature resistant organic glue slurry having the same expansion coefficient as the mica. The energy-saving electrothermal blower has some advantages such as: high exothermic efficiency, low noise and energy-saving and the like, and can be used as an electric blower in hairdressing and as an air heater used for household warming.

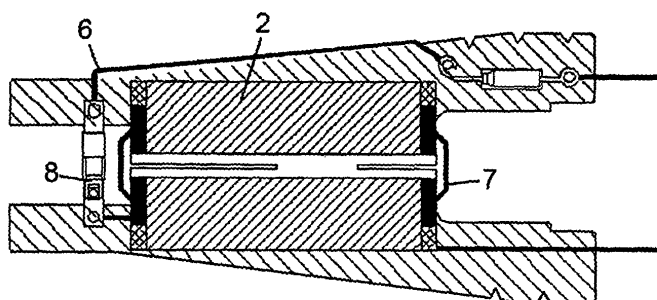


Fig. 3

Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of electrothermal blowers, in particular to an electrothermal blower in which mica lamination is used as a basic material of the heater. An electrothermal blower in accordance with the present invention can be used as an electric blower in hairdressing and as an air heater used for household warming.

BACKGROUND OF THE INVENTION

[0002] The electrothermal blower is one of the electrical appliances used widely, and the technical research on the heating element which is one of the key parts thereof is being developed. The heating element used at present is usually various resistance wires or electric heating tubes (See Figure 1). When the traditional resistance wire is used as the electrothermal element of the electrothermal blower it has the following disadvantages: the resistance wire is wound on the insulating plate in the blower, hence the resistance of the air is high; to reach the temperature needed for the air on the outlet, the power of the motor must be high, resulting in high energy consumption, high air speed, high noise and uneven heating; the use of a high motor speed leads to a faster wear of the motor. Therefore it has the following defects: a low heating efficiency, a short life and it can not be operated at a low voltage (for example 12V), etc.

SUMMARY OF THE INVENTION

[0003] The technical problem the invention aims to settle is to overcome the defects existing in the prior art and to provide an electrothermal blower, wherein the heating element thereof is made by use of a heating film adhering to a mica lamination as basic material.

[0004] Another object of the invention is to provide a method for manufacturing the heating element of the electrothermal blower mentioned above.

[0005] The technical scheme used by the inventor to solve the problem mentioned above is as follows:

[0006] An energy-saving electrothermal blower is composed of: a shell with an outlet and inlet, a fan and a motor for driving it fixed in the shell; an insulating plate with an electrothermal element in the shell, a connecting circuit for connection of the electrothermal element with a power supply, **characterized in that** mica is used as the basic material of the electrothermal element and coated or screen printed with a thin layer of high temperature resistant strong glue as a connection layer, and then coated or screen printed with a layer of heating film and an electrode to form the heating element.

[0007] The main raw material of the slurry of the heating film of the heating element consists of one or more of silicon oxide, alumina, silicon carbide, calcium, and

potassium. The slurry is made by said main raw material, which is sintered at a high temperature and then broken into pieces and screened to powder and then mixed with a high temperature resistant organic glue slurry having the same expansion coefficient as the mica.

[0008] The wire of said electrothermal element is fixed on the electrode film by a conducting clip. One end of the electrode film is connected with a temperature controller, a fuse and a power switch in series; and the wire of the other end thereof is fixed on the other pole of the power switch by a conducting clip to form an electrical circuit.

[0009] The arrangement of the electrothermal elements is a grid, a cross or star, a triangle or a diamond in shape.

[0010] The outlet of said blower is a square, a rectangle, an ellipse, a circle, a taper or a triangle in shape. The total thickness of the heating film of the heating element and the mica lamination is less than 1 mm.

[0011] The technical scheme used by the inventor also includes the method for manufacturing the electrothermal element of the energy-saving electrothermal blower, and the method includes the following steps:

A. A thin layer of high temperature resistant strong glue is screen printed or coated on each surface of the mica lamination under the condition with a drying system, and then it is dried;

B. The slurry of the heating film, which is prepared according to the desirable power and temperature, is screen printed or coated on the surface of the mica lamination with a layer of high temperature resistant strong glue, and then it is dried;

C. The silver electrode film with a regulated ratio is screen printed on both ends of the heating film, and then it is dried to form the heating element.

[0012] The main raw material of the slurry of the heating film consists of one or more of silicon oxide, alumina, silicon carbide, calcium, and potassium. The slurry is made by said main raw material, which is sintered at a high temperature and then broken into pieces and screened to powder and then mixed with a high temperature resistant organic glue slurry having the same expansion coefficient as the mica; The drying process in steps a, b and c is carried out at 300°C.

[0013] After the mica lamination is adhered to the heating film, said heating element can be formed and then stored in a sealed plastic bag.

[0014] Comparing with the blower in the prior art, the application of the energy-saving electrothermal blower according to the present invention has following advantages:

1. In view of the air strength and energy consumption

A. Many heating coils should be wound around

the insulating plate in the traditional blower, so the motor should overcome the resistance resulting in high rotational speed, high temperature and high energy consumption.

B. The total thickness of the heating plate and the mica lamination of the energy-saving electrothermal blower according to the present invention is only 0.7mm, so it has large space, low resistance and a desirable air volume can be reached under low rotational speed.

2. In view of noise

A. The motor of the traditional blower will produce a noise of more than 80 db under a high rotational speed and resistance.

B. The energy-saving electrothermal blower in accordance with the present invention blows in the axial direction; the motor is running almost without resistance and at 30% of the air volume and rotational speed, so the noise is less than 74 db.

3. Energy-saving: the energy-saving electrothermal blower in accordance with the present invention can transmit a far infrared ray and the motor is running at low speed and low resistance, thus the consumption of energy can be saved by more than 30%.

4. The mica heating plate is arranged in the same direction as the air outlet of the motor, thus the average exothermic efficiency is high, the radial radiation is less and the temperature is extraordinarily uniform.

5. The electrothermal element of the energy-saving electrothermal blower in accordance with the present invention can transmit a far infrared ray which can be absorbed by the human body without any side effect. Furthermore it can promote hypodermic blood circulation so that hypodermic cells can absorb more nutrition, which has certain effect in view of cosmetology and health.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Figure 1 is a partial structural schematic drawing of an electrothermal blower of the prior art.

[0016] Figure 2 is a sectional view of a heating element of a energy-saving electrothermal blower in accordance with the present invention.

[0017] Figure 3 is a circuit connection drawing of a heating element of the energy-saving electrothermal blower in accordance with the present invention.

[0018] Figure 4 is a partial sectional view of an energy-saving electrothermal blower in accordance with the

present invention.

[0019] Figure 5 is a partial sectional view of an energy-saving electrothermal blower in accordance with the present invention.

5 [0020] Figures 6, 7 and 8 are structural schematic drawings of three arrangements in the shape of a grid of a heating element of the energy-saving electrothermal blower in accordance with the present invention respectively.

10 [0021] Figures 9, 10 and 11 are structural schematic drawings of three arrangements in the shape of a cross or star of a heating element of the energy-saving electrothermal blower in accordance with the present invention respectively.

15 [0022] Figures 12, 13 and 14 are schematic drawings of three arrangements in the shape of a triangle or diamond of a heating element of the energy-saving electrothermal blower in accordance with the present invention respectively.

DETAILED DESCRIPTION

20 [0023] The technical scheme of the present invention will be described using an electrothermal blower as an example combined with the drawings.

25 [0024] As shown in the figures 2, 3, 4 and 5, an energy-saving electrothermal blower according to the present invention is composed of: a shell 1 with an outlet and inlet 4, a fan and a motor for driving it fixed in the shell 1; an insulating plate with an electrothermal element in the shell, a connecting circuit for connection of the electrothermal element with a power supply, and a handle with a switch fixed on one side of the shell 1. The key technological features in accordance with the present invention are **characterized in that** mica is used as the basic material of the electrothermal element and coated or screen printed with a thin layer of high temperature resistant strong glue as a connection layer, and then coated or screen printed with a layer of heating film and an electrode to form the heating element.

30 [0025] The main raw material of the slurry of the heating film for the heating element consists of one or more of silicon oxide, alumina, silicon carbide, calcium, potassium. The slurry is made by said main raw material, which is sintered at a high temperature and then broken into pieces and screened to powder and then mixed with a high temperature resistant organic glue slurry having the same expansion coefficient with the mica. In particular, the heating film contains many elements such as germanium, silicon and semiconductor ceramic resistant slurry. The resistant slurry does not contain any harmful substances such as lead, mercury, high valence chromium, polybenzoether and acidic benzene. The expansion coefficient of it is the same as the ceramic body. The resistant slurry is coated on the surface of the mica basic material and then is dried at 300°C to form the heating film adhering to the surface of the mica, and the heating film can produce heat energy and heat energy of far in-

frared rays when switched on.

[0026] The wire of said electrothermal element is fixed on the electrode film 3 by a conducting clip 7. One end of the electrode film is connected with a temperature controller 8, a fuse 6 and the power switch in series; and the wire of the other end thereof is fixed on the other pole of the power switch by a conducting clip 7 to form an electrical circuit.

[0027] The total thickness of the heating film of the heating element and the mica lamination is not more than 0.8 mm. The arrangement of the said electrothermal element may be any of several varieties.

[0028] As shown in the drawings 6, 7 and 8, the arrangement of the electrothermal elements may be a grid in shape. As shown in the drawings 9, 10 and 11, the arrangement of the electrothermal elements can be a cross or star in shape. As shown in the drawings 12, 13 and 14, the arrangement of the electrothermal elements can be a triangle or a diamond in shape.

[0029] The outlet of the blower, manufactured correspondingly according to the shape of the arrangement of the electrothermal element, may be a square, a rectangle, an ellipse, a circle, a taper or a triangle in shape.

[0030] The method for manufacturing the electrothermal elements of the electrothermal blower in accordance with the present invention includes the following steps:

a. A thin layer of high temperature resistant strong glue is screen printed on each surface of the mica lamination under the condition with a drying system, and then it is dried at 300°C;

b. The slurry of the heating film, which is prepared according to the desirable power and temperature, is screen printed on the surface of the mica lamination and then it is dried at 300°C;

c. A silver electrode film with a regulated ratio is screen printed on both ends of the heating film and then it is dried at 300°C;

d. After the mica lamination is adhered to the heating film, said heating element can be formed and then stored in a sealed plastic bag.

Claims

1. An energy-saving electrothermal blower including a shell (1) with an inlet and outlet (4), a fan and a motor for driving it fixed in the shell (1); an insulating plate with an electrothermal element in the shell; and a connecting circuit for connection of the electrothermal element with a power supply, **characterized in that** mica is used as a base material of the electrothermal element (2) and is coated or screen printed with a thin layer of high temperature resistant strong glue as a connection layer, and then coated or screen

printed with a layer of heating film and an electrode.

2. The energy-saving electrothermal blower according to claim 1, **characterized in that** the main raw material of a slurry of the heating film includes one or more of silicon oxide, alumina, silicon carbide, calcium, and potassium; and the slurry is made by said main raw material, which is sintered at a high temperature and then broken into pieces and screened to powder and then mixed with a high temperature resistant organic glue slurry having an expansion coefficient which is the same as an expansion coefficient as the mica.

3. The energy-saving electrothermal blower according to claim 1 or claim 2, **characterized in that** wire of said electrothermal element is fixed on an electrode film (3) by a first conducting clip (7); one end of the electrode film is connected with a temperature controller (8), a fuse (9) and a power switch in series; and another end thereof is fixed on another pole of the power switch by a second conducting clip (7) to form an electrical circuit.

4. The energy-saving electrothermal blower according to any of claims 1, 2 or 3, **characterized in that** the electrothermal element (2) is a cross or star in shape.

5. The energy-saving electrothermal blower according to any of claims 1, 2 or 3, **characterized in that** the electrothermal element (2) is a grid in shape.

6. The energy-saving electrothermal blower according to any of claims 1, 2 or 3, **characterized in that** the electrothermal element (2) is a triangle or a diamond in shape.

7. The energy-saving electrothermal blower according to any one of the preceding claims, **characterized in that** the outlet of the blower is one of a square, a rectangle, an ellipse, a circle, a taper or a triangle in shape.

8. The energy-saving electrothermal blower according to any one of the preceding claims, **characterized in that** a total thickness of the heating film and mica is less than 1 mm.

9. A method for manufacturing an electrothermal element of an energy-saving electrothermal blower, comprising:

a. screen printing or coating on each surface of a mica lamination a thin layer of high temperature resistant strong glue and then drying same;

b. screen printing or coating on a surface of the mica lamination a slurry of heating film prepared according to desirable power and temperature

with a layer of high temperature resistant strong glue and then drying same;
c. screen printing on both ends of the heating film a silver electrode film with a regulated ratio and then drying same to form the heating element.

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10. The method for manufacturing the electrothermal element of the energy-saving electrothermal blower according to claim 9, **characterized in that:** a main raw material of the slurry of the heating film includes one or more of silicon oxide, alumina, silicon carbide, calcium, and potassium; the slurry being made by said main raw material, which is sintered at a high temperature and then broken into pieces and screened to powder and then mixed with a high temperature resistant organic glue slurry having an expansion coefficient which is the same as an expansion coefficient as the mica; and the drying in steps a, b and c is carried out at 300°C.

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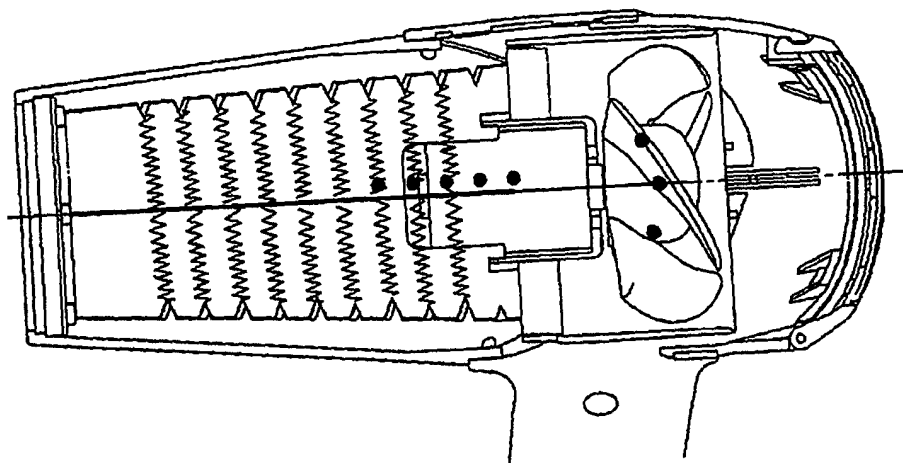


Fig. 1

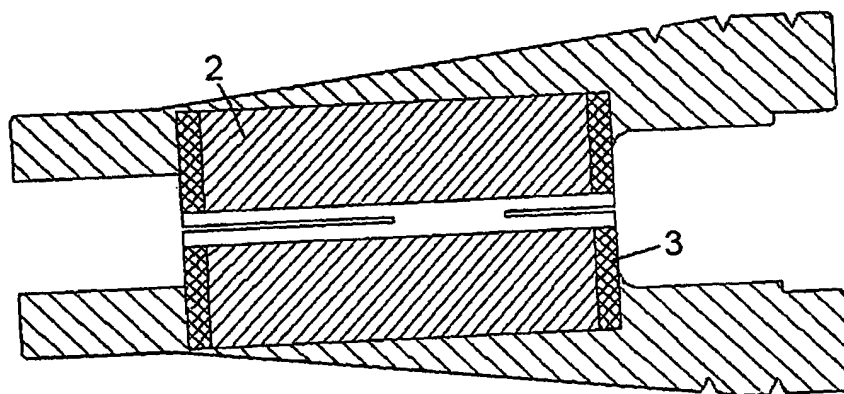


Fig. 2

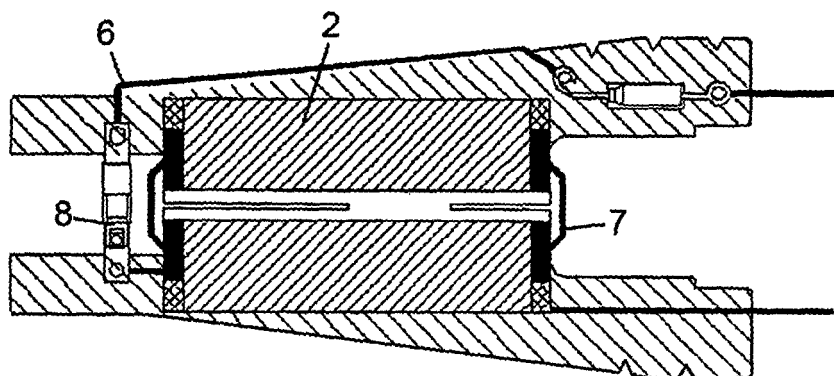


Fig. 3

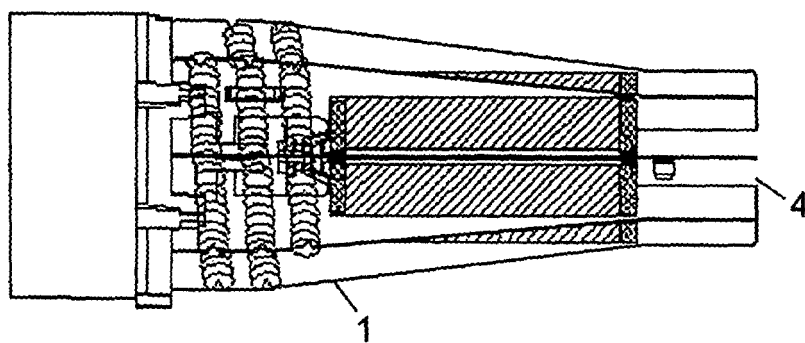


Fig. 4

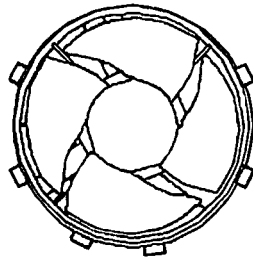


Fig. 5

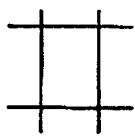


Fig. 6

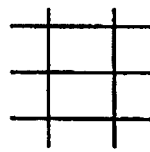


Fig. 7

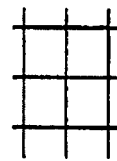


Fig. 8

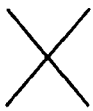


Fig. 9

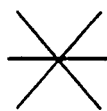


Fig. 10

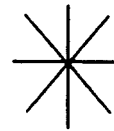


Fig. 11

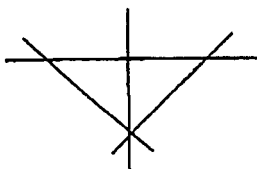


Fig. 12

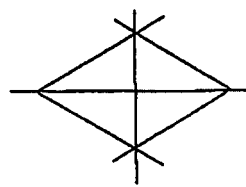


Fig. 13

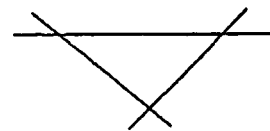


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2007/002820

A. CLASSIFICATION OF SUBJECT MATTER

See 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: F24H3, F24D13, A45D20, H05B3

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)

CNKI,CNPAT,WPI,PAJ,EPODOC: electric heating fan hair drier mica coating screen printing electrode film
alumina silicon oxide silicon carbide kalium calcium

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN2750243Y (HEJI IND CO LTD) 04 Jan.2006 (04.01.2006) Desc. page 1 to page 3, Figures 1-6	1, 4-8
A		2, 3, 9, 10
Y	CN2457832Y (XU, Zhenqing et al) 31 Oct.2001 (31.10.2001) Desc. page 1, Figures	1, 4-8
A		2, 3, 9, 10
Y	CN2779303Y ((HEJI IND CO LTD) 10 May 2006 (10.05.2006) Desc. page 1 to page 3, Figures 1-6	1, 4-8

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
25 Feb. 2008(25.02.2008)Date of mailing of the international search report
20 Mar. 2008 (20.03.2008)Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2007/002820

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A		2, 3, 9, 10
A	JP1131605A (KYUSHU HITACHI MAXELL LTD) 24 May 1989 (24.05.1989) whole document	1—10

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2007/002820

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN2750243Y	04.01.2006	NONE	
CN2457832Y	31.10.2001	NONE	
CN2779303Y	10.05.2006	NONE	
JP1131605A	24.05.1989	JP1044321B	27.09.1989
		JP1559316C	16.05.1990

Form PCT/ISA/210 (patent family annex) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2007/002820

F24H3/00 (2006.01)i

F24D13/02 (2006.01)i

A45D20/08 (2006.01)i