(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 530 138 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
28.08.2019 Bulletin 2019/35

(21) Application number: **17868924.6**

(22) Date of filing: **29.09.2017**

(51) Int Cl.:
A45D 2/00 *(2006.01)* ***A45D 2/36*** *(2006.01)*
A45D 1/04 *(2006.01)* ***A45D 1/14*** *(2006.01)*

(86) International application number:
PCT/CN2017/104424

(87) International publication number:
WO 2018/086429 (17.05.2018 Gazette 2018/20)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **10.11.2016 CN 201610990911**
10.11.2016 CN 201621217420 U

(71) Applicant: **Changsha Huaishi New Material Technology Co., Ltd**
Changsha, Hunan 410005 (CN)

(72) Inventor: **QIU, Zhiyong**
Changsha, Hunan 410005 (CN)

(74) Representative: **Roman, Alexis**
Cabinet Roman
35 rue Paradis
B.P. 30064
13484 Marseille Cedex 20 (FR)

(54) **WATER COMPENSATING ASSEMBLY FOR HAIR STRAIGHTENER, AND WATER COMPENSATING HAIR STRAIGHTENER**

(57) The present invention discloses a water replenishing assembly for a hair straightener and a water replenishing hair straightener. According to the water replenishing assembly for the hair straightener, silica gel layers provided with through holes are arranged on heating modules, so that water on the hair flows through the through holes to the heating modules to form water vapor for replenishing water. The water replenishing hair straightener constructed based on the water replenishing assembly includes an upper shell, a lower shell, heating modules, a heating control plate, and a power module, where the heating modules, a heating control module, and the power module are sequentially connected; a detachable silica gel layer is arranged on each heating module; and through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module. By utilizing the water replenishing assembly, water on the hair flows through the through holes to the heating modules to form water vapor, the water vapor is sprayed to the hair by the through holes to heat the hair, and a part of water vapor is absorbed by the hair, thereby achieving the effects of shaping hair and replenishing water, and simultaneously lowering the burning degree to the hair by the hair straightener.

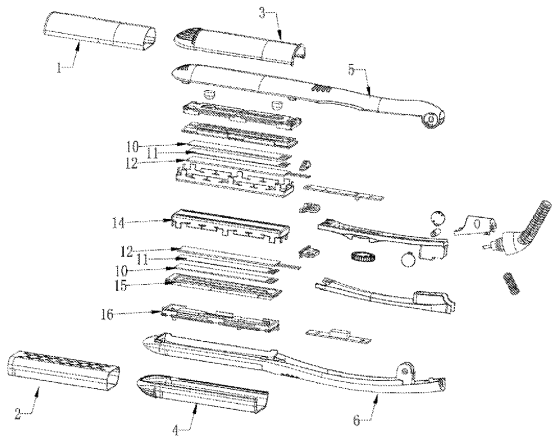


FIG. 6

EP 3 530 138 A1

Description

BACKGROUND

Technical Field

[0001] The present invention belongs to the field of hairdressing tools, and particularly relates to a water replenishing assembly for a hair straightener and a water replenishing hair straightener.

Related Art

[0002] According to an existing hair straightener, hair is clamped by a high-temperature metal surface or hard resin surface so as to heat the hair and simultaneously straighten the hair. In this process, the hair is damaged in three ways: (1) the hair is burnt by high temperature above 200 °C; (2) the hair softened at high temperature is scratched by the hard metal surface or the hard resin surface; and (3) the water inside the hair is baked at high temperature, and the hair is seriously dehydrated. The straightened hair is straighter but is hard, dry, split, more static and tarnished. Therefore, chemical liquid needs to be smeared on the surface of the hair before the hair is straightened so as to form a protective film, and simultaneously, the straightened hair needs to be softened by using chemical liquid.

[0003] The existing technologies are provided with some vapor hair straighteners. However, an electric heating mode is mainly used for boiling water to generate vapor, the temperature of the vapor is too high, and the vapor cannot directly form water drops. Simultaneously, when a vapor hair straightener is used for straightening the hair, the vapor easily scalds scalp or hands; and water cannot fully form mist and cannot fully enter the hair scales of the hair, so that the hair cannot be replenished with water, and the hair cannot be nursed.

[0004] CN203618965U discloses an atomized vapor hair straightener using ultrasonic atomization sheets. However, the heating time of the hair straightener is longer, the temperature of the hair straightener cannot rise to the working temperature within a short time, and long-time ultrasonic atomization enables the water of the hair to be atomized in advance in the straightening process.

[0005] Therefore, a hair straightener capable of realizing quick temperature rise and water replenishment needs to be designed.

SUMMARY

Technical problems

[0006] The present invention aims to overcome the problem that the temperature of a hair straightener in existing technologies cannot quickly rise to enable the hair straightener to work, and simultaneously ensure water replenishment.

Solution of problems

Technical solution

[0007] A water replenishing assembly for a hair straightener includes silica gel layers covering heating modules in a hair straightener body, where
through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module; and
each heating module includes a working plate, a heating sheet, and a base which are sequentially arranged.

[0008] Further, the diameter of each through hole is 4-6mm.

[0009] Further, the thickness of the spacing layer is 0.3-0.5mm.

[0010] Further, the thickness of the silica gel layer is 0.5-0.8mm.

[0011] Further, a heat insulation sheet is arranged between the heating sheet and the base.

[0012] Further, each heating module includes the base, the working plate, the heating sheet, the heat insulation sheet, and a silica gel pad, where a containing groove is formed in the base; the silica gel pad is arranged in the containing groove; the heat insulation sheet is embedded in the silica gel pad; the heating sheet is arranged on the heat insulation sheet; the working plate is n-shaped and is matched with the base so as to clamp the heating sheet, the heat insulation sheet, and the silica gel pad between the working plate and the base; and
the heating sheet is tightly attached to the bottom surface of the working plate.

[0013] Further, each heating module includes the base, the working plate, the heating sheet, and the heat insulation sheet, where the heat insulation sheet is embedded in the base; the heating sheet is arranged on the heat insulation sheet; the working plate is matched with the base so as to clamp the heat insulation sheet and the heating sheet between the working plate and the base; and
the heating sheet is tightly attached to the bottom surface of the working plate.

[0014] The heating sheet is tightly attached to the bottom surface of the working plate, so that the heat loss of each heating module is low. The temperature difference between the heating sheet and the outer surface of the working plate in each heating module is less than 5 °C (the temperature difference of a common hair straightener is equal to or greater than 15 °C), so that the temperature rise speed of the whole heating module is very high (the temperature rises from normal temperature to the set temperature of 230 °C within 30 seconds), and the temperature swing range is small during balance (within 2 °C).

[0015] Further, each heating module includes the working plate, an outer fixing frame, a substrate, a silica gel pad, the heating sheet, and the heat insulation sheet, where the substrate is clamped in the outer fixing frame;

the silica gel pad is arranged on the substrate; the heat insulation sheet is arranged on the silica gel pad; the heating sheet is arranged on the heat insulation sheet; the working plate is clamped in the outer fixing frame, the upper surface of the working plate is flush with the upper surface of the outer fixing frame, and the working plate is matched with the substrate so as to clamp the silica gel pad, the heating sheet, and the heat insulation sheet between the working plate and the substrate; and the heating sheet is tightly attached to the bottom surface of the working plate.

[0016] Further, each silica gel layer sleeves each heating module.

[0017] Further, each silica gel layer covers each heating module.

[0018] Further, the edges of two sides of the silica gel layer are provided with metal buckles fastened with the edges of the body.

[0019] Further, the working plate is made of an aluminum alloy provided with a porous ceramic layer on an aluminum alloy matrix;

the thickness of the porous ceramic layer is greater than or equal to 8 μm; and

in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.

[0020] By the arrangement of the porous ceramic layer, the working plate has strong heat-resisting and moisturizing functions in a hair heating process and can directly humidify and moisturize the hair, so that the design of a spraying device for the hair straightener is greatly simplified or even omitted, and a good user experience can be obtained.

[0021] A water replenishing hair straightener includes an upper shell, a lower shell, heating modules, a heating control plate and a power module, where

the heating modules, the heating control plate, and the power module are sequentially connected;

one end of the upper shell is hinged with one end of the lower shell, and the hinged position is provided with a spring matched with the upper shell and the lower shell;

the heating modules are clamped in both the upper shell and the lower shell, and the heating control plate is clamped in the lower shell;

a detachable silica gel layer is arranged on each heating module; and

through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module.

[0022] Further, each heating module includes a working plate, a heating sheet, and a base which are sequentially arranged, and a heat insulation sheet is arranged between the heating sheet and the base.

[0023] Further, the working surfaces of an upper working plate and a lower working plate of the hair straightener are planes, the middle part of the working surface of the upper working plate is provided with at least one bulge, and each of the two sides of the working surface of the lower working plate is at least provided with a bulge; and the bulges on the upper working plate and the bulges on the lower working plate are parallel, and the upper working plate and the lower working plate of the hair straightener are matched oppositely.

[0024] Further, the working plate is made of an aluminum alloy provided with a porous ceramic layer on the surface;

the thickness of the porous ceramic layer is greater than or equal to 8 μm;

and in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.

[0025] Further, the silica gel layers sleeve plastic sleeves matched with the outer sides of heating parts of the upper shell and the lower shell of the hair straightener.

[0026] Further, each silica gel layer covers each heating module.

[0027] Further, the edges of two sides of the silica gel layer are provided with metal buckles fastened with the edges of the body.

[0028] Further, each heating module includes the working plate, the heating sheet, the heat insulation sheet, a silica gel pad, a middle plate, and a back plate, where a containing groove is formed in the middle plate; the silica gel pad is arranged in the containing groove; the heat insulation sheet is embedded in the silica gel pad; the heating sheet is arranged on the heat insulation sheet; the working plate is n-shaped and is matched with the middle plate so as to clamp the heating sheet, the heat insulation sheet, and the silica gel pad between the working plate and the middle plate, thereby forming a heating part; the bulges on the edges of the working plate are matched with the back plate so as to fix the heating part on the back plate; and

the heating sheet is tightly attached to the bottom surface of the working plate.

[0029] Further, each heating module includes the base, the working plate, the heating sheet, and the heat insulation sheet, where the heat insulation sheet is embedded in the base; the heating sheet is arranged on the heat insulation sheet; the working plate is matched with the base so as to clamp the heat insulation sheet and the heating sheet between the working plate and the base; and

the heating sheet is tightly attached to the bottom surface of the working plate.

[0030] Further, each heating module includes the working plate, an outer fixing frame, a substrate, a silica gel pad, the heating sheet, and the heat insulation sheet, where the substrate is clamped in the outer fixing frame; the silica gel pad is arranged on the substrate; the heat insulation sheet is arranged on the silica gel pad; the heating sheet is arranged on the heat insulation sheet;

the working plate is clamped in the outer fixing frame, the upper surface of the working plate is flush with the upper surface of the outer fixing frame, and the working plate is matched with the substrate so as to clamp the silica gel pad, the heating sheet, and the heat insulation sheet between the working plate and the substrate; and the heating sheet is tightly attached to the bottom surface of the working plate.

Beneficial effects of the present invention

Beneficial effects

[0031] The present invention provides a water replenishing assembly for a hair straightener and a water replenishing hair straightener. The water replenishing assembly includes silica gel layers covering heating modules in a hair straightener body, where through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module. By arranging the silica gel layers provided with the through holes on the heating modules, water on the hair flows through the through holes to the heating modules to form water vapor, the water vapor is sprayed to the hair by the through holes to heat the hair, and a part of water vapor is absorbed by the hair, thereby achieving the effects of shaping hair and replenishing water. In addition, the silica gel layers are favorable for enhancing the grasping force of the hair straightener on the hair and lowering the burning degree to the hair by the hair straightener. By utilizing the heating modules provided with the heat insulation sheets, the heating speed is greatly increased, and the water flowing through the through holes of the silica gel layer to the working plate is quickly evaporated, thereby further improving the water replenishing property for the hair. The heating sheet is tightly attached to the bottom surface of the working plate, so that the heat loss of each heating module is low. The temperature difference between the heating sheet and the outer surface of the working plate in each heating module is less than 5 °C (the temperature difference of a common hair straightener is equal to or greater than 15 °C), so that the temperature rise speed of the whole heating module is very high (the temperature rises from normal temperature to the set temperature of 230 °C within 30 seconds), and the temperature swing range is small during balance (within 2 °C). By utilizing the working plate made of an aluminum alloy provided with a porous ceramic layer, the thermal conductivity, surface hardness, and wear resistance of the assembly are enhanced; and at a higher temperature, each heating module has better corrosion resistance and heat-resisting and moisturizing properties, and the structure of a heat-resisting and moisturizing device is greatly simplified.

[0032] The water replenishing hair straightener includes an upper shell, a lower shell, heating modules, a heating control plate, and a power module, where the heating modules, the heating control plate, and the power module are sequentially connected; one end of the upper shell is hinged with one end of the lower shell, and the hinged position is provided with a spring matched with the upper shell and the lower shell; the heating modules are clamped in both the upper shell and the lower shell, and the heating control plate is clamped in the lower shell; a detachable silica gel layer is arranged on each heating module; and through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module. By arranging the silica gel layers provided with the through holes on the heating modules, water on the hair flows through the through holes to the heating modules to form water vapor, the water vapor is sprayed to the hair by the through holes to heat the hair, and a part of water vapor is absorbed by the hair, thereby achieving the effects of shaping hair and replenishing water, and simultaneously lowering the burning degree to the hair by the hair straightener.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

FIG. 1 is a structural schematic diagram of a water replenishing assembly provided by the present invention;

FIG. 2 is a structural schematic diagram I of a heating module in the water replenishing assembly provided by the present invention;

FIG. 3 is a structural schematic diagram II of the heating module in the water replenishing assembly provided by the present invention;

FIG. 4 is a structural schematic diagram III of the heating module in the water replenishing assembly provided by the present invention;

FIG. 5 is a schematic diagram showing the installation of a silica gel layer and the heating module, where FIG. 5(a) shows a sleeving mode, and FIG. 5(b) shows a covering mode;

FIG. 6 is a structural schematic diagram of a water replenishing hair straightener in a specific embodiment of the present invention; and

FIG. 7 is a schematic diagram showing the installation of the silica gel layer in the water replenishing hair straightener provided by the present invention, where FIG. 7(a) shows the sleeving mode, and FIG. 7(b) shows the covering mode.

DETAILED DESCRIPTION

[0034] The present invention is further described below in conjunction with drawings and embodiments.

Embodiment 1

[0035] As shown in FIG. 1, a water replenishing assembly for a hair straightener includes silica gel layers covering heating modules in a hair straightener body, where
through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module.

[0036] The diameter of each through hole is 4-6 mm.

[0037] The thickness of the spacing layer is 0.3-0.5 mm.

[0038] The thickness of the silica gel layer is 0.5-0.8 mm.

[0039] As shown in FIG. 2, the heating module includes a base, a working plate 14, a heating sheet 12, a heat insulation sheet 11, and a silica gel pad 10, where a containing groove is formed in the base; the silica gel pad is arranged in the containing groove; the heat insulation sheet is embedded in the silica gel pad; the heating sheet is arranged on the heat insulation sheet; the working plate is n-shaped and is matched with the base so as to clamp the heating sheet, the heat insulation sheet, and the silica gel pad between the working plate and the base;
the base includes a heating module middle plate 15 and a heating module back plate 16; the working plate 14 is in the form of a metal cover, and the edges of the working plate 14 are provided with bendable long and short clamping sheets; the short clamping sheets are used for fixing the working plate, the heating sheet, the heat insulation sheet, the silica gel pad and the middle plate together so as to form a heating part, and then, the long clamping sheets are used for fixing the heating part on the heating module back plate 16, so that the heating part can be conveniently installed on the hair straightener through the back plate; and the heating sheet is tightly attached to the bottom surface of the working plate.

[0040] The working plate is made of an aluminum alloy provided with a porous ceramic layer on an aluminum alloy matrix;
the thickness of the porous ceramic layer is greater than or equal to 8 μm; and
in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.

Embodiment 2

[0041] A water replenishing assembly for a hair straightener includes silica gel layers covering heating modules in a hair straightener body, where
through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module.

[0042] The diameter of each through hole is 4-6 mm.

[0043] The thickness of the spacing layer is 0.3-0.5 mm.

[0044] The thickness of the silica gel layer is 0.5-0.8 mm.

[0045] As shown in FIG. 3, the heating module includes a base 22, a working plate 14, a heating sheet 12, and a heat insulation sheet 11, where the heat insulation sheet is embedded in the base; the heating sheet is arranged on the heat insulation sheet; the working plate is matched with the base so as to clamp the heat insulation sheet and the heating sheet between the working plate and the base; and
the heating sheet is tightly attached to the bottom surface of the working plate.

[0046] The working plate is made of an aluminum alloy provided with a porous ceramic layer on an aluminum alloy matrix;
the thickness of the porous ceramic layer is greater than or equal to 8 μm; and
in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.Embodiment 3

[0047] As shown in FIG. 1, a water replenishing assembly for a hair straightener includes silica gel layers covering heating modules in a hair straightener body, where
through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module.

[0048] The diameter of each through hole is 4-6 mm.

[0049] The thickness of the spacing layer is 0.3-0.5 mm.

[0050] The thickness of the silica gel layer is 0.5-0.8 mm.

[0051] As shown in FIG. 4, the heating module includes a working plate 14, an outer fixing frame 20, a substrate 21, a silica gel pad 10, a heating sheet 12, and a heat insulation sheet 11, where the substrate is clamped in the outer fixing frame; the silica gel pad is arranged on the substrate; the heat insulation sheet is arranged on the silica gel pad; the heating sheet is arranged on the heat insulation sheet; the working plate is clamped in the outer fixing frame, the upper surface of the working plate is flush with the upper surface of the outer fixing frame, and the working plate is matched with the substrate so as to clamp the silica gel pad, the heating sheet, and the heat insulation sheet between the working plate and the substrate; and
the heating sheet is tightly attached to the bottom surface of the working plate.

[0052] The working plate is made of an aluminum alloy provided with a porous ceramic layer on an aluminum alloy matrix;
the thickness of the porous ceramic layer is greater than or equal to 8 μm; and
in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied

by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.

[0053] As shown in FIG. 5a, the silica gel layer sleeves the heating module.

[0054] As shown in FIG. 5b, the silica gel layer covers the heating module, and the edges of two sides of the silica gel layer are provided with metal buckles fastened with the edges of the body.

[0055] As shown in FIG. 6, a water replenishing hair straightener includes an upper shell 6, a lower shell 5, heating modules, a heating control plate, and a power module, where

the heating modules, the heating control plate and the power module are sequentially connected;

one end of the upper shell 6 is hinged with one end of the lower shell 5, and the hinged position is provided with a spring matched with the upper shell and the lower shell;

the heating modules are clamped in both the upper shell and the lower shell, and the heating control plate is clamped in the lower shell;

a detachable silica gel layer is arranged on each heating module; and

through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module.

[0056] Each heating module includes a working plate, a heating sheet, and a base which are sequentially arranged, and a heat insulation sheet is arranged between the heating sheet and the base.

[0057] The working surfaces of an upper working plate and a lower working plate of the hair straightener are planes, the middle part of the working surface of the upper working plate is provided with at least one bulge, and each of the two sides of the working surface of the lower working plate is at least provided with a bulge; and the bulges on the upper working plate and the bulges on the lower working plate are parallel, and the upper working plate and the lower working plate of the hair straightener are matched oppositely.

[0058] The working plate is made of an aluminum alloy provided with a porous ceramic layer on the surface;

the thickness of the porous ceramic layer is greater than or equal to 8 μm; and

in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.

[0059] As shown in FIG. 7a, an upper silica gel layer 1 and a lower silica gel layer 2 respectively sleeve an upper plastic sleeve 3 and a lower plastic sleeve 4 matched with the outer sides of the heating parts of the upper shell and the lower shell of the hair straightener. First, the silica gel layers sleeve the outer shell plastic sleeves, and then, the plastic sleeves sleeved with the silica gel layers sleeve the upper shell and the lower shell, thereby being convenient for cleaning after installation and disassembly.

[0060] As shown in FIG. 7b, each silica gel layer covers each heating module, and the edges of two sides of the silica gel layer are provided with metal buckles fastened with the edges of the body.

[0061] Each heating module includes a working plate 14, a heating sheet 12, a heat insulation sheet 11, a silica gel pad 10, a middle plate 15 and a back plate 16, where a containing groove is formed in the middle plate; the silica gel pad is arranged in the containing groove; the heat insulation sheet is embedded in the silica gel pad; the heating sheet is arranged on the heat insulation sheet; the working plate is n-shaped and is matched with the middle plate so as to clamp the heating sheet, the heat insulation sheet, and the silica gel pad between the working plate and the middle plate, thereby forming a heating part; the bulges on the edges of the working plate are matched with the back plate so as to fix the heating part on the back plate;

the working plate 14 is in the form of a metal cover, and the edges of the working plate 14 are provided with bendable long and short bulges; the short bulges are used for fixing the working plate, the heating sheet, the heat insulation sheet, the silica gel pad and the middle plate together so as to form a heating part, and then, the long bulges are used for fixing the heating part on the heating module back plate 16, so that the heating part can be conveniently installed on the hair straightener through the back plate; and

the heating sheet is tightly attached to the bottom surface of the working plate.

[0062] The heating module can also be in a structural form as shown in FIG. 3. The heating module includes a base 22, a working plate 14, a heating sheet 12, and a heat insulation sheet 11, where the heat insulation sheet is embedded in the base; the heating sheet is arranged on the heat insulation sheet; the working plate is matched with the base so as to clamp the heat insulation sheet and the heating sheet between the working plate and the base; and

the heating sheet is tightly attached to the bottom surface of the working plate.

[0063] The heating module can also be in a structural form as shown in FIG. 4. The heating module includes a working plate 14, an outer fixing frame 20, a substrate 21, a silica gel pad 10, a heating sheet 12, and a heat insulation sheet 11, where the substrate is clamped in the outer fixing frame; the silica gel pad is arranged on the substrate; the heat insulation sheet is arranged on the silica gel pad; the heating sheet is arranged on the heat insulation sheet; the working plate is clamped in the outer fixing frame, the upper surface of the working plate is flush with the upper surface of the outer fixing frame, and the working plate is matched with the substrate so as to clamp the silica gel pad, the heating sheet, and the heat insulation sheet between the working plate and the substrate; and the heating sheet is tightly attached to the bottom surface of the working plate.

[0064] The above embodiments are preferred embodiments of the present invention and are not intended to limit the present invention in any form. All technicians familiar with this profession can make changes or modifications according to the above disclosed technical contents to obtain equivalent embodiments with equivalent changes. However, all modifications, equivalent changes and corrections made to the above embodiments according to the technical essence of the present invention and without departing from the principles or contents of the technical method of the present invention are still within the scope of the technical method of the present invention.

Claims

1. A water replenishing assembly for a hair straightener, comprising silica gel layers (1, 2) covering heating modules (15, 16) in a hair straightener body, wherein through holes are formed in each silica gel layer (1, 2), and a spacing layer is arranged between each silica gel layer (1, 2) and each heating module (15, 16); and
each heating module (15, 16) comprises a working plate (14), a heating sheet (12), and a base (22) which are sequentially arranged.

2. The water replenishing assembly for the hair straightener according to claim 1, wherein the diameter of the through hole is 4-6 mm.

3. The water replenishing assembly for the hair straightener according to claim 2, wherein the thickness of the spacing layer is 0.3-0.5 mm.

4. The water replenishing assembly for the hair straightener according to claim 3, wherein the thickness of the silica gel layer is 0.5-0.8 mm.

5. The water replenishing assembly for the hair straightener according to any one of claims 1-4, wherein a heat insulation sheet (11) is arranged between the heating sheet (12) and the base (22).

6. The water replenishing assembly for the hair straightener according to claim 5, wherein each heating module (15, 16) comprises the base (22), the working plate (14), the heating sheet (12), the heat insulation sheet (11), and a silica gel pad (10), wherein a containing groove is formed in the base (22); the silica gel pad (10) is arranged in the containing groove; the heat insulation sheet (11) is embedded in the silica gel pad (10); the heating sheet (12) is arranged on the heat insulation sheet (11); the working plate (14) is n-shaped and is matched with the base (22) so as to clamp the heating sheet (12), the heat insulation sheet (11), and the silica gel pad (10) between the working plate (14) and the base (22); and
the heating sheet (12) is tightly attached to the bottom surface of the working plate (14).

7. The water replenishing assembly for the hair straightener according to claim 5, wherein each heating module (15, 16) comprises the base (22), the working plate (14), the heating sheet (12), and the heat insulation sheet (11), wherein the heat insulation sheet (11) is embedded in the base (22); the heating sheet (12) is arranged on the heat insulation sheet (11); the working plate (14) is matched with the base (22) so as to clamp the heat insulation sheet (11) and the heating sheet (12) between the working plate (14) and the base (22); and
the heating sheet (12) is tightly attached to the bottom surface of the working plate (14).

8. The water replenishing assembly for the hair straightener according to claim 5, wherein each heating module (15, 16) comprises the working plate (14), an outer fixing frame (20), a substrate (21), a silica gel pad (10), the heating sheet (12), and the heat insulation sheet (11), wherein the substrate (21) is clamped in the outer fixing frame (20); the silica gel pad (10) is arranged on the substrate (21); the heat insulation sheet (11) is arranged on the silica gel pad (10); the heating sheet (12) is arranged on the heat insulation sheet (11); the working plate (14) is clamped in the outer fixing frame (20), the upper surface of the working plate (14) is flush with the upper surface of the outer fixing frame (20), and the working plate (14) is matched with the substrate (21) so as to clamp the silica gel pad (10), the heating sheet (12), and the heat insulation sheet (11) between the working plate (14) and the substrate (21); and
the heating sheet (12) is tightly attached to the bottom surface of the working plate (14).

9. The water replenishing assembly for the hair straightener according to claim 5, wherein each silica gel layer sleeves each heating module (15, 16).

10. The water replenishing assembly for the hair straightener according to claim 5, wherein each silica gel layer covers each heating module (15, 16).

11. The water replenishing assembly for the hair straightener according to claim 10, wherein the edges of two sides of the silica gel layer are provided with metal buckles fastened with the edges of the body.

12. The water replenishing assembly for the hair straightener according to claim 1, wherein the working plate (14) is made of an aluminum alloy provided with a porous ceramic layer on an aluminum alloy

matrix;
the thickness of the porous ceramic layer is greater than or equal to 8 μm; and
in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.

13. A water replenishing hair straightener, comprising an upper shell (6), a lower shell (5), heating modules (15, 16), a heating control plate and a power module, wherein
the heating modules (15, 16), the heating control plate, and the power module are sequentially connected;
one end of the upper shell (6) is hinged with one end of the lower shell (5), and the hinged position is provided with a spring matched with the upper shell (6) and the lower shell (5); the heating modules (15, 16) are clamped in both the upper shell (6) and the lower shell (5), and the heating control plate is clamped in the lower shell (5);
a detachable silica gel layer is arranged on each heating module (15, 16); and
through holes are formed in each silica gel layer, and a spacing layer is arranged between each silica gel layer and each heating module (15, 16).

14. The water replenishing hair straightener according to claim 13, wherein each heating module (15, 16) comprises a working plate (14), a heating sheet (12), and a base (22) which are sequentially arranged, and a heat insulation sheet (11) is arranged between the heating sheet (12) and the base (22).

15. The water replenishing hair straightener according to claim 14, wherein the working surfaces of an upper working plate and a lower working plate of the hair straightener are planes, the middle part of the working surface of the upper working plate is provided with at least one bulge, and each of the two sides of the working surface of the lower working plate is at least provided with a bulge; and the bulges on the upper working plate and the bulges on the lower working plate are parallel, and the upper working plate and the lower working plate of the hair straightener are matched oppositely.

16. The water replenishing hair straightener according to claim 14, wherein the working plate (14) is made of an aluminum alloy provided with a porous ceramic layer on the surface;
the thickness of the porous ceramic layer is greater than or equal to 8 μm; and
in the porous ceramic layer, the average diameter of the pores is less than or equal to 6 μm, and the area occupied by the surface pores of the porous ceramic layer is greater than or equal to 8% of the total area of the surface of the porous ceramic layer.

17. The water replenishing hair straightener according to claim 13, wherein the silica gel layers sleeve plastic sleeves matched with the outer sides of the heating parts of the upper shell (6) and the lower shell (5) of the hair straightener.

18. The water replenishing hair straightener according to claim 13, wherein each silica gel layer covers each heating module (15, 16).

19. The water replenishing hair straightener according to claim 18, wherein the edges of two sides of the silica gel layer are provided with metal buckles fastened with the edges of the body.

20. The water replenishing hair straightener according to any one of claims 13-19, wherein each heating module (15, 16) comprises the working plate (14), the heating sheet (12), the heat insulation sheet (11), a silica gel pad (10), a middle plate (15), and a back plate (16), wherein a containing groove is formed in the middle plate (15); the silica gel pad (10) is arranged in the containing groove; the heat insulation sheet (11) is embedded in the silica gel pad (10); the heating sheet (12) is arranged on the heat insulation sheet (11); the working plate (14) is n-shaped and is matched with the middle plate (15) so as to clamp the heating sheet (12), the heat insulation sheet (11), and the silica gel pad (10) between the working plate (14) and the middle plate (15), thereby forming a heating part; the bulges on the edges of the working plate (14) are matched with the back plate (16) so as to fix the heating part on the back plate (16); and the heating sheet (12) is tightly attached to the bottom surface of the working plate (14).

21. The water replenishing hair straightener according to any one of claims 13-19, wherein each heating module (15, 16) comprises the base (22), the working plate (14), the heating sheet (12), and the heat insulation sheet (11), wherein the heat insulation sheet (11) is embedded in the base (22); the heating sheet (12) is arranged on the heat insulation sheet (11); the working plate (14) is matched with the base (22) so as to clamp the heat insulation sheet (11) and the heating sheet (12) between the working plate (14) and the base (22); and
the heating sheet (12) is tightly attached to the bottom surface of the working plate (14).

22. The water replenishing hair straightener according to any one of claims 13-19, wherein each heating module (15, 16) comprises the working plate (14), an outer fixing frame (20), a substrate (21), a silica gel pad (10), the heating sheet (12), and the heat

insulation sheet (11), wherein the substrate (21) is clamped in the outer fixing frame (20); the silica gel pad (10) is arranged on the substrate (21); the heat insulation sheet (11) is arranged on the silica gel pad (10); the heating sheet (12) is arranged on the heat insulation sheet (11); the working plate (14) is clamped in the outer fixing frame (20), the upper surface of the working plate (14) is flush with the upper surface of the outer fixing frame (20), and the working plate (14) is matched with the substrate (21) so as to clamp the silica gel pad (10), the heating sheet (12), and the heat insulation sheet (11) between the working plate (14) and the substrate (21); and
the heating sheet (12) is tightly attached to the bottom surface of the working plate (14).

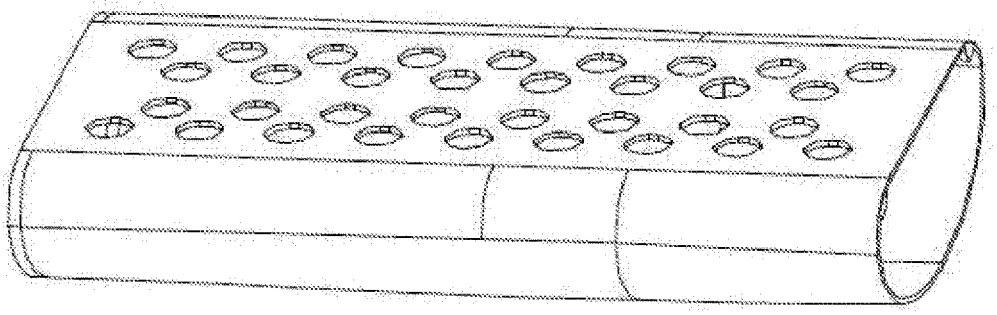


FIG. 1

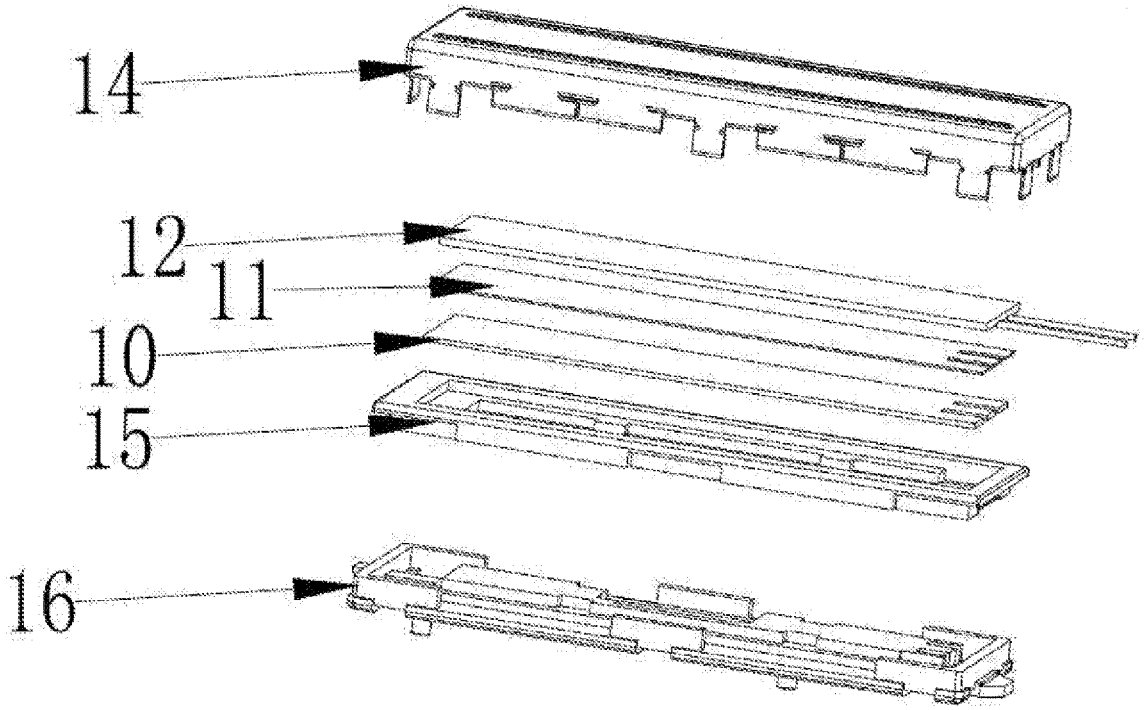


FIG. 2

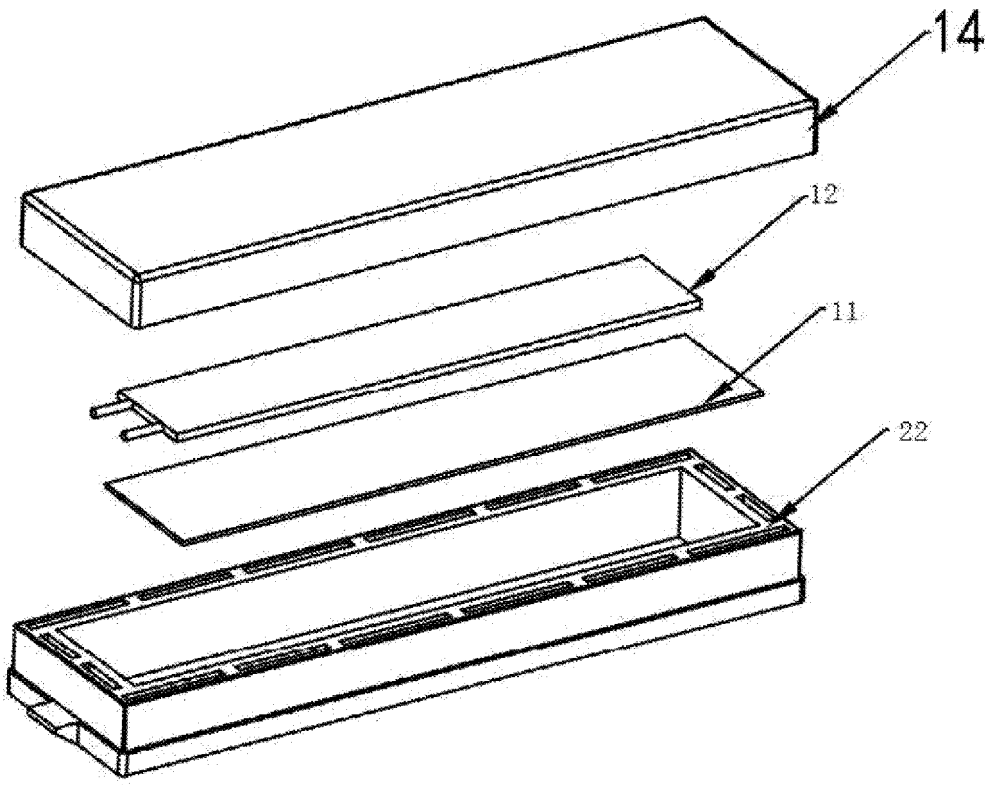


FIG. 3

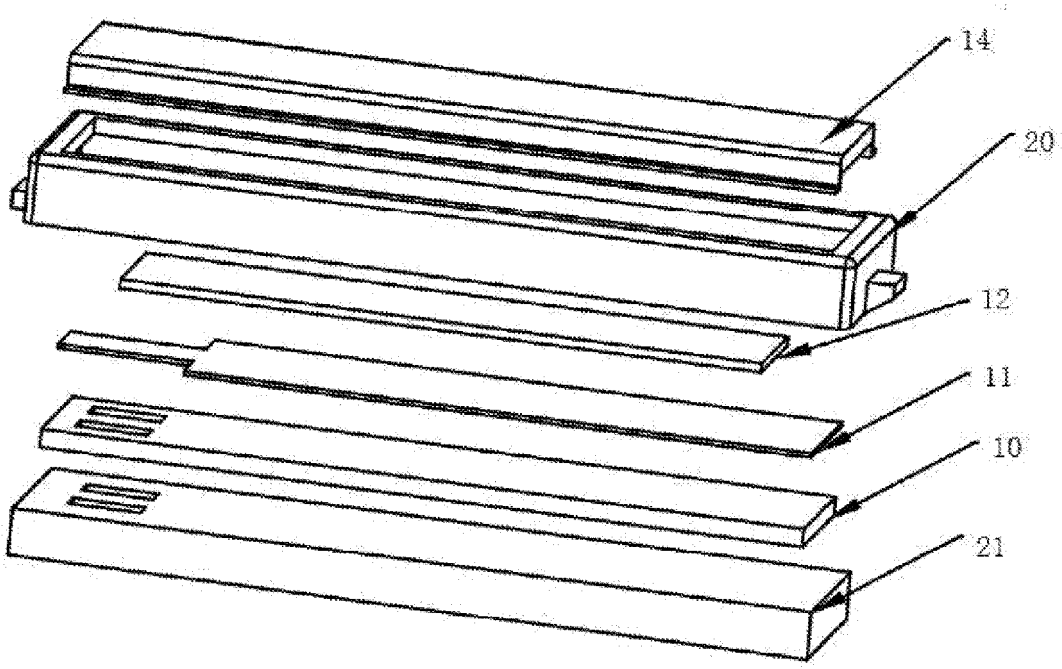
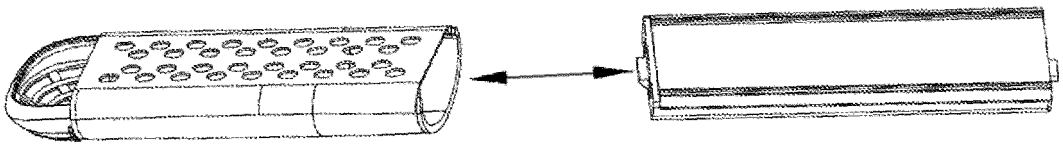
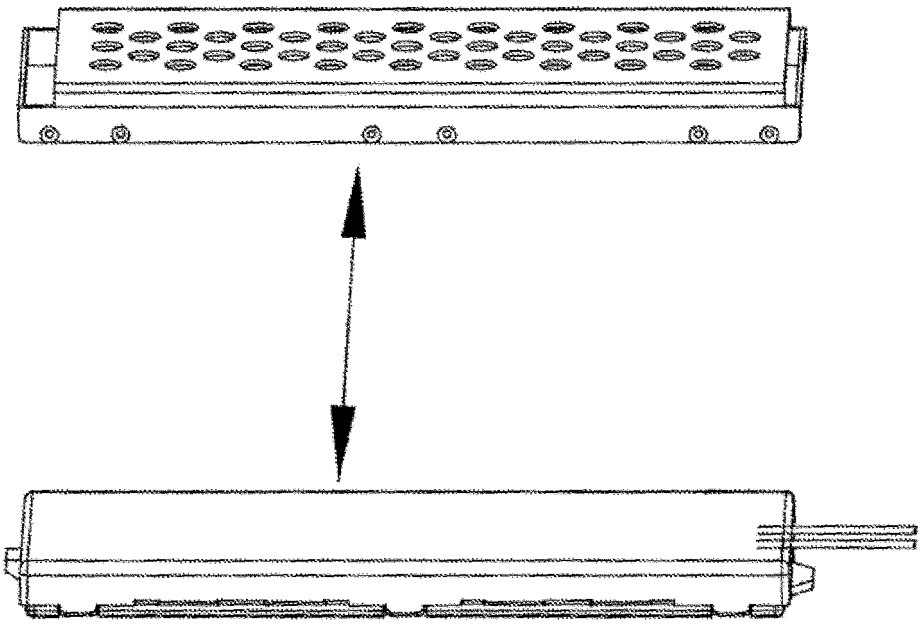


FIG. 4



(a)



(b)

FIG. 5

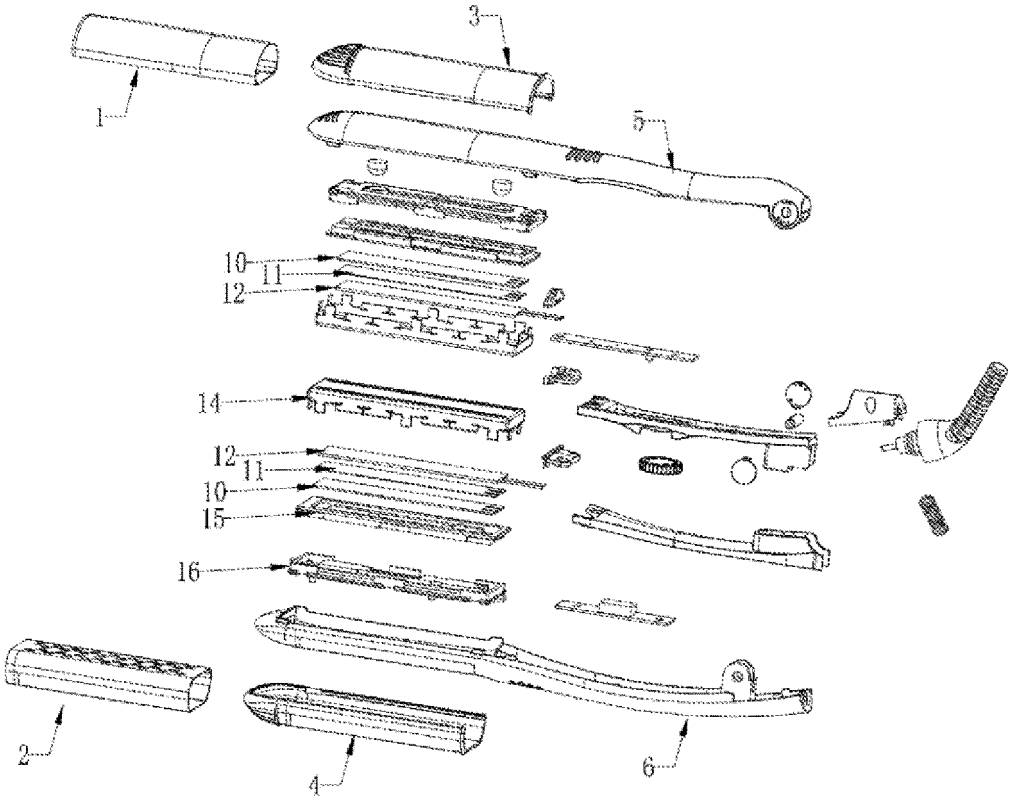
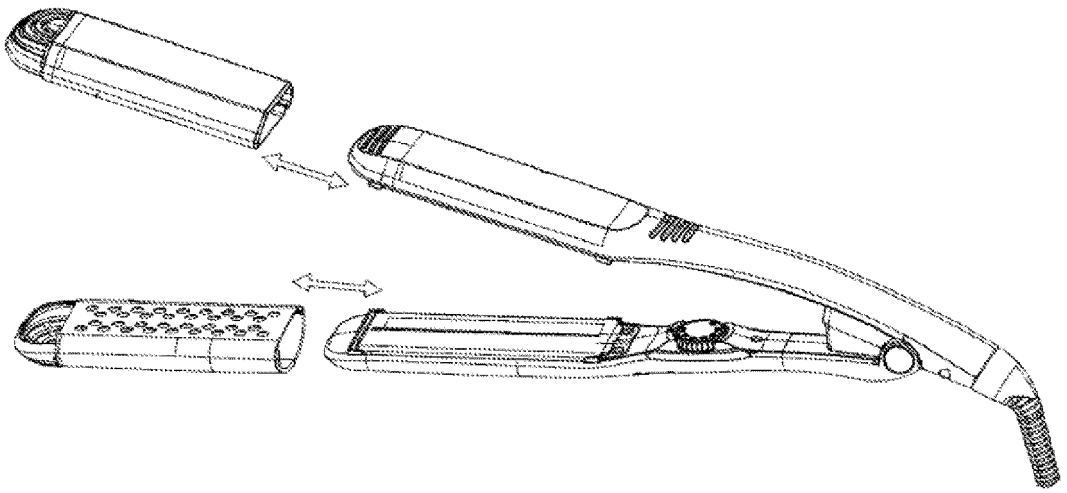
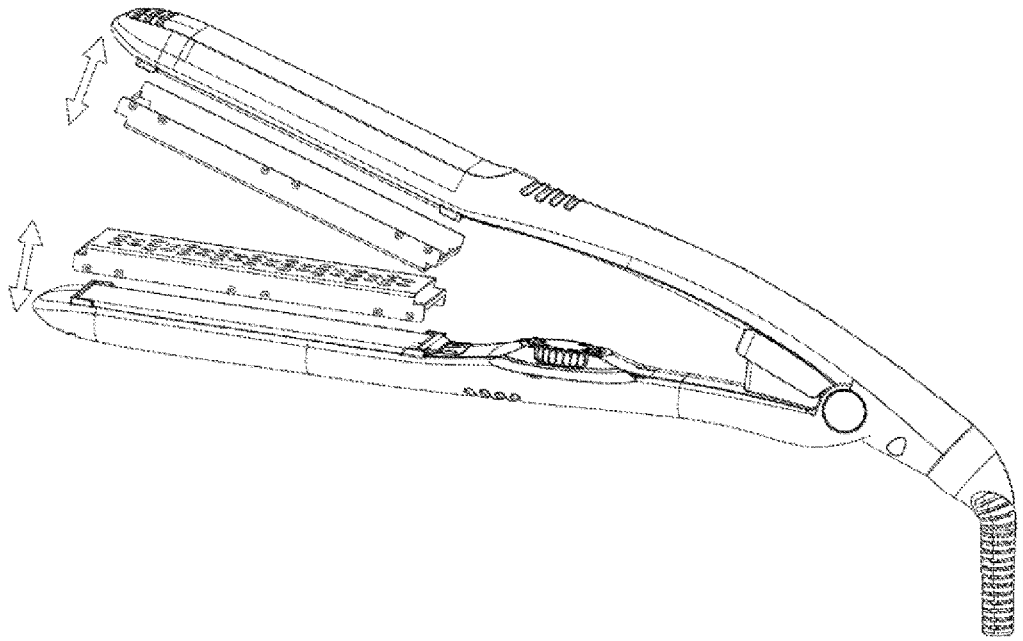


FIG. 6



(a)



(b)

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/104424

A. CLASSIFICATION OF SUBJECT MATTER

A45D 2/00 (2006.01) i; A45D 2/36 (2006.01) i; A45D 1/04 (2006.01) i; A45D 1/14 (2006.01) i

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)

A45D 2/-, A45D 1/-

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)

CNABS, TWABS, CNTXT, TWTXT, CNKI, WPI, EPODOC: 长沙淮石新材料科技, 邱志勇, 直发器, 硅胶层, 间隔层, 水蒸气, 发热, 通孔, 头发, 水分, 补水, 抓力, 降低, 灼伤, 损伤, moisturiz+, hair, straighten+, silica, layer, cover+, heat+, through hole, spacer, hole, moisture, water, vapor, spray+, absorb, grasp, force, burning degree

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 106419025 A (CHANGSHA HUAISHI NEW MATERIAL TECHNOLOGY CO., LTD.), 22 February 2017 (22.02.2017), claims 1-12, description, paragraphs [0004]-[0069], and figures 1-5	1-12
PX	CN 206482182 U (CHANGSHA HUAISHI NEW MATERIAL TECHNOLOGY CO., LTD.), 12 September 2017 (12.09.2017), claims 1-10, description, paragraphs [0004]-[0047], and figures 1-4	13-22
Y	CN 201624259 U (XIE, Runhuan), 10 November 2010 (10.11.2010), description, paragraphs [0016]-[0019], and figures 1-6	1-22
Y	CN 203814826 U (HAOTING ELECTRICAL APPLIANCE (ZHUHAI) CO., LTD.), 10 September 2014 (10.09.2014), description, paragraphs [0019]-[0023], and figures 1-2	1-22
Y	CN 104997270 A (QIU, Zhiyong), 28 October 2015 (28.10.2015), description, paragraphs [0020]-[0024], and figures 1-4	5-11, 13-22
A	CN 205492912 U (DONGGUAN BIDISCO ELECTRIC CO., LIMITED), 24 August 2016 (24.08.2016), entire document	1-22
A	CN 204838400 U (QIU, Zhiyong), 09 December 2015 (09.12.2015), entire document	1-22

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 December 2017	08 January 2018
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer LIU, Shixiong Telephone No. (86-10) 62413698

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/104424

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 205390721 U (ZENG, Zhaoli), 27 July 2016 (27.07.2016), entire document	1-22
A	JP 62117901 U (FURUKANA ELEC. CO., LTD. et al.), 27 July 1987 (27.07.1987), entire document	1-22
A	US 7078654 B1 (TSEN, S.), 18 July 2006 (18.07.2006), entire document	1-22
A	EP 0197824 B1 (PERMA S.A.), 11 October 1989 (11.10.1989), entire document	1-22

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/104424

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 106419025 A	22 February 2017	None	
CN 206482182 U	12 September 2017	None	
CN 201624259 U	10 November 2010	None	
CN 203814826 U	10 September 2014	None	
CN 104997270 A	28 October 2015	None	
CN 205492912 U	24 August 2016	None	
CN 204838400 U	09 December 2015	WO 2017020442 A1	09 February 2017
CN 205390721 U	27 July 2016	None	
JP 62117901 U	27 July 1987	US 4829155 A	09 May 1989
US 7078654 B1	18 July 2006	None	
EP 0197824 B1	11 October 1989	EP 0197824 A1	15 October 1986
		JP S61253005 A	10 November 1986
		FR 2579086 B1	18 November 1988
		CA 1274744 A	02 October 1990
		DK 132586 A	23 September 1986
		FR 2579086 A1	26 September 1986
		DE 3666130 D1	16 November 1989

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 203618965 U **[0004]**