

Hair Appliances Heating Mat

Field of the Invention

[0001] The present invention generally relates to hair styling appliances, and in particular to an induction heating mat adapted for heating hair styling appliances.

Background

[0002] Many hair styling appliances are required to be heated for styling hair. Depending on the use, different hair styling appliances have different ways of heating up. For example, curling tongs and hair straightening devices, such devices require electrical power to continuously heat up the heating elements thereon. Most commonly, the electrical power is supplied through a power cord/wire connected thereto. Such power cord/wire often gets in the users' way when they operate these appliances.

[0003] Induction heating pots offer a flexible way of heating up the appliances quickly and effectively. The heating pots are initially manufactured in a fixed size for adopting the appliances of the intended sizes, which are limited in options. Further, the pot is usually adapted for heating up one appliance at one time.

[0004] Further, such heating pots are relatively bulky, i.e. immobile, for carrying around. The size of the pot is a massive disadvantage as most salons have limited space.

[0005] Once the roller is placed into the pot it is only visible and accessible from the top. Small items could fall into the pot unbeknown to the user causing possible damage or even fire. Dust can settle and cleaning can be difficult.

[0006] The pot is very made from plastic and could easily be damaged if
5 dropped on the floor.

Summary

[0007] In one aspect of the present invention, there is provided an induction-heater mat for heating up hair-styling appliances. The induction-heater mat comprises a mat that is made up of a flexible material, the mat having an induction coil embedded
10 therein; and a power supply and controlling unit that is electrically connected to the induction coil of the mat, the power supply and controlling unit operationally controls the power supply to the induction coil to heat up the hair-styling appliance that is placed on the mat.

[0008] In one embodiment, the mat is fabricated form a monolithic body to
15 house the induction coil there between. The mat may comprise two substrates, laminating the induction coil there between.

[0009] In another embodiment, the induction coil is made up of flexible, re-shapeable wire. The induction coil may be positioned on the mat in a serpentine manner or a swirling manner.

20 **[0010]** In a further embodiment, the induction-heater mat may further comprise a sensor unit operationally detecting the temperature of the appliance and feeding back

information to the power supply and controlling unit. The sensor unit may be embedded on the mat at a suitable location. Alternatively, the sensor unit may be positioned on the power supply and controlling unit.

[0011] In yet a further embodiment, the induction-heater mat may be a low/mid
5 frequency induction-heater mat. The mat may be detachable from the power supply and controlling unit.

Brief Description of the Drawings

[0012] Preferred embodiments according to the present invention will now be described with reference to the figures accompanied herein, in which like reference
10 numerals denote like elements;

[0013] **FIG. 1** shows an induction-heater mat in accordance with one embodiment of the present invention;

[0014] **FIG. 2** illustrates an induction-heater mat in accordance with another embodiment of the present invention;

15 [0015] **FIG. 3** is a schematic depiction of the connections between the induction induction-heater mat and the power supply and controlling unit in accordance with one embodiment of the present invention;

[0016] **FIG. 4** illustrates an operational usage of the induction-heater mat in **FIG. 1**; and

[0017] **FIG. 5** illustrates an induction-heater mat in accordance with yet another embodiment of the present invention

Detailed Description

[0018] Embodiments of the present invention shall now be described in detail,
5 with reference to the attached drawings. It is to be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

10 [0019] **FIG. 1** shows an induction-heater mat **100** in accordance with one embodiment of the present invention. The induction-heater mat **100** is adapted to control and provide sufficient power to heat up hair styling appliances, such as hair rollers, hair brushes, curling tongs or the like, for styling hair. The induction-heater mat **100** is made with a flexible part for portability, and it is not limited to heat up only one
15 appliance at one time. The induction-heater mat **100** may allow a plurality of appliances to be heated up simultaneously. Preferably, the appliances to be heated are made up of electrically conductive materials, such as iron-contained materials, or ferromagnetic-based materials, for heating up by the induction heater mat **100**.

[0020] The induction-heater mat **100** comprises a mat **110** and a power supply
20 and controlling unit **150**. The mat **110** is attached to the power supply and controlling unit **150** physically and electrically. Operationally, the power supply and controlling unit **150** is connected to a power source. The user places the appliance to be heated on

the mat **110** and powers up the power supply and controlling unit **150**. The appliance to be heated may be heated up automatically once the power supply and controlling unit **150** is powered up, or user can operate the induction-heater mat **100** with the available operating modes controllable to heat up the appliances through the buttons **155** disposed on the power supply and controlling unit **150**.

[0021] The mat **110** comprises a substrate layer **112** and a coil **114** embedded within the substrate layer **112**. The substrate layer **112**, which is preferably a flexible material formed in a mat form. In one embodiment, the substrate layer **112** is a dielectric material suitable for induction heating. The substrate layer **112** is made of high-temperature engineering thermoplastic which is the same as, or compatible with the materials of the other components and connectors of the heater so that, when at the end of the assembly process the components are laminated together. Preferably, the materials shall be able to fuse or bond the components (i.e. coil and connectors/terminators) to form a monolithic body and will not delaminate. The materials may include Poly(p-phenylene sulfide) (PPS), silicone, thermoset plastic, or any other known suitable materials. In another embodiment, the mat may be made up of any non-electrically conducted, rubberized material that is able to withstand heat of at least 150-200 degree Celsius.

[0022] The coil **114** illustrates in the **FIG. 1** is disposed in a swirling-form over the substrate layer **112**. The coil configuration and design is however not to be limited to such configuration. The size and shape of the coil can be altered accordingly to the mat size and shape and the intended heated object to ensure that a correct heat pattern can be obtained to maximize the efficiency of heating. Preferably, the coil **114** is made

up of flexible, re-shapeable wire or wire assembly, for example, Litz-wire, that bundles a plurality of wires therein. However, the invention should not be restricted by this type of wire as other types may also be suitable.

[0023] In one embodiment, the substrate layer **112** may be fabricated through molding, extrusion or any known industrial process. It can be also made up of two thermoplastic sheets to sandwich the components between. Preferably, the stack of assembled components can be dispersed or merged into one another to form the monolithic unit when the thermoplastic material is heated to above its melt point and pressure applied.

[0024] In one illustrative example, a sheet of dielectric material can be cut into a desired shape and size form the substrate layer or half part of the substrate layer, a mask may be used to flame spray a conductive metal (e.g. copper) or metal alloy onto a main surface of the substrate layer **112** to form the coil **114**. At this stage, all the necessary components, such as sensor(s), and the connectors/terminators can also be lay down accordingly. Once the components are set properly, another sheet of same dielectric material can be laid on top for sandwiching and sealing the components beneath.

[0025] The above is exemplified for illustrations only. It is understood that all known materials and fabrication methods suitable for fabricating the induction-heating mat **100** can be desired for the present invention.

[0026] Still referring to **FIG. 1**, the power supply and controlling unit **150** further comprises a sensor unit **158** disposed thereon. The sensor unit **158** is adapted for sensing the appliance to be heated up on the mat **110** in order to provide the

necessary power controls, which include power cut-off, to prevent overheating. Preferably, the sensor is a contactless temperature sensor for sensing the temperature status of the appliance to be heated.

[0027] **FIG. 2** illustrates an induction-heater mat **200** in accordance with
5 another embodiment of the present invention. The induction-heater mat **200**, unlike the mat **100** in **FIG. 1**, is adapted with a coil mat **210** and a power supply and controlling unit **250** fabricated as parted bodies but connecting with each other via a connecting wire **220**. In this embodiment, a coil **215** is embedded within the coil mat **210** and disposed in a serpentine manner across the entire mat surface. The coil mat **210** further
10 comprises a sensor **212** embedded at the center of the coil mat **210** for sensing the temperature status of the appliance to be heated.

[0028] The power supply and controlling unit **250** is adapted to supply power to the coil mat **210**. The power supply and controlling unit **250** may be adapted to operate as a high-frequency power supply unit, or it can also be adapted to operate as a low to
15 mid frequency power supply unit.

[0029] **FIG. 3** is a schematic depiction of the connections between the induction induction-heater mat **200** and the power supply and controlling unit **250** in accordance with one embodiment of the present invention. The power supply and controlling unit **250** may further comprise a power supply **352**, a controller **354** and input buttons **356**.

20 [0030] Power supply **252** can be a low/mid-frequency power supply, and desirably, it is a mid-frequency power supply having an output frequency up to about 1.5kHz. In another embodiment, the induction-heating unit that operates in the range of

80kHz – 120kHz can also be desired, although the scope of the invention shall not be restricted to the suggested range of frequencies.

[0031] The controller **254** may include a microprocessor that receives inputs from the sensor(s) **212** and the input buttons **356** to control the heating power according to predefined operation modes stored on the controller **254**. Operationally, the user selects an operating mode through the input buttons **356** to initiate a heating sequence to heat up the appliance. The heating sequence may include sensing the initial temperature of the appliance, heating up the appliance by supplying an appropriate power to the heater element (i.e. induction coil) **215**, triggering a timer, monitoring the temperature of the appliance, cutting off the power when the timer has ended, or the temperature has reached a predefined threshold temperature.

[0032] In another embodiment, the power supply and controlling unit **250** may further comprise a display screen for outputting the operating statuses.

[0033] **FIG. 4** illustrates an operational usage of the induction-heater mat **100**. In this illustration, instead of having the mat **110** operationally lying flat on a flat surface **402**, the user may place it on a depression allowing the mat **100** to bend up on the side to form a cavity such that the article or object to be heated within the cavity formed by the mat **100**. In the absent of the depression, the user may simply place two blocks apart and place the mat **100** such that the two sides of the mat **100** is bent up to form the cavity so that the appliance can be heated up within the cavity in a similar manner.

[0034] **FIG. 5** illustrates an induction-heater mat **500** in accordance with yet another embodiment of the present invention. The induction-heater mat **500** is embedded with a wire-frame **520** alongside of the mat **510** of the induction-heater mat **500**. Preferably, the wire-frame **520** is flexible wire that can be bent and reshaped
5 along its length, which allows the sides of the mat **510** be held up themselves to form the cavity.

[0035] In one further embodiment, the induction-heater mat is battery operated.

[0036] In yet a further embodiment, the induction-heater mat of the present invention may include an appliance identifier for detecting the presence of the
10 appliances and to detect the type of the appliances placing thereon. Such appliance identifier serves as a safety feature to operate the induction-heater mat. The induction-heater mat can be adapted to detect if the object that is placed on the mat is an appropriate appliance to be heated up. With the appliance identifier, the induction-heater mat can also detect the type and/or model of the appliances, which allows the
15 power supply and controlling unit to operate automatically without the need of pressing any button as required above.

[0037] In one embodiment, the appliance identifier can be an optical scanner to scan an optical-readable tag that is provided on the appliance. In another embodiment, the appliance identifier can be a radio frequency (RF) reader for scanning a radio
20 frequency identification (RFID) tag provided on the appliances.

[0038] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations and combinations thereof

could be made to the present invention without departing from the scope of the invention.

Claims

1. An induction-heater mat for heating up hair-styling appliances, the induction-heater mat comprising:
 - 5 a mat that is made up of flexible material, the mat having an induction coil embedded therein; and
 - a power supply and controlling unit that is electrically connected to the induction coil of the mat, the power supply and controlling unit operationally controls the power supply to the induction coil to heat up the hair-styling appliance that is
 - 10 placed on the mat.
2. The induction-heater mat according to claim 1, wherein the mat is fabricated to form a monolithic body to house the induction coil there between.
3. The induction-heater mat according to claim 2, wherein the mat comprises two substrates laminating the induction coil there between.
- 15 4. The induction-heater mat according to claim 1, wherein the induction coil is made up of flexible, re-shapeable wire.
5. The induction-heater mat according to claim 1, wherein the induction coil is disposed on the mat in a serpentine manner.
6. The induction-heater mat according to claim 1, wherein the induction coil is
- 20 disposed on the mat in a swirling manner.

7. The induction-heater mat according to claim 1, further comprising a sensor unit operationally detecting a temperature of the appliance and feeding back information to the power supply and controlling unit.
8. The induction-heater mat according to claim 7, wherein the sensor unit is
5 embedded in/on the mat at a suitable location.
9. The induction-heater mat according to claim 7, wherein the sensor unit is positioned on the power supply and controlling unit.
10. The induction-heater mat according to claim 1, wherein the induction-heater mat is a low/mid frequency induction-heater mat.
- 10 11. The induction-heater mat according to claim 1, wherein the mat is detachable from the power supply and controlling unit.