

Hair Styling Appliances Heating Apparatus and Communications

Therewith

Field of the Invention

[0001] The present invention generally relates to hair styling appliances, and in particular to an induction heating apparatus and system and method for communicating the same with the appliances to be heated thereon.

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 apparatus offer a flexible way of heating up the appliances quickly and effectively. While the appliances are being heated, it is important to ensure a proper control over the heating operations. To do that, it is important to obtain the temperature of the appliances in real time during the heating operation. However, it is difficult to impossible to measure the temperature of the heating appliances accurately. It is especially difficult if the internal part of the appliances is to be measured.

[0004] Further, the induction heating apparatus and the appliances are specially designed to use appropriate and compatible materials to ensure the safety of its operations. It is therefore important to ensure that the appliances are from the authorized source.

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Summary

[0005] In one aspect of the present invention, there is provided an induction-heating apparatus for hair-styling comprises an induction heater having a communication module connected to a controller that controls operations of the induction heater; and a hair-styling appliance having a communicator and a sensor,
10 wherein the communicator is adapted to operationally establish a wireless communication with the communication module for transmitting signals, and the sensor is attached to the inner part of the appliance for measuring inner temperature of the appliance. Operationally the sensor sends signals to the induction heater through the communicator, and the controller of the induction heater performs induction heating
15 based on the signals.

[0006] In one embodiment, the hair-styling appliance further comprises an active power source for powering the communicator and the sensor operationally. The active power source can be a battery, or any suitable capacitor.

[0007] In another embodiment, the induction heater may further comprise a
20 magnet at a heating area adapted for holding the appliance in place over the heating area.

[0008] In another aspect of the present invention, there is also provided an induction heater adapted for the aforesaid induction-heating apparatus the induction heater comprises a communication module connected to a controller therein. The induction heater is adapted to heat up a hair-styling appliance having a communicator and a sensor, the communicator is adapted to operationally establish a wireless communication with the communication module for transmitting signals, and the sensor is attached to the inner part of the appliance for measuring the inner wall temperature of the appliance. Operationally the sensor sends signals to the induction heater through the communicator, and the controller of the induction heater performs induction heating based on the signals received by the induction heater.

[0009] In yet another aspect of the present invention, there is also provided a hair-styling appliance for the aforesaid induction-heating apparatus. The hair styling appliance comprises a communicator and a sensor. The communicator is adapted to operationally establish a wireless communication with a communication module of an induction heater for transmitting signals, and the sensor is attached to the inner wall of the appliance for measuring inner temperature of the appliance. Operationally the sensor sends signals to the induction heater through the communicator, and the controller of the induction heater performs induction heating based on the signals received by the induction heater.

[0010] In a further aspect, there is also provided a method of heating up a hair styling appliance over an induction heating device, the method comprises providing communication modules on an induction heating unit and an appliance to be heated respectively; placing the appliance in a close proximity to the induction heating unit; establishing wireless communication between the induction heating unit and the

appliance to be heated; heating up the appliance on the induction heating unit; detecting temperature of the appliance with a temperature sensor disposed inside of the appliance throughout the heating process; sending the temperature information to the induction heating unit through the communication modules wirelessly; and controlling
5 the heating process based on the detected temperature in light of prescribed parameters.

[0011] In one embodiment, the heating step is only carried out on authenticated appliance.

Brief Description of the Drawings

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

[0013] **FIG. 1** shows as schematic diagram of an induction-heating apparatus in accordance with one embodiment of the present invention;

[0014] **FIG. 2** shows an induction-heating set in accordance with one
15 embodiment of the present invention;

[0015] **FIG. 3A** shows an induction-heating set in accordance with another embodiment of the present invention;

[0016] **FIG. 3B** shows an hair styling appliance in accordance with an embodiment of the present invention; and

20 [0017] **FIG. 4** shows a flow chart of process of operating the induction heating set for hair appliances in accordance with an 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 a schematic diagram of an induction heating set in accordance with one embodiment of the present invention. The induction heating set is adapted for heating up hair styling appliances operationally. The induction heating set generally comprises two parts, an induction-heating apparatus or simply induction heater **100**, and a hair styling appliance **150** to be heated.

15 [0020] The induction-heating apparatus **100** comprises a control unit or controller **110** and a communication module **120**. The controller **110** is connected to the main power supply (not shown) of the induction heater **100**. The controller **110** is a core-controlling unit that provides controls from the power rating switching, to the power control of the induction heater **100** based on feedback information regarding the
20 status of the heating appliance **120**. The controller may be adapted with a power voltage switching circuitry to automatically detect incoming voltage and regulate the incoming voltage accordingly. Beyond the power supply/regulator, in one embodiment,

the controller **110** comprises a programmable chip allowing the manufacturer to configure the induction heater **100** to provide various controls according to the received input, or feedback. The input may include user input through the input interface provided on the induction heater, such as option selection buttons, dials, touch panel
5 and/or the like. The feedback on the other hand is referring to the non-user input type of data or instructions that are sent to the controller. It can be a signal measured based on the status of the hair styling appliance **150**. The feedback is useful to provide references to the controller **110** to provide appropriate controls.

[0021] The hair styling appliances, or simply appliances **150** are tools that are
10 used to interact with hair for styling, such as hair rollers, hair brushes, curling tongs or the like, for styling hair. These tools are required to be heated to an appropriate temperature operationally. To ensure that, the present invention provides a feedback system to correspond with the induction heater **100** to provide a better control. Each of the appliances is adapted to comprise a sensor **152** and a communicator **154**.
15 Preferably, the sensor is a temperature sensor. More desirably, the temperature sensor is able to measure or detect the temperature state of the inner wall of the appliances. In one embodiment, the sensor can be any of the thermistor, negative temperature coefficient (NTC) or positive temperature (PTC), thermocouple, resistance thermometer or the like that can acquire an electrical signal of a temperature state of
20 the appliance, whereby the signal is sent to the communicator **154** for its forward transmission.

[0022] In an alternative embodiment, the sensor **152** may be an infrared sensor unit embedded therein to measure the temperature of the appliance.

[0023] The communicator **154** is adapted to receive signal from the sensor **152** and send the same to the induction heater **100**. In the present embodiment, the communication means of the induction heater **100** and the appliances **150** are wireless means. One example of the wireless means may include radio communication means
5 and for the purpose of the present invention, a short-range radio communication means is sufficient.

[0024] As the controlling unit **110** of the induction heater **100** receives signals/feedback from the appliance **150**, the controlling unit of the induction heater **100** processes the same and provide an appropriate controls, including cut-off, in
10 corresponding with the processed signals. One of the critical parameter of the appliance's state is the temperature. It is important to determine the ~~appliance's~~ temperature of the appliance while during the heating operation to avoid overheating. With the information regarding the temperature of the appliance, the induction heater **100** may appropriately control the heating power to heat the appliance to an appropriate
15 temperature.

[0025] In one embodiment, the signal from the appliance can be pushed to the induction heater in a periodic manner, or in real-time operationally. Alternatively, the induction heater may send request to the appliance to obtain the required feedback therefrom.

20 [0026] Asides from the temperature parameter, the signal/feedback may comprises other parameters, for example, appliance type, parts ID, or the like. Such information will allow the induction heater **100** to determine the appliance type so that it can provide an appropriate heating control. Further, the parameters may include

some authentication information to identify if the source of the appliances is authorized. For safety reason, among others, the induction heater **100** is adapted to be inoperable if an un-authorized appliance is placed onto the heater for heating. That would ensure that the user is placing the authorized appliances or items on the
5 induction heater **100** for heating.

[0027] In one embodiment, the communication means establishes communication through the communication module **120** of the induction heater **100** and the communicator **154** of the appliance **150**. Wireless communication between the induction heater **100** and the appliance **150** offers a great flexibility over the
10 operational control of the induction heater and the appliance heating.

[0028] In one embodiment, the appliance **150** runs on active power, i.e. it contains internal power source in the appliance **150** itself. Accordingly, it powers up the communicator **150** operationally allowing it to communicate with the communication module.

15 [0029] In one embodiment, the appliance maybe adapted in power down mode, or sleep mode to conserve power, and it can be turn on or wake up operationally. The power on or off can be controlled by physical buttons, it can go into sleep mode and be waken by the controller of the induction heater **100** through the communication means.

[0030] The induction-heating apparatus **100** is adapted to heat up appliance
20 when it is placed therein or thereon. The induction heating apparatus **100** may be adapted as a heating pot or it can be adapted as with a heating top panel, or any other suitable form for heating up appliances through electromagnetic induction. The induction-heating apparatus **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**.

[0031] The induction-heating apparatus **100** comprises a control unit **110** and a communication module **120**. The control unit **110** provides full operational controls over the induction-heating apparatus **100**. Depending on the functions and features available on the induction-heating unit **100**, the control unit may be connected to an input unit, a display or the like.

[0032] In one embodiment, the appliance is provided with active power supply. Preferably, the appliance is battery powered for mobility. The battery may be off-the-shelf batteries, or rechargeable batteries. In one embodiment, the appliances is adapted with wireless charging capability such that the appliance can be charged simultaneously when it is being heated on the induction heater.

[0033] In another embodiment, passive power can be adapted on the appliances.

[0034] In yet a further embodiment, the appliance to be heated comprises a detachable handle and a heated part. The heated part is to be heated by the induction heater and once heated, the heated part is used on the hair for styling. The heated part can be made up mainly of heat conductive materials, such as iron-contained materials, or ferromagnetic-based materials, for heating up by the induction heater. The detachable handle offers a flexible way of handling the appliances of various types.

[0035] In one embodiment, the handle is affixed to the appliance or the heated part.

[0036] Whether the handle is affixed or detachable, the communicator and the battery may be adapted in the handle of the appliances leaving only the sensory part, i.e. the temperature sensor, within the heated part of the appliance, such that it can measure the temperature operationally. In the case of a detachable handle, the handle and the heated part is adapted with coupling terminals or connector to ensure that electrical connections between the handle and the heated part once they are attached. Preferably, the detachable handle is adapted with a quick release means allowing the heated part to be easily detached from the handle. The coupling terminals or connector and the quick release means are well known in the art, and there are many possibility of achieving it. These details are not provided herein.

[0037] FIG. 2 shows an induction heating set in accordance with an embodiment of the present invention. The induction heater **210** is adapted as an induction heating pot whereby the appliance **220** is placed in the pot for heating. As the appliance **220** is placed and the induction heater **210** is turned on, the circuitry of the appliance **220** is activated or powered up. The sensor (not shown) equipped within the appliance **220** starts sensing temperature of the inner wall of the appliance **220** and sends to the induction heater **210** through the wireless communication means. Among the temperature information, the communication means may also transmit other prescribed parameters that can be used for the operational control. The prescribed parameters may include the current temperature of the appliance, the appliance manufactured ID or serial number, or the like.

[0038] Once the induction heater **210** detects an authenticated appliance, it may further determine the appliance's type for appropriate heating control. Together with the initial temperature information of the appliance, the induction heater **210** may start

heating up the appliance according to its presets. Operationally, the controlling unit of the induction heater **210** receives the temperature states wirelessly from the appliance, and when the selected operational cycle ends, or the temperature of the appliance has reached the maximum allowable temperature, the induction heater **210** will stop the heating operation, and user may use the heated appliance accordingly.

[0039] **FIG. 3A** illustrates an induction heating set in accordance with another embodiment of the present invention. The induction heater **315** is adapted as an opened-top heater whereby the appliance **325** is placed on the opened-top panel for heating at a heating area **317**. The appliance **325** comprises, *inter alia*, a handle **330** and a heat element **332**. The handle **330** is connecting to the heat element **332** allowing user to operate the heat element **332** to style hair. The appliance **325** further comprises a sensor **334** for operatively measuring temperature of the heat element **332**, and an electronic means **331** disposed beneath the handle casing. The electronic means may include a PCB (printed circuit board) and a power source for operationally powering the components mounted on the PCB. The PCB may further include input/output (I/O) interface, such as input buttons, display screen. In one embodiment, the input buttons can be touch buttons. The PCB may further include induction heater driver for driving the induction coil, a controller chip or module for controlling the overall operations of the appliance, and a communication module adapted to pair with that of the induction heater. In one embodiment, the handle may further provide a charging port to allow the battery of the appliance be charged through a cable. In yet a further embodiment, the cable can further be used for data communication between the appliance **325** and induction heater **315**.

[0040] In another embodiment, the induction heater **315** may provide a docking terminal (not shown), where the appliance **325** may be placed and connected with the induction heater **315** through the docking terminal, such that the appliance **325** can be charged and possibly be controlled, during the heating operation. Such docking
 5 terminal avoids cable but yet allows a contact connection to the appliance for charging and possibly data communication. In yet a further embodiment, the docking terminal may be adapted with magnet element that allows an easy plug and unplug between the appliance and the induction heater.

[0041] To properly hold the appliance **325** in place over the induction heater
 10 **315** may further comprise a magnet **319** underneath the heating area, whereby when the appliance is placed over the heating area, the magnet may hold the appliance on the induction heater **315**. In one embodiment, the induction heater **315** may be adapted with a magnetic keyhole **319** and correspondingly, the handle **330** is adapted with a metal notch, that allow the appliance **325** be secured thereon when the notch is inserted
 15 to the magnetic keyhole **319**.

[0042] In yet another embodiment, the aforesaid docking terminal may be adapted on the keyhole and the notch, such that when the appliance is properly held on the induction heater, it is being charged as well.

[0043] In yet another embodiment, the induction heater **315** may comprises an
 20 indicator **318** to show that the wireless communication is in operation.

[0044] Operationally, when the appliance **325** is placed and secured on the induction heater **315**, the heating operation may start immediately. As the appliance **325** is being heated, the sensor **334** within the heat element **332** senses the temperature

of the heat element 332, and the information is sent to the electronic element of the appliance, whereby the information or processed information is further sent to the induction heater for proper control over the heating power.

[0045] Through the present invention, as the appliance is capable in getting
5 communication with the induction heater wirelessly, it offers a great flexibility over the interactions between the induction heater and the appliances. As pointed out, the induction heater can have constant communications with the appliance to determine its current temperature and it is to be appreciated that it allows the temperature to be measured internally. Another function is to ensure that an appropriate authorized
10 appliance to be heated thereon for safety control. The configurations allows the hair-styling appliances to be light weight as there are only a small battery, and simple and light weight components equipped within the appliances and the appliances are cordless. Users may operate the appliances at ease in a prolonging period.

[0046] In accordance a further embodiment, the handle of the appliance may be
15 detachable from the heating element as shown in **FIG. 3B**. The advantages for being detachable is that it allows one handle be connectable to many other types of heat element. The heat element can be a curling tong, heating plat, heating brush, etc. Each of the heat elements is installed with a sensor 352, more specifically temperature sensor. Similarly, the handle is adapted with electronic elements that include a
20 wireless communication module 356. Between the handle and the heat element, there may be provided a socket and plug pair 355, to provide electrical connection between the sensor 352 of the heat element and the electronic elements 354 of the handle, when they are attached to each other.

[0047] There can be many possibility of providing a suitable attachable/detachable mean. The attachable / detachable means can possibly be adapted to provide both mechanical and electrical connection between the heat element and the handle.

5 [0048] **FIG. 4** shows a flow chart of process of operating the induction heating set for hair appliances in accordance with an embodiment of the present invention. Process comprises providing communication modules on an induction heating unit and an appliance to be heated respectively **402**; placing the appliance in a close proximity to the induction heating unit **404**; establishing wireless communication between the
 10 induction heating unit and the appliance to be heated **406**; heating up the appliance on the induction heating unit **408**; detecting temperature of the appliance with a temperature sensor disposed inside of the appliance throughout the heating process **410**; sending the temperature information to the induction heating unit through the communication modules wirelessly; controlling the heating process based on the
 15 detected temperature in light of prescribed parameters.

[0049] In another embodiment, the process may further comprise authenticating the appliance, and only the authenticated appliance will be heated up.

[0050] A skilled person in the art would appreciate that the above illustrated embodiments, by way of example, not limitations, provides a induction heater that
 20 operationally controls the heating power based on a signal of temperature reading from a hair styling appliance. Depending on the need, the power adjustments or heating controls can also be processed and send from a controller of the hair styling appliance. Such model provides a flexibility of deploying the necessary controls on the hair

styling appliance of the different types and uses as the number of types and models of the hair styling appliances expend from time to time.

[0051] It is to be noted that, in accordance with the embodiments of the present invention, the hair-styling appliances, or simply the appliance adapted with a handle
5 and a heat element, wherein the sensor is disposed within the heat element to measure the temperature from the inner side operatively, while the temperature information (processed or unprocessed) is then transmitted to the handle (i.e. electronic elements) for further transmitting to the induction heater.

[0052] In yet a further embodiment, heating power control can be processed and
10 handled by the electronic elements housed under the handle, or on the induction heater.

[0053] 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-heating apparatus for hair-styling, the induction-heating apparatus comprising:

an induction heater having a communication module connected to a controller
5 that controls operations of the induction heater; and

a hair-styling appliance having a communicator and a sensor, wherein the communicator is adapted to operationally establish a wireless communication with the communication module for transmitting signals, and the sensor is attached to the inner part of the appliance for measuring inner temperature of the appliance;

10 wherein operationally the sensor sends signals to the induction heater through the communicator, and the controller of the induction heater performs induction heating based on the signals.

2. The induction-heating apparatus in accordance with claim 1, wherein the hair-styling appliance further comprises an active power source for powering the
15 communicator and the sensor operationally.

3. The induction-heating apparatus in accordance with claim 2, wherein the active power source is a battery.

4. The induction-heating apparatus in accordance with claim 1, wherein the induction heater comprises a magnet at a heating area adapted for holding the appliance
20 in place over the heating area.

5. An induction heater adapted for an induction-heating apparatus of Claim 1, the induction heater comprising:

a communication module connected to a controller therein,

wherein the induction heater is adapted to heat up a hair-styling appliance
5 having a communicator and a sensor, the communicator is adapted to operationally establish a wireless communication with the communication module for transmitting signals, and the sensor is attached to the inner wall of the appliance for measuring inner temperature of the appliance,

whereby operationally the sensor sends signals to the induction heater through
10 the communicator, and the controller of the induction heater performs induction heating based on the signals received by the induction heater.

6. A hair-styling appliance for an induction-heating apparatus of Claim 1, wherein the hair styling appliance comprises:

a communicator and a sensor,

15 wherein the communicator is adapted to operationally establish a wireless communication with a communication module of a induction heater for transmitting signals, and the sensor is attached to the inner part of the appliance for measuring inner temperature of the appliance;

whereby operationally the sensor sends signals to the induction heater through the
20 communicator, and the controller of the induction heater performs induction heating based on the signals received by the induction heater.

7. The hair-styling appliance according to Claim 6, further comprises a handle and a heat element, wherein the sensor is disposed within the heat element, while the communicator is disposed within the handle, and the handle is detachable from the heat element.

5 8. A method of heating up a hair styling appliance over an induction heating device, the method comprising:

providing communication modules on an induction heating unit and an appliance to be heated respectively;

placing the appliance in a close proximity to the induction heating unit;

10 establishing wireless communication between the induction heating unit and the appliance to be heated;

heating up the appliance on the induction heating unit;

detecting temperature of the appliance with a temperature sensor disposed inside of the appliance throughout the heating process;

15 sending the temperature information to the induction heating unit through the communication modules wirelessly;

controlling the heating process based on the detected temperature in light of prescribed parameters.

9. The method of Claim 8, further comprising, authenticating the appliance to be
20 heated, wherein the heating step is only carried out on authenticated appliance.