US 20160255936A1

(19) United States
(12) Patent Application Publication
(10) Pub. No.: US 2016/0255936 A1
(43) Pub. Date: Sep. 8, 2016
deGrood

(54) HAIR STYLING APPARATUS WITH INSULATING AIR GAPS

(71) Applicant: **Spectrum Brands, Inc.**, Middleton, WI (US)

(72) Inventor: **Michael John deGrood**, Madison, WI (US)

(21) Appl. No.: **15/054,418**

(22) Filed: **Feb. 26, 2016**

Related U.S. Application Data

(60) Provisional application No. 62/129,335, filed on Mar. 6, 2015.

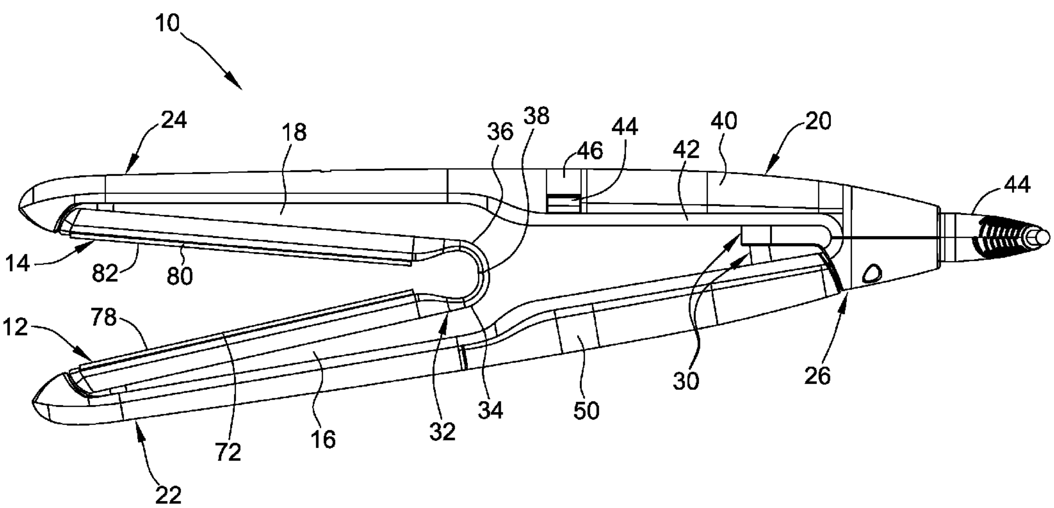
Publication Classification

(51) **Int. Cl.**
A45D 2/00 (2006.01)
A45D 1/28 (2006.01)

(52) **U.S. Cl.**
CPC . ***A45D 2/001*** (2013.01); ***A45D 1/28*** (2013.01)

(57) **ABSTRACT**

A hair styling apparatus includes first and second arms, each having respective first and second ends. The first and second arms are pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to configure the hair styling apparatus between an opened position and a closed position. A heating assembly has a first and second end. The second end of the heating assembly is pivotably coupled to the second end of the first arm. The heating assembly includes a heat plate having a hair-heating surface. The heat plate is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus to define an air gap therebetween.



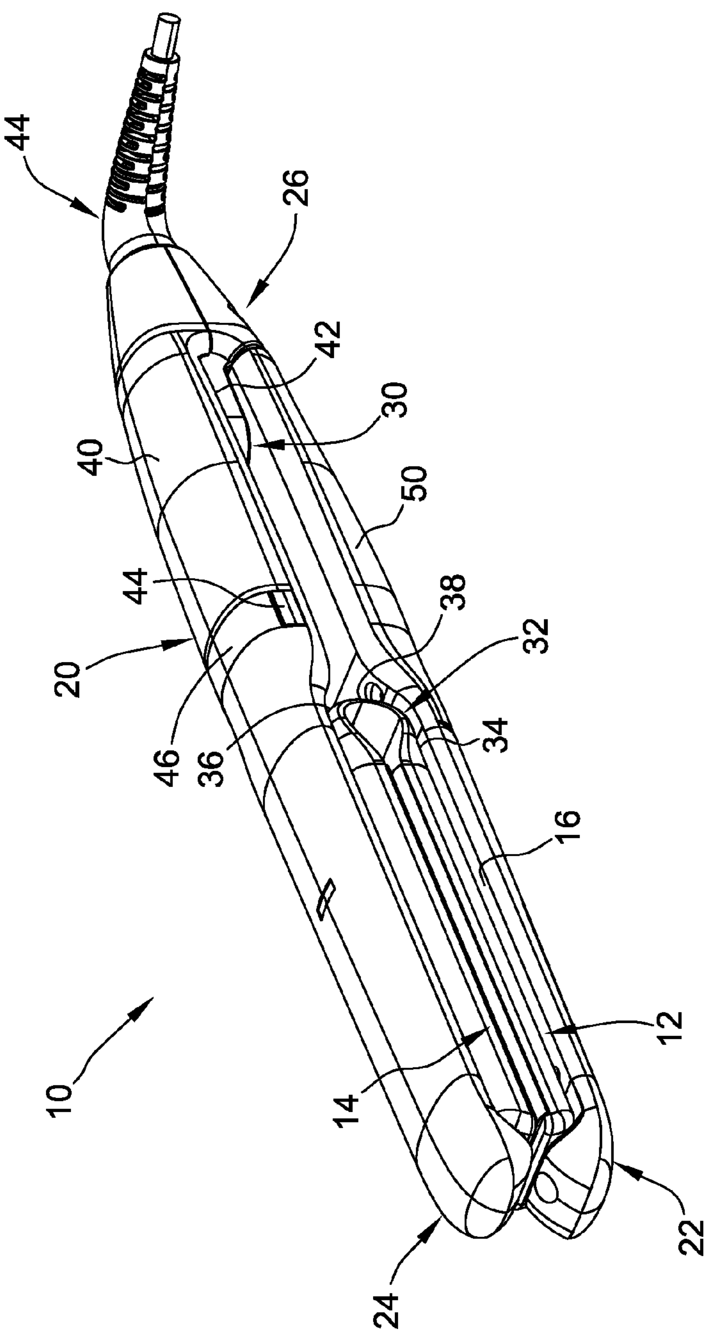


FIG. 1

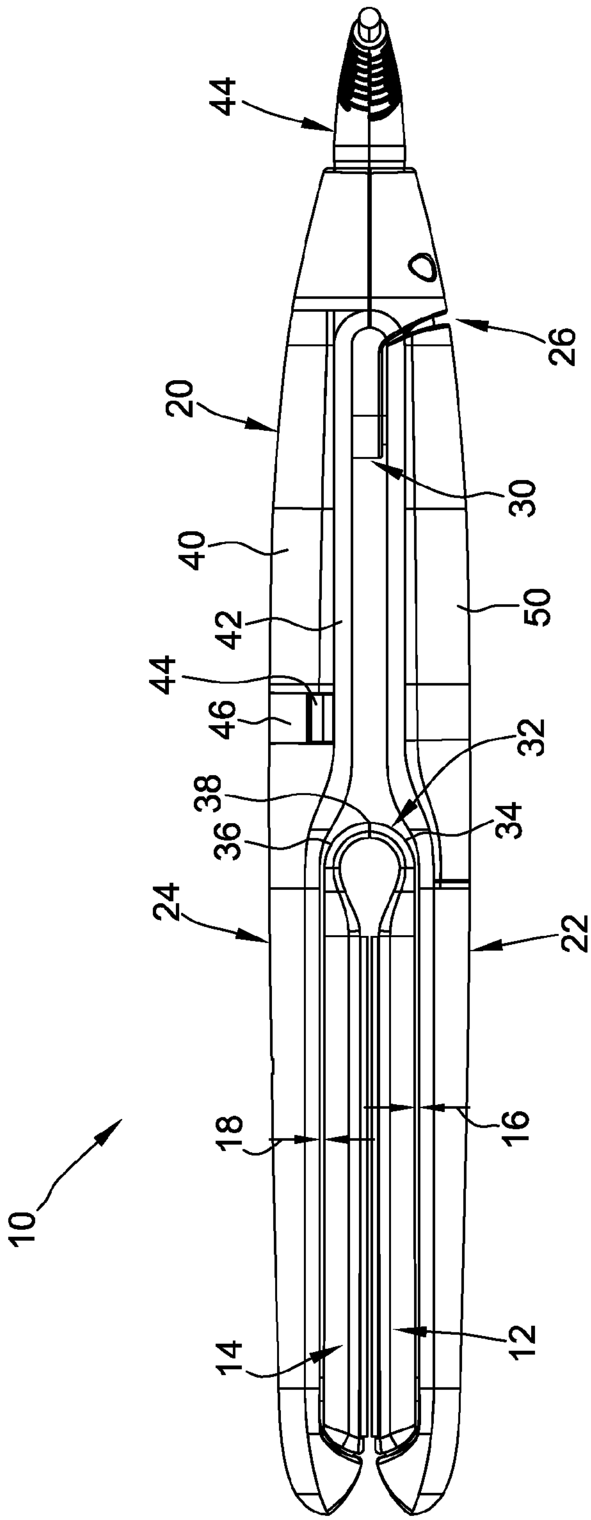


FIG. 2

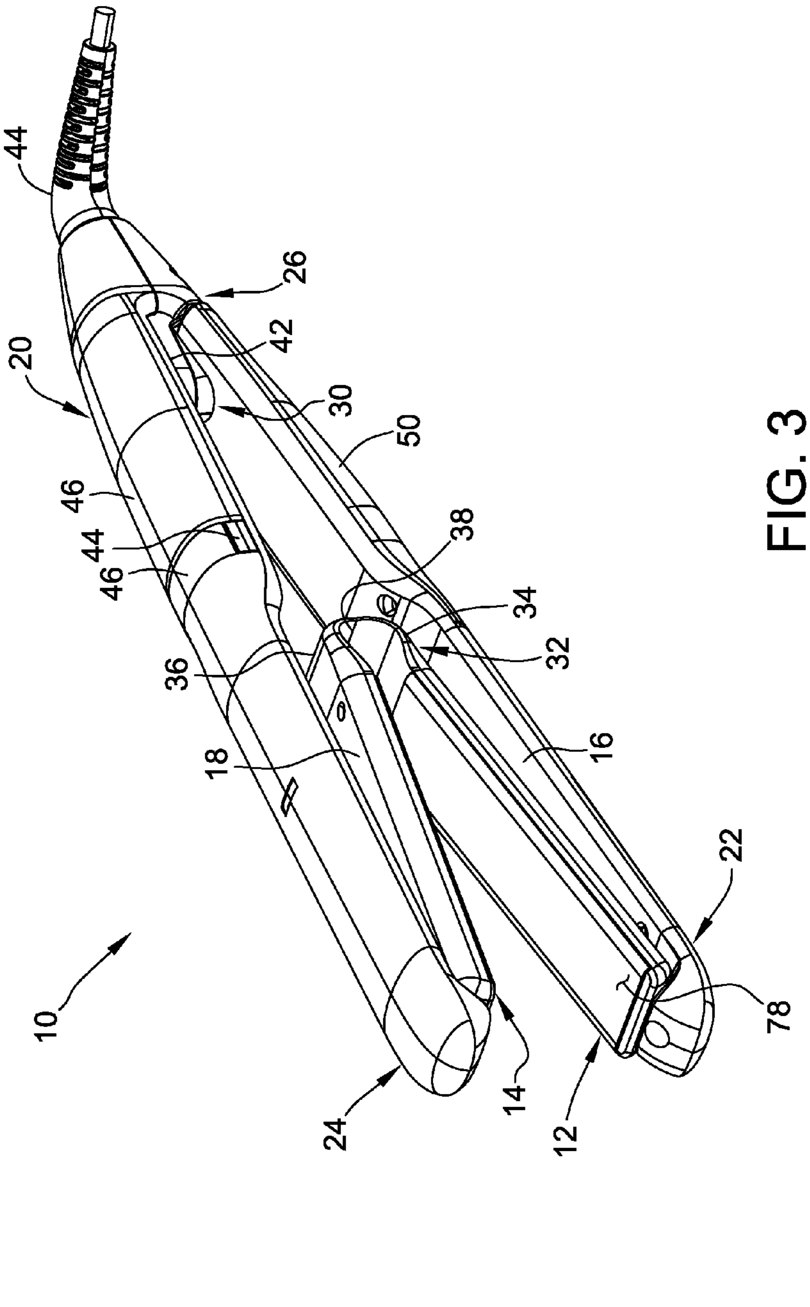


FIG. 3

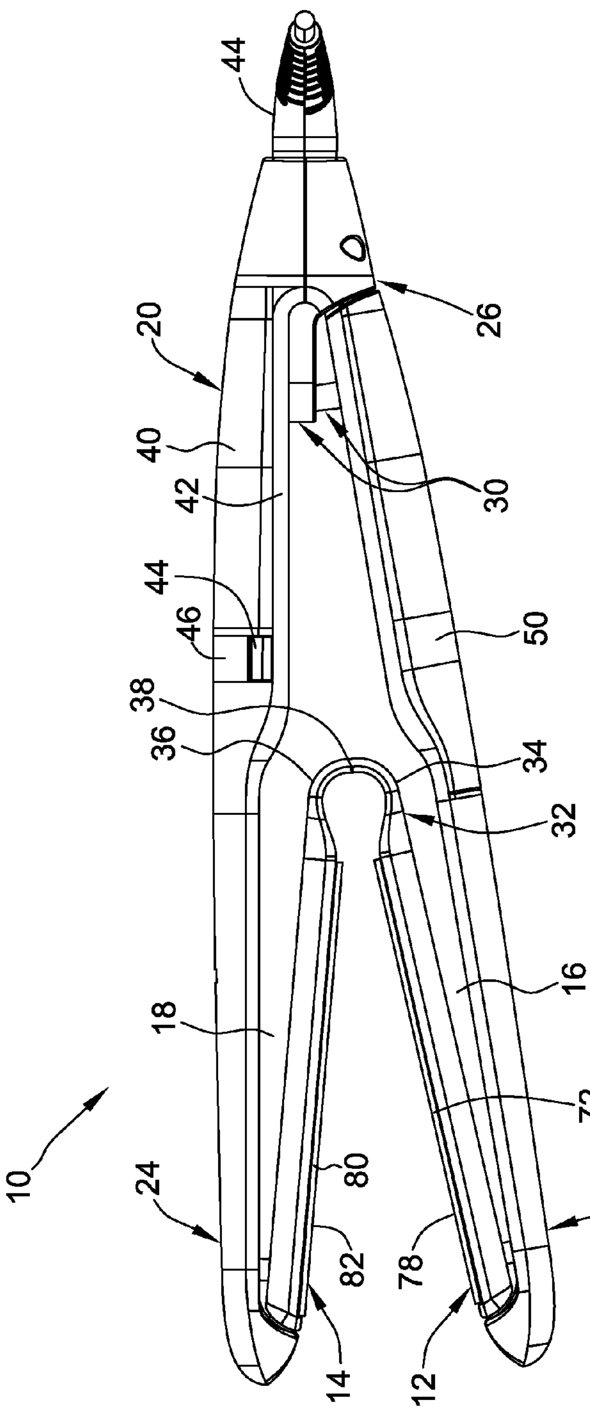


FIG. 4

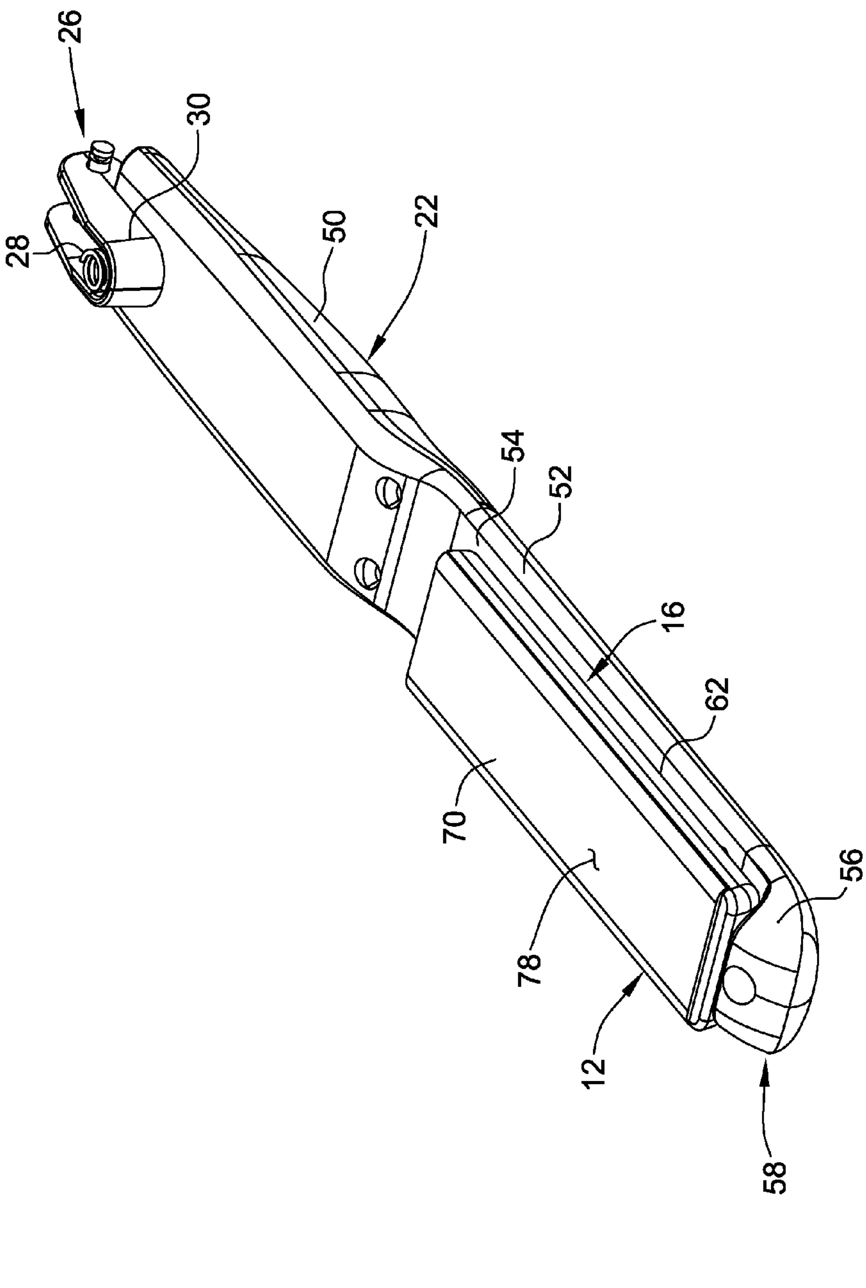


FIG. 5

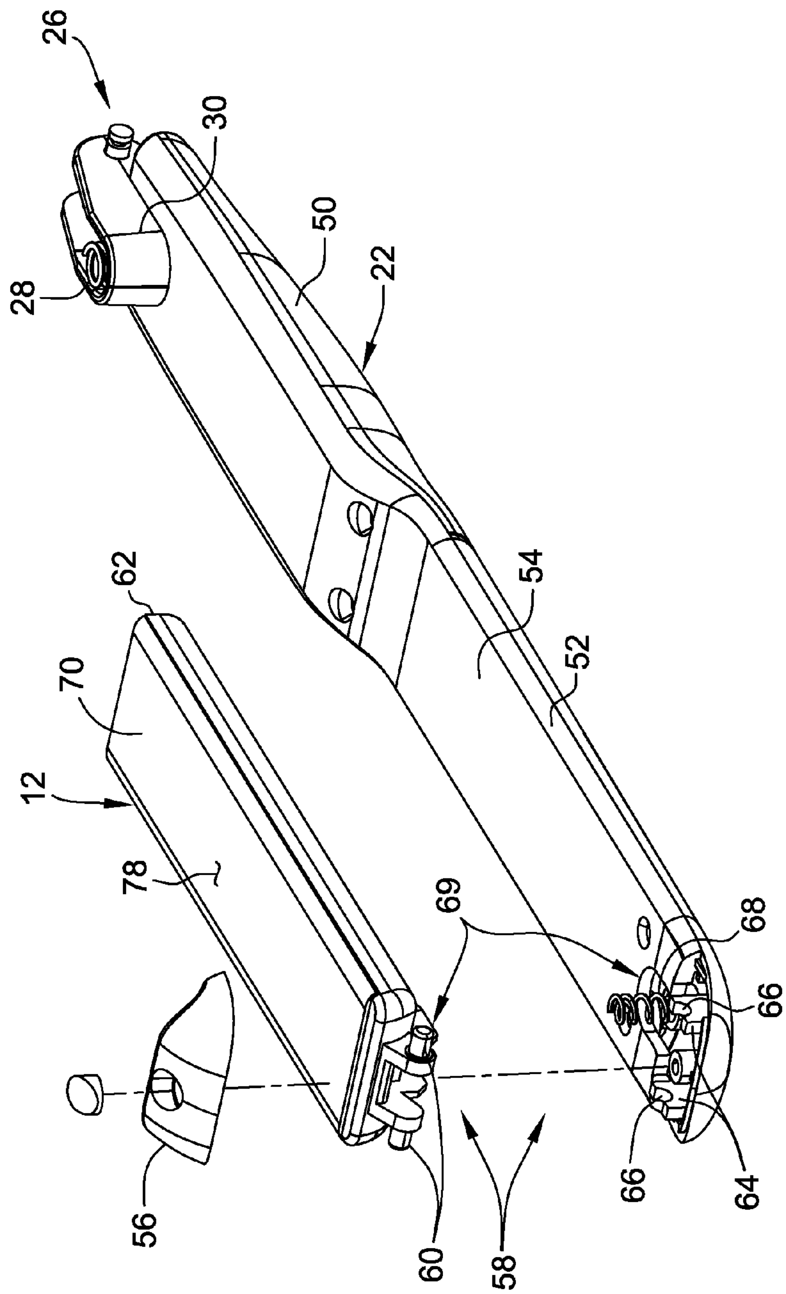


FIG. 6

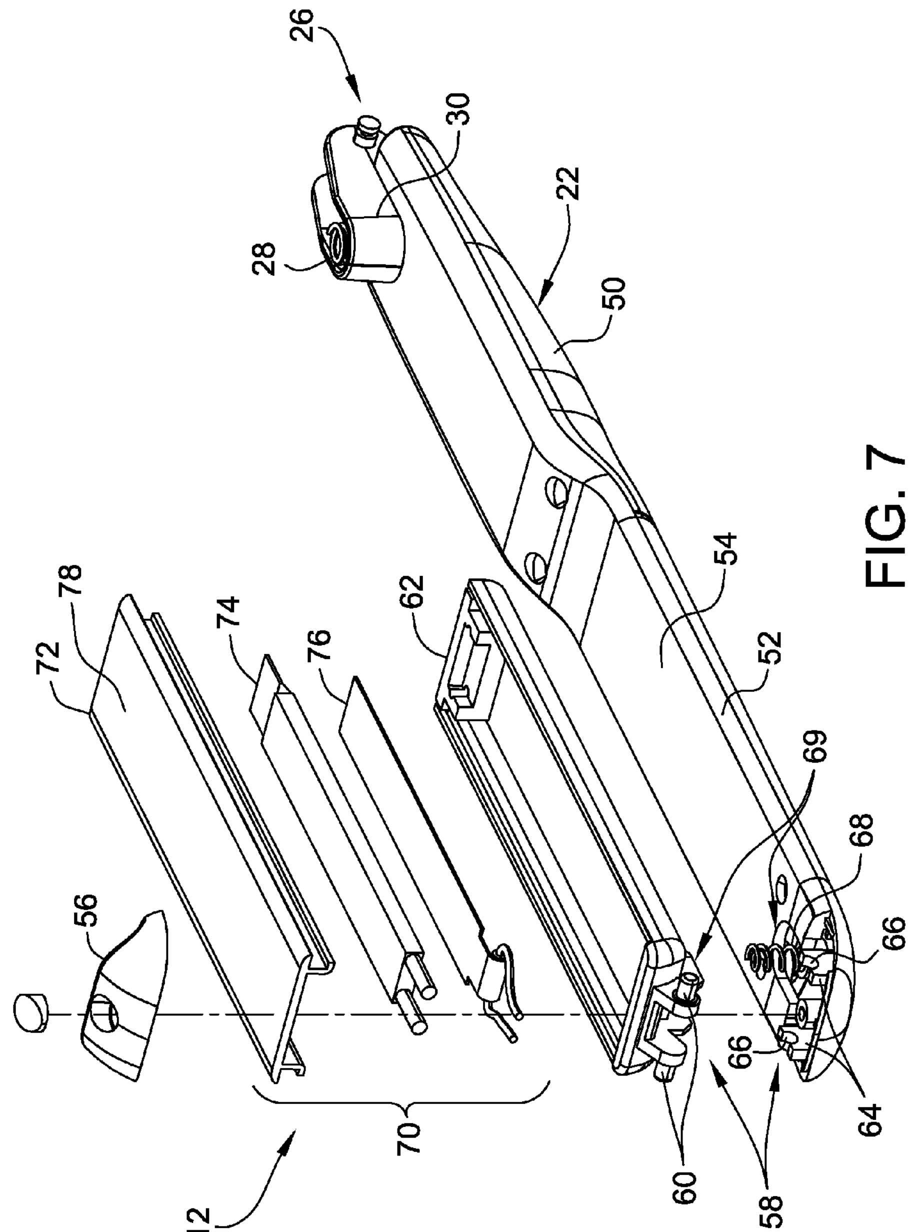


FIG. 7

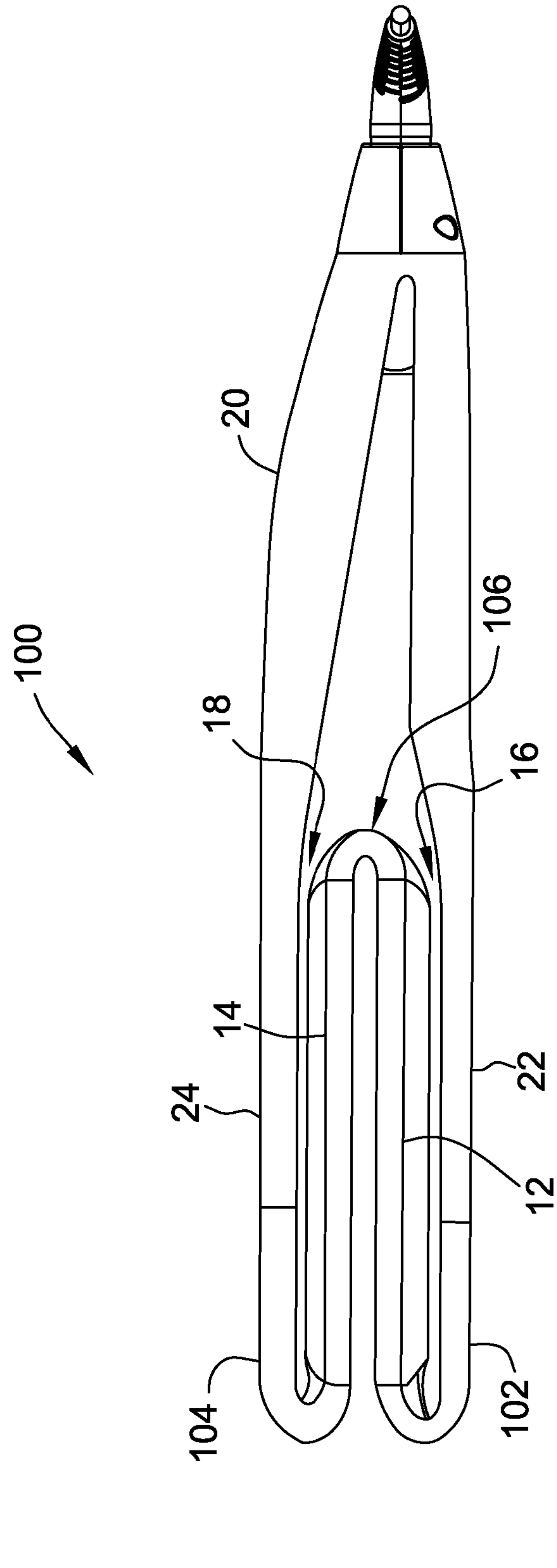


FIG. 8

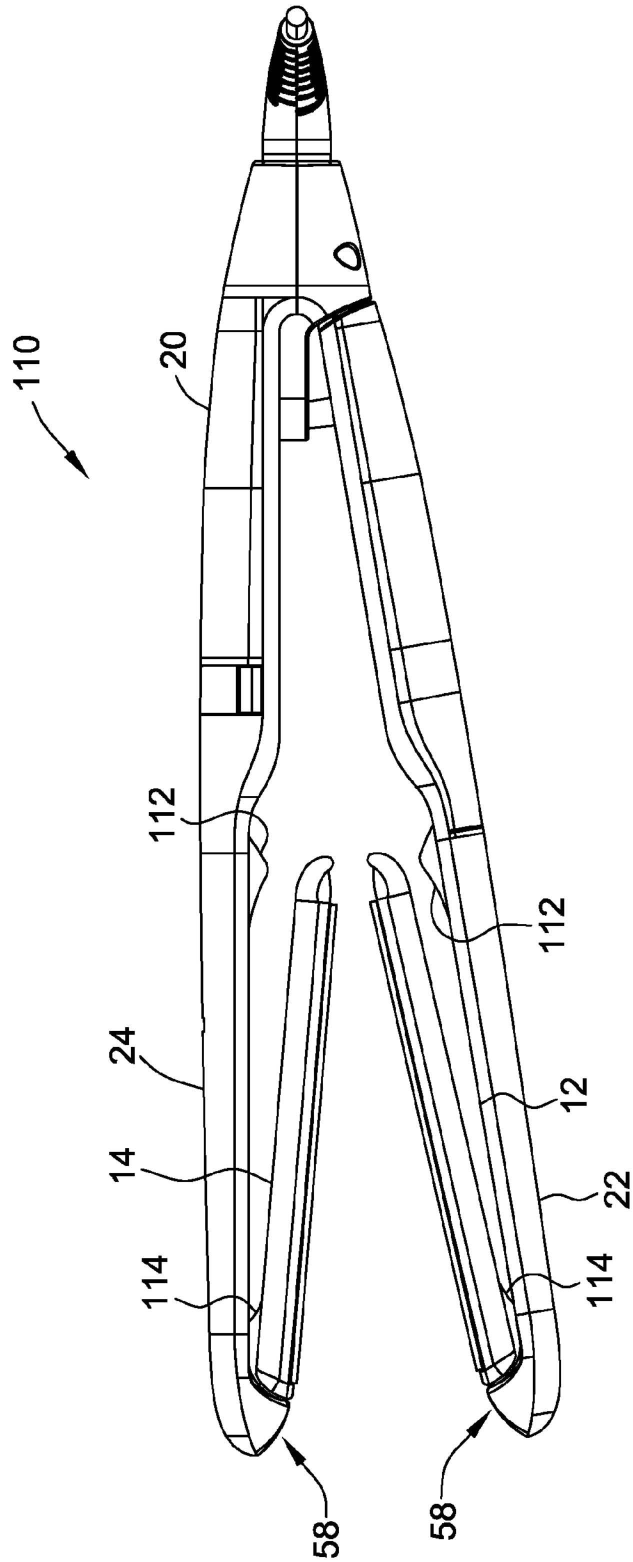


FIG. 9

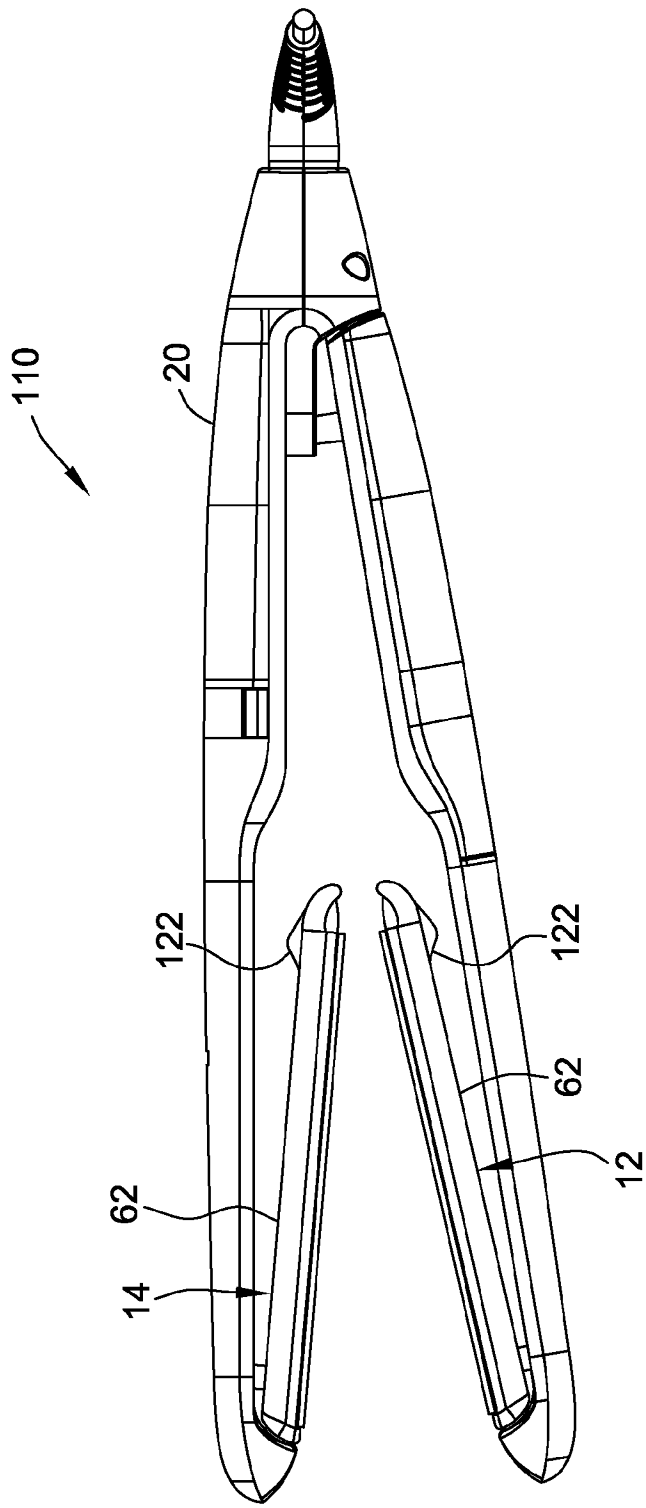


FIG. 10

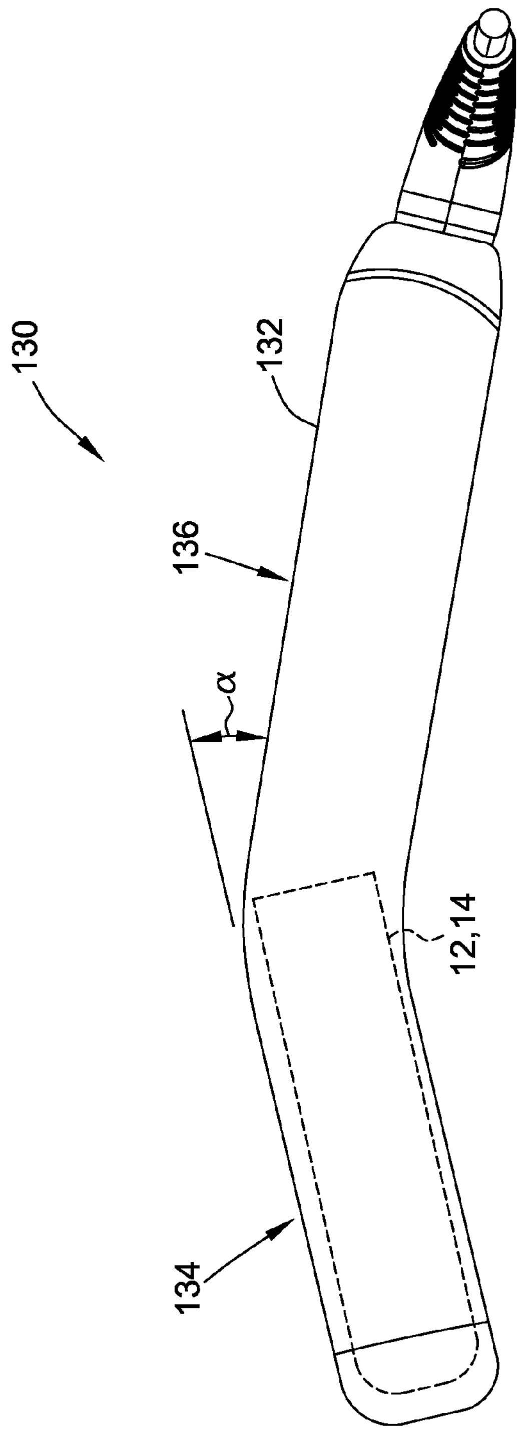


FIG. 11

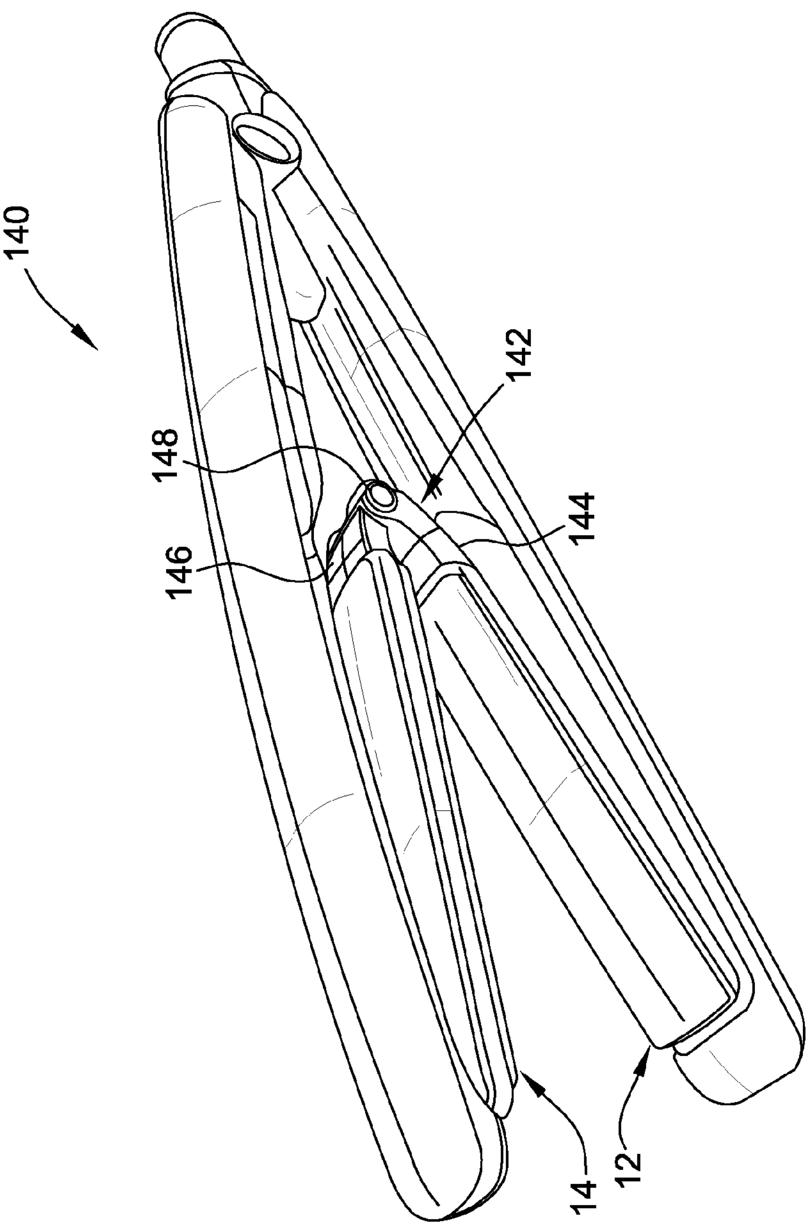


FIG. 12

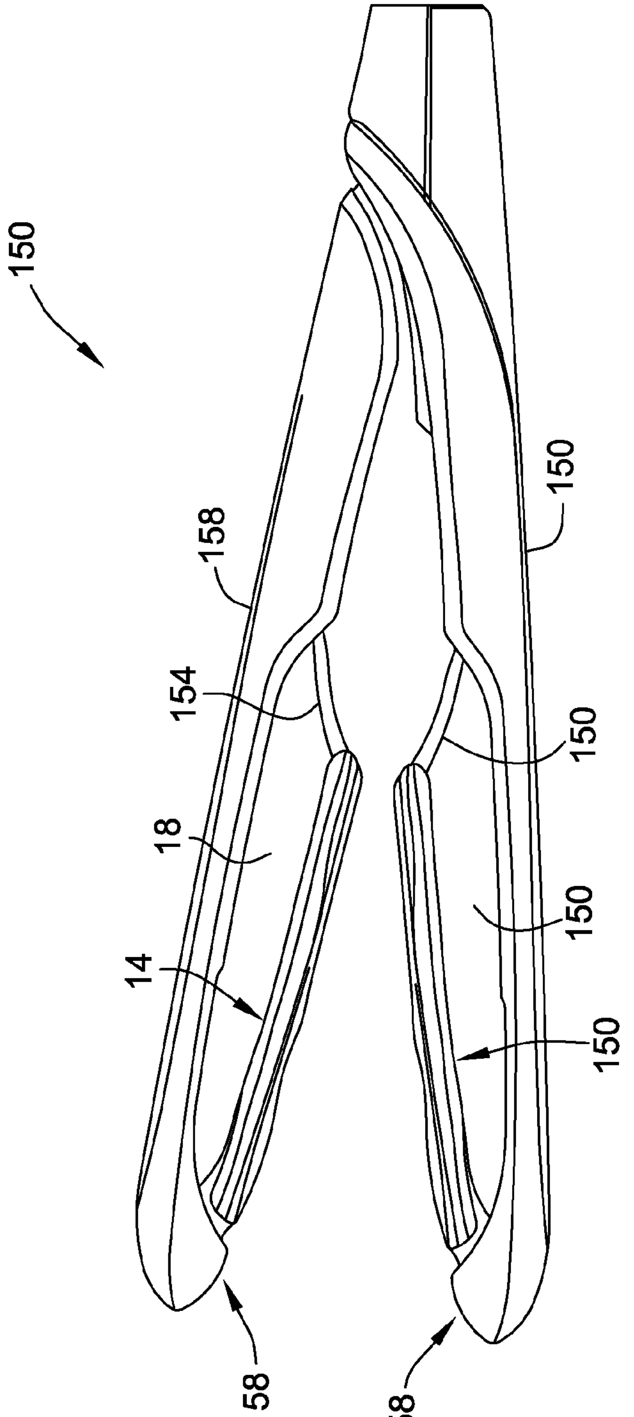


FIG. 13

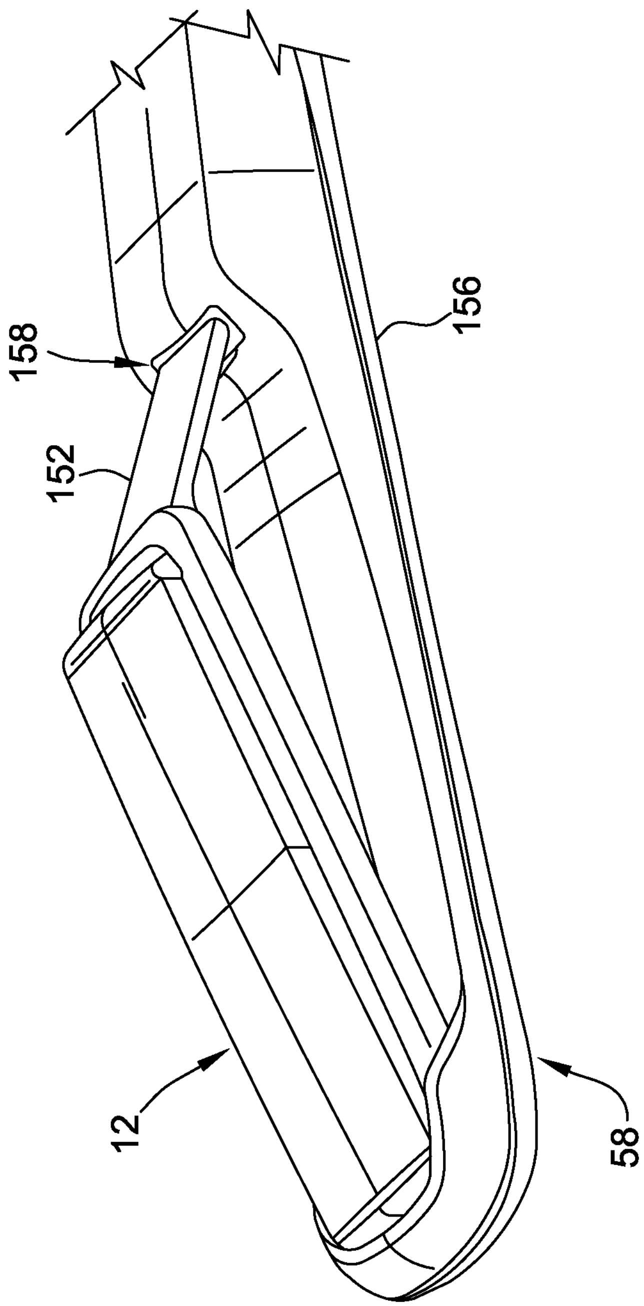


FIG. 14

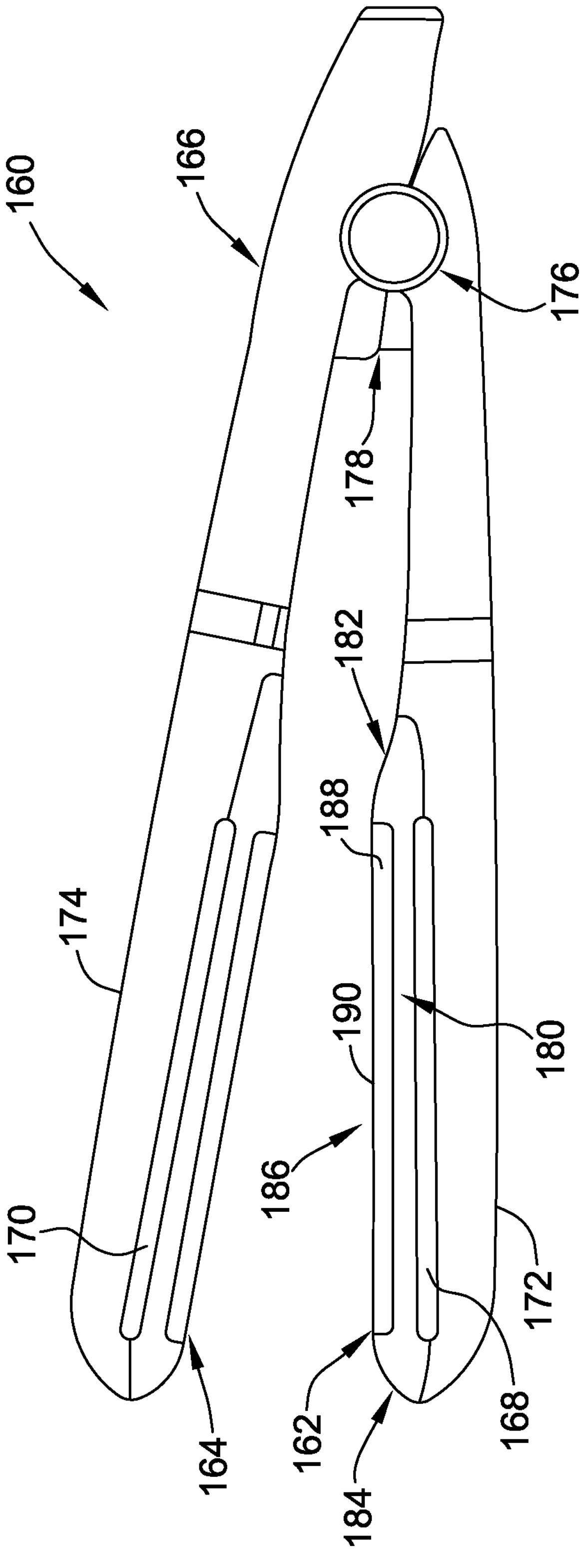


FIG. 15

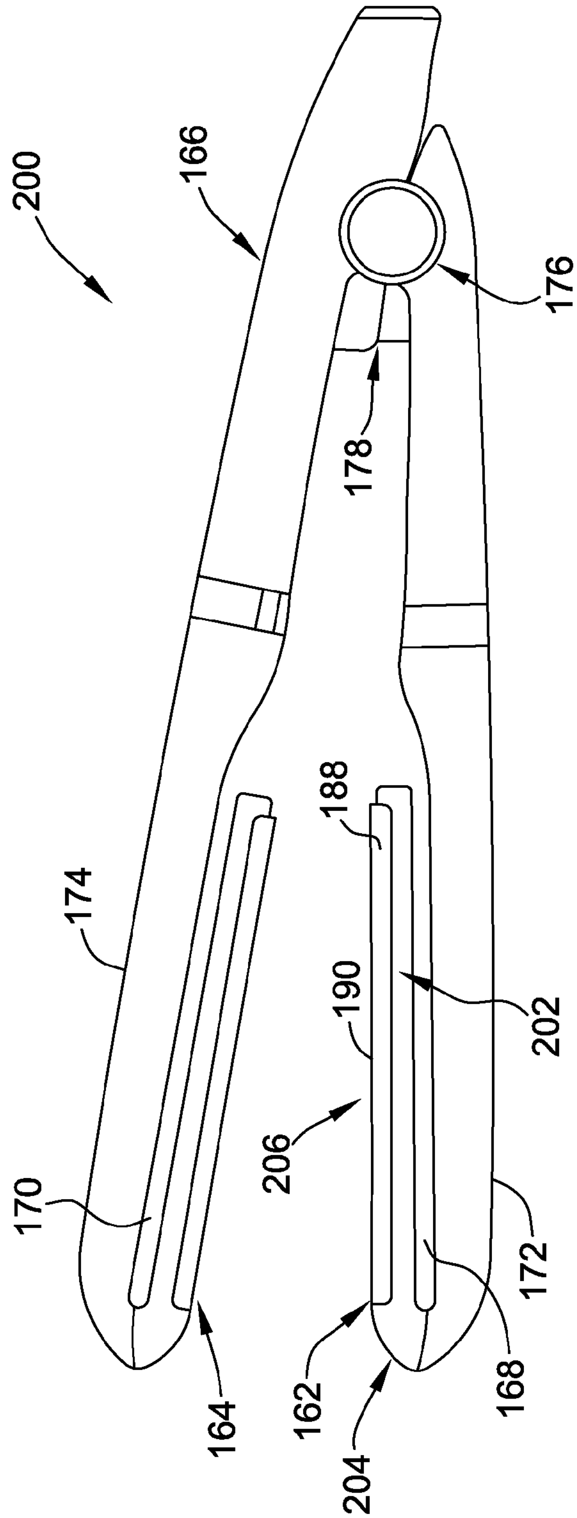


FIG. 16

HAIR STYLING APPARATUS WITH INSULATING AIR GAPS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Ser. No. 62/129,335 filed on Mar. 6, 2015, which is incorporated herein by reference in its entirety.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates generally to a hair styling apparatus, and more particularly to a hair styling apparatus having heating assemblies spaced apart from the housing by insulating air gaps.

BACKGROUND OF THE DISCLOSURE

[0003] Many different types of hair styling apparatus are available for use in styling hair, such as straightening, curling, waving or otherwise achieving a desired look. Common among such hair styling apparatus is the ability to apply heat to the hair, and in particular to provide one or more heated surfaces against which the hair to be styled is contacted during styling. For example, flat irons (which are also sometimes referred to as heated tongs or hair straighteners) often have a pair of arms that are moveable relative to each other between a closed position, in which at least portions of the arms are in close proximity to each other to hold hair therebetween, and an open position, in which the arms are spaced from each other such that the arms are generally inoperative to hold hair. A heating member with a heating surface is provided on at least one of the arms, and more typically on both of the arms. In use, the hair being styled is sandwiched between the heating surfaces of the heating members when the arms are in their closed position.

[0004] During use, at least some known flat irons do not close entirely, leaving a gap between the heating members at an end of the flat iron. In such instances, a user may grasp the free ends of the flat iron housing to squeeze the free ends of the arms together. However, due to the heating members being provided on the arms of the housing, the housing may become hot through the transfer of heat from the heating members to the arms. Thus, a user grasping the ends of the arms may experience discomfort due to the excessive heat transferred to the arms. There is a need, therefore, for a hair styling apparatus that can be grasped or otherwise manipulated near the heating members without such discomfort.

BRIEF DESCRIPTION

[0005] In one aspect, a hair styling apparatus is provided. The hair styling apparatus includes first and second arms each having respective first and second ends. The first and second arms are pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an opened position and a closed position. The hair styling apparatus also includes a heating assembly having a first and second end. The second end of the heating assembly is pivotably coupled to the second end of the first arm. The heating assembly includes a heat plate having a hair-heating surface. The heat plate is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus to define an air gap therebetween.

[0006] In another aspect, another hair styling apparatus is provided. The hair styling apparatus includes a handle having first and second arms having respective first and second ends. The first and second arms are pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an open position and a closed position. The hair styling apparatus also includes a first heating assembly having a first end and a second end. The second end of the first heating assembly is pivotably coupled to the second end of the first arm forming a cantilever. The first heating assembly is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus to define a first air gap therebetween. The hair styling apparatus also includes a second heating assembly having a first end and a second end. The second end of the second heating assembly is pivotably coupled to the second end of the second arm forming a cantilever. The second heating assembly is spaced from the second arm in both the opened position and the closed position of the hair styling apparatus to define an air gap therebetween. Moreover, the hair styling apparatus includes a resilient bridge member coupled to the first ends of the first and second heating assemblies.

[0007] In another aspect, yet another hair styling apparatus is provided. The hair styling apparatus includes first and second arms each having respective first and second ends. The first and second arms are pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an opened position and a closed position. The hair styling apparatus also includes a cantilevered first heating assembly having a first end and a second end. The second end of the first heating assembly pivotably is coupled to the second end of the first arm. The first heating assembly is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus to define a first air gap therebetween. Moreover, the hair styling apparatus includes a cantilevered second heating assembly having a first end and a second end. The second end of the second heating assembly is pivotably coupled to the second end of the second arm. The second heating assembly is spaced from the second arm in both the opened position and the closed position of the hair styling apparatus to define a second air gap therebetween. Furthermore, the hair styling apparatus includes a spring hinge. The spring hinge includes a first hinge member coupled to the first end of the first heating assembly, a second hinge member coupled to the first end of the second heating assembly and rotatably coupled to the first hinge member, and a torsion spring having a first end secured relative to the first hinge member and a second end secured relative to the second hinge member.

[0008] In yet another aspect, another hair styling apparatus is provided. The hair styling apparatus includes first and second arms each having respective first and second ends. The first and second arms are pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an opened position and a closed position. The apparatus also includes a heating assembly housing having first and second end portions and a center portion extending therebetween. At least the first end portion is coupled to the second end of the first arm. The center portion is spaced from the first arm to define an air gap therebetween. Moreover, the apparatus includes a heat plate coupled to the center portion of the heating assembly housing. The heat plate includes a hair-heating surface. The heat plate is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus.

DRAWINGS

[0009] These and other features, aspects, and advantages of the present disclosure will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

[0010] FIG. **1** is an isometric schematic of a hair styling apparatus having cantilevered heating assemblies, the hair styling apparatus being in a closed position;

[0011] FIG. **2** is a side view of the hair styling apparatus of FIG. **1** in the closed position;

[0012] FIG. **3** is an isometric schematic of the hair styling apparatus of FIG. **1** with the hair styling apparatus shown in an open position;

[0013] FIG. **4** is a side view of the hair styling apparatus of FIG. **3** in the open position;

[0014] FIG. **5** is an isometric schematic of a first arm of the hair styling apparatus of FIG. **1**;

[0015] FIG. **6** is an exploded isometric schematic of the first arm of FIG. **5**;

[0016] FIG. **7** is an exploded isometric schematic of the first arm of FIG. **5** illustrating the heating assembly exploded therefrom;

[0017] FIG. **8** is a side view of a second embodiment of a hair styling apparatus with the apparatus shown in a closed position;

[0018] FIG. **9** is a side view of a third embodiment of a hair styling apparatus illustrating bumpers coupled to a housing of the apparatus;

[0019] FIG. **10** is a side view of a fourth embodiment of a hair styling apparatus illustrating bumpers coupled to first and second heating assemblies of the apparatus;

[0020] FIG. **11** is a top view of a fifth embodiment of a hair styling apparatus with the apparatus having an angled handle;

[0021] FIG. **12** is an isometric schematic of a sixth embodiment of a hair styling apparatus with the apparatus having cantilevered heating assemblies and a spring hinge coupled therebetween;

[0022] FIG. **13** is a side view of a seventh embodiment of a hair styling apparatus with the apparatus having flexible hinges coupled to first and second heating assemblies;

[0023] FIG. **14** is a partial isometric view of an end of a lower arm assembly of the hair styling apparatus of FIG. **13**;

[0024] FIG. **15** is a side view of an eight embodiment of a hair styling apparatus having heating assemblies spaced apart from a handle of the apparatus by insulating air gaps; and

[0025] FIG. **16** is a side view of an ninth embodiment of a hair styling apparatus having heating assemblies spaced apart from a handle of the apparatus by insulating air gaps.

[0026] Unless otherwise indicated, the drawings provided herein are meant to illustrate features of embodiments of the disclosure. These features are believed to be applicable in a wide variety of systems comprising one or more embodiments of the disclosure. As such, the drawings are not meant to include all conventional features known by those of ordinary skill in the art to be required for the practice of the embodiments disclosed herein.

DETAILED DESCRIPTION

[0027] In the following specification and the claims, reference will be made to a number of terms, which shall be defined to have the following meanings. The singular forms "a", "an", and "the" include plural references unless the context clearly dictates otherwise. The terms "comprising", "including", and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. "Optional" or "optionally" means that the subsequently described event or circumstance may or may not occur, and that the description includes instances where the event occurs and instances where it does not.

[0028] Approximating language, as used herein throughout the specification and claims, may be applied to modify any quantitative representation that could permissibly vary without resulting in a change in the basic function to which it is related. Accordingly, a value modified by a term or terms, such as "about", "approximately", and "substantially", are not to be limited to the precise value specified. In at least some instances, the approximating language may correspond to the precision of an instrument for measuring the value. Here and throughout the specification and claims, range limitations may be combined and/or interchanged; such ranges are identified and include all the sub-ranges contained therein unless context or language indicates otherwise.

[0029] Referring now to the drawings and in particular to FIGS. **1-4**, FIG. **1** is an isometric schematic of a hair styling apparatus **10** having cantilevered heating assemblies **12**, **14**, with the hair styling apparatus **10** shown in a closed position. FIG. **2** is a side view of the hair styling apparatus **10** shown in the closed position. FIG. **3** is an isometric schematic of the hair styling apparatus **10** shown in an open position. FIG. **4** is a side view of the hair styling apparatus **10** shown in the open position. In the exemplary embodiment, the hair styling apparatus **10** is generally in the form of a flat iron—also referred to as a hair straightener—that is used to straighten a user's hair. The hair styling apparatus **10** includes two generally elongate cantilevered heating assemblies **12**, **14** for use in straightening the user's hair when using the apparatus. The heating assemblies **12**, **14** include opposite longitudinal ends, each having one of the longitudinal ends pivotably coupled to a handle **20** of the hair styling apparatus **10**, thereby forming the cantilever. The heating assemblies **12**, **14** are configured to maintain an air gap **16**, **18** between the heating assemblies **12**, **14**, respectively, and the handle **20**. The air gaps **16**, **18** facilitate reducing the temperature of the handle **20** when the heating assemblies **12**, **14** are producing heat.

[0030] In the exemplary embodiment, the handle **20** of the hair styling apparatus **10** is generally elongate with opposite longitudinal ends, and includes first and second arms (lower and upper arms as illustrated in FIGS. **1-4**), generally indicated at **22** and **24**, respectively. The first and second arms **22**, **24** are pivotably coupled to each other by a suitable pivot connection, generally indicated at **26**, at one of the longitudinal ends of the handle **20**. The first and second arms **22**, **24** are moveable relative to each other about a pivot axis of the pivot connection **26** such that the hair styling apparatus **10** is positionable between a closed position (FIGS. **1** and **2**) and an opened position (FIGS. **3** and **4**) of the hair styling apparatus **10**.

[0031] In one suitable embodiment, a biasing member, for example, without limitation, a compression spring **28** (shown in FIGS. **5-7**), is positioned between the first and second arms **22**, **24** adjacent the pivot connection **26**. In particular, the compression spring **28** is seated within opposing spring seats **30** (one of which is illustrated in FIGS. **3** and **4**) formed on each of the arms **22**, **24** to urge the arms toward the open position of the hair styling apparatus **10**. It is contemplated that other embodiments of the hair styling apparatus **10** may not include the compression spring **28**, but may include an alternative biasing member, for example, without limitation, a torsion spring integrated with the pivot connection **26**.

[0032] In the exemplary embodiment, the hair styling apparatus **10** includes a resilient bridge member **32** coupled between the heating assemblies **12**, **14** at each of the free longitudinal ends. The resilient bridge member **32** includes first and second support mounts **34**, **36** coupled to the respective free longitudinal ends of the heating assemblies **12**, **14**. A resilient coupling **38** is coupled to the support mounts **34**, **36** to form the resilient bridge member **32**, which extends between the heating assemblies **12**, **14** and facilitates reducing the likelihood that the user's hair will fall into the air gaps **16**, **18**. In an alternative embodiment, the resilient bridge member **32** includes a single resilient material that extends between the heating assemblies **12**, **14**. The resilient bridge member **32** can include, for example, without limitation, a thermoplastic elastomer and a thermoset elastomer. In one suitable embodiment, the resilient bridge member **32** includes a silicone-based material. Alternatively, the resilient bridge member **32** can include any resilient material that enables the resilient bridge member **32** to function as described herein. It is contemplated that other embodiments of the hair styling apparatus **10** may not include the resilient bridge member **32**, such that the free longitudinal ends of the heating assemblies **12**, **14** remain free.

[0033] In the exemplary embodiment, the second arm **24** (the upper arm as shown in FIGS. **1-4**) includes an outer shell or housing member **40** having an interior space configured to enclose various components of the hair styling apparatus **10** therein. For example, without limitation, longitudinally adjacent to the spring seat **30** is an upper cover panel **42** that together with the housing member **40** encloses a control system (not shown) for controlling operation of the hair styling apparatus **10**. The control system is configured to control, for example, power on/off and/or heat output control of the hair styling apparatus **10**. The control system is electrically coupled to a power source (not shown) via an electrical cord **44** that is coupled to the hair styling apparatus **10** rearward of the pivot connection **26**. The housing member **40** includes an integrated button **44**, which is useable by the user to operate the hair styling apparatus **10**, and an integrated display **46**, which displays pertinent information to the user.

[0034] While in the exemplary embodiment the switch **44**, the integrated display **46**, and the control system are located on the second arm **24**, it is contemplated that one or more of the switch **44**, the integrated display **46**, and the control system may instead be located on the first arm **22**. It is also contemplated that more than one switch **44** may be provided, for example, without limitation, one for powering the hair styling apparatus **10** on/off and another for controlling the amount of heat output. Alternatively, the hair styling apparatus **10** includes any number of switches that enable the hair styling apparatus **10** to function as described herein.

[0035] FIG. **5** is an isometric schematic of the first arm **22** of the hair styling apparatus **10**. FIG. **6** is an exploded isometric schematic of the first arm **22**. FIG. **7** is an exploded isometric schematic of the first arm **22** illustrating the heating assembly **12** exploded therefrom. With reference to FIGS. **5-7**, the first arm **22** includes a housing member **50** having an interior space configured to enclose various components of the hair styling apparatus **10** therein. For example, as disclosed above, the housing member **50** can include one or more of the switch **44**, the integrated display **46**, and the control system of hair styling apparatus **10**. The first arm **22** includes a cover **52** coupled to the housing **50** generally at the longitudinal end opposite the spring seat **30**. The cover **52** includes an upper surface **54** (as illustrated in FIGS. **5-7**) generally opposing the heating assembly **12**. A front cover **56** is coupled to the housing **50** to facilitate covering a revolute joint, generally indicated at **58**, formed between the first heating assembly **12** and the first arm **22**.

[0036] As shown in FIGS. **6** and **7**, in the exemplary embodiment, the revolute joint **58** includes a pin **60** that is coupled to an insulating housing **62** of the heating assembly **12**. The pin **60** is rotatably coupled to a pin receiving block **64**, which is coupled to the first arm **22**, and in particular the housing **50**. The pin receiving block **64** includes an arcuate mounting surface **66** configured to receive the pin **60** and define a pivot axis for the first heating assembly **12**. The front cover **56** includes a corresponding arcuate mounting surface (not shown) such that the pin **60** is captured between the pin receiving block **64** and the front cover **56**, thereby defining the revolute joint **58**.

[0037] In the exemplary embodiment, a biasing member, for example, without limitation, a compression spring **68** (shown in FIGS. **6** and **7**), is positioned between the first arm **22** and the first heating assembly **12** adjacent the revolute joint **58**. In particular, the compression spring **68** is seated within opposing spring seats **69** formed on each of the first arms **22** and the insulating housing **62** to urge the first heating assembly **12** away from the first arm **22**. It is contemplated that other embodiments of the hair styling apparatus **10** may not include the compression spring **68**, but may include an alternative biasing member, for example, without limitation, a resilient material, or a torsion spring integrated with the revolute joint **58**.

[0038] Referring to FIG. **7**, the insulating housing **62** of the first heating assembly **12** forms a framework in which a heat plate assembly **70** is mounted. The heat plate assembly **70** includes a heat plate **72**, a heating device **74**, and a temperature sensor **76**. The heat plate assembly **72** is generally formed as a substantially rectangular plate having a cavity or channel for receiving the heating device **74**. The heating device **74** is thermally coupled to the heat plate **72**, and upon assembly of the first heating assembly **12**, is located within the framework of the insulating housing **62**. The heating device **74** is electrically coupled to the control system via suitable wiring (not shown). The temperature sensor **76** is thermally coupled to the heating device **74** and is electrically connected to the control system. In the exemplary embodiment, the temperature sensor **76** includes a thermistor. Alternatively, the temperature sensor **76** is any type of temperature sensor that enables the hair styling apparatus **10** to function as described herein. In the exemplary embodiment, the temperature sensor **76** sends a temperature-indicating signal, indicative of the temperature of the heating device **74**, to the control system. The control system is configured to regulate the temperature of the heat plate **72** by regulating the heat output of the heating device **74** in response to the temperature-indicating signal.

[0039] In the exemplary embodiment, the heating device **74** includes one or more heaters, for example, without limitation, electrical resistance heaters, in thermal contact with the heat plate **72** to heat the heat plate during use of the hair styling apparatus **10**. In one suitable embodiment, the heating device **74** is operable to heat the heat plate **72** to a temperature of at least about 100 degrees Celsius (° C.), and may heat the heat plate **72** to a temperature of about 250° C. In another suitable embodiment, the heating device **74** is operable to heat the heat plate **72** to a temperature in the range of about 180° C. to about 230° C. It is understood that other suitable heating units or heating methods may be used to heat the heat plate **72** without departing from the scope of this invention. In the exemplary embodiment, the heat plate **72** has a hair-heating surface **78** generally opposing the second arm **24** of the hair styling apparatus **10**. The heat plate **72** may be constructed of any suitable material, such as, without limitation, metal, ceramic materials, or combinations thereof, that enable the heat plate **72** to function as described herein. The heat plate **72** can be formed in other configurations, including other shapes and sizes, without departing from the scope of this disclosure.

[0040] Referring back to FIGS. **1-4**, the upper arm or second arm **24** is constructed substantially similar to the first arm **22**. As disclosed herein, the second arm **24** includes the housing member **40** having an interior space configured to enclose various components of the hair styling apparatus **10** therein. In the exemplary embodiment, the second heating assembly **14** is pivotably coupled to the second arm **24** of the hair styling apparatus **10** and is constructed substantially the same as the first heating assembly **12** pivotably coupled to the first arm **22**. A heat plate **80** of the second heating assembly **14** has a hair-heating surface **82** generally opposing the hair-heating surface **78** of the first heating assembly **12**. The first and second heating assemblies **12**, **14** each include substantially similar heating devices and temperature sensors. For example, in the exemplary embodiment, the first and second heating assemblies **12**, **14** each include the heating device **74** and the temperature sensor **76**.

[0041] In operation, the heating devices **74** of the respective heating assemblies **12**, **14** of the first and second arms **22**, **24** pivot about a longitudinal end of the respective arms so that in the closed position of the hair styling apparatus **10**, the hair-heating surfaces **78**, **82** sandwich hair therebetween. The cantilever configuration of the heating assemblies **12**, **14** operates to maintain the insulating air gaps **16**, **18**, respectively, between the heating assemblies **12**, **14** and the first and second arms **22**, **24**, respectively. This facilitates reducing the heat transferred from the heating devices **72** to the first and second arms **22**, **24**. In the open position of the hair styling apparatus **10**, the hair-heating surfaces **78**, **82** of the heating devices **74** are spaced apart from each other a sufficient distance to allow the introduction of hair between the hair-heating surfaces while maintaining the air gaps **16**, **18**.

[0042] FIG. **8** is a side view of a second embodiment of a hair styling apparatus **100** with the apparatus shown in the closed position. The basic configuration of the hair styling apparatus **100** is substantially similar to the hair styling apparatus **10**, and as such, like characters represent like parts throughout the drawings. The hair styling apparatus **100** includes the cantilevered heating assemblies **12**, **14** for use in straightening the user's hair when using the apparatus. The heating assemblies **12**, **14** include opposite longitudinal ends, each having one of the longitudinal ends pivotably coupled to the handle **20** of the hair styling apparatus **100**, thereby forming the cantilever. The heating assemblies **12**, **14** are configured to maintain the air gaps **16**, **18** between the heating assemblies **12**, **14**, respectively, and the handle **20**.

[0043] In the exemplary embodiment, the handle **20** of the hair styling apparatus **100** includes first and second arms **22**, **24** (lower and upper arms as illustrated in FIG. **8**). The first and second arms **22**, **24** are pivotably coupled to the heating assemblies **12**, **14**, respectively, via resilient end pieces **102**, **104**, respectively. In the exemplary embodiment, the resilient end pieces **102**, **104** are constructed and assembled substantially the same, thus only the lower arm assembly of the hair styling apparatus **100** will be discussed. The resilient end piece **102** is formed as a U-shaped component and is coupled to a longitudinal end of the first arm **22** and the longitudinal end of the first heating assembly **12**. The U-shaped end piece **102** is configured to locate the first heating assembly **12** away from the arm **22**, thereby maintaining the air gap **16** therebetween. As the hair styling apparatus **100** is moved from an opened position to a closed position, the end piece **102** flexes, enabling the first heating assembly **12** to pivot about the longitudinal end of the first arm **22**. While in the various embodiments of the hair styling apparatus the connection between the first and second arms **22**, **24** and the heating assemblies **12**, **14** is pivotable, or flexible, it is understood that the connection can be a fixed connection that retains the heating assemblies **12**, **14** in a spaced relationship with the first and second arms **22**, **24**, as is further described herein.

[0044] In the exemplary embodiment, the resilient end piece **102** of the hair styling apparatus **100** is formed from a single resilient material, extending between the first arm **22** and the heating assembly **12**. The resilient end piece **102** can include, for example, without limitation, a thermoplastic elastomer and a thermoset elastomer. Alternatively, the resilient end piece **102** can include any resilient material that enables resilient end piece **102** to function as described herein. In one suitable embodiment, the resilient end piece **102** includes a silicone-based material. In another suitable embodiment, the resilient end piece **102** is formed as a U-shaped tube, thereby facilitating passing electrical wires (not shown) therethrough such that the control system can be electrically coupled to the first heating assembly **12**. In another suitable embodiment, the resilient end piece **102** is formed as a solid component, having the electrical wires mold therein.

[0045] In the exemplary embodiment, the hair styling apparatus **100** includes a resilient bridge member **106** coupled between the heating assemblies **12**, **14** at each of the free longitudinal ends, generally opposite the resilient end pieces **102**, **104**. The resilient bridge member **106** is substantially C-shaped and is formed from a single resilient material. The resilient bridge member **106** can include, for example, without limitation, a thermoplastic elastomer, a thermoset elastomer, and a fabric-based material. In one suitable embodiment, the resilient bridge member **106** includes a silicone-based material. Alternatively, the resilient bridge member **106** can include any resilient material that enables the resilient bridge member to function as described herein. In one suitable embodiment, the resilient bridge member **106** is formed substantially the same as the resilient bridge member **32** of the embodiment of FIGS. **1-7**, and includes the first and second support mounts (not shown in FIG. **8** but similar to support mounts **34**, **36** of FIGS. **1-7**) coupled to the free longitudinal end of the heating assemblies **12**, **14**, respectively. A resilient coupling (not shown in FIG. **8** but similar to resilient coupling **38** of FIGS. **1-7**) is coupled to the support mounts to form the resilient bridge member **106**. The resilient bridge member **106** facilitates reducing the likelihood that the user's hair will fall into the air gaps **16**, **18**. It is contemplated that other embodiments of the hair styling apparatus **100** may not include the resilient bridge member **106**.

[0046] FIG. **9** is a side view of a third embodiment of a hair styling apparatus **110** illustrating bumpers **112** coupled to the housing **20**. In particular a bumper **112** is coupled to each of the first and second arms **22**, **24** proximate the free ends of the first and second heating assemblies **12**, **14**, respectively. The bumpers **112** can be integrally formed with the first and second arms **22**, **24**, or can be mechanically coupled thereto. In the exemplary embodiment, the bumpers **112** are formed from a resilient material, for example, without limitation, a thermoplastic elastomer or a thermoset elastomer. In one suitable embodiment, the bumpers **112** include a silicone-based material coupled to the first and second arms **22**, **24**, respectively. In the exemplary embodiment, the bumpers **112** are configured to maintain the air gaps **16**, **18** between the heating assemblies **12**, **14**, respectively, and the handle **20**. The air gaps **16**, **18** facilitate reducing the temperature of the handle **20** when the heating assemblies **12**, **14** are producing heat.

[0047] In the exemplary embodiment, the hair styling apparatus **110** includes an alternative biasing member **114** positioned between the first arm **22** and the first heating assembly **12**, and the second heating assembly **14** and the second arm **24**, respectively. The biasing member **114** is positioned between the heating assemblies **12**, **14** and the arms **22**, **24**, respectively, to urge the heating assemblies **12**, **14** away from the arms **22**, **24**, respectively. In the exemplary embodiment, the biasing members **114** are formed from a resilient material, for example, without limitation, a thermoplastic elastomer or a thermoset elastomer. In one suitable embodiment, the biasing members **114** include a silicone-based material.

[0048] FIG. **10** is a side view of a fourth embodiment of a hair styling apparatus **120** illustrating bumpers **122** coupled to the first and second heating assemblies **12**, **14**. In the exemplary embodiment, a bumper **122** is coupled to each of the heating assemblies **12**, **14** proximate the free ends of the first and second heating assemblies **12**, **14**, respectively. The bumpers **122** can be integrally formed with the insulating housing **62** of the first and second heating assemblies **12**, **14**, or can be mechanically coupled thereto. In the exemplary embodiment, the bumpers **122** are formed from a resilient material, for example, without limitation, a thermoplastic elastomer or a thermoset elastomer. In one suitable embodiment, the bumpers **122** include a silicone-based material coupled to the first and second heating assemblies **12**, **14**, respectively. In the exemplary embodiment, the bumpers **122** are configured to the maintain air gaps **16**, **18** between the heating assemblies **12**, **14**, respectively, and the handle **20**. The air gaps **16**, **18** facilitate reducing the temperature of the handle **20** when the heating assemblies **12**, **14** are producing heat.

[0049] FIG. **11** is a top view of a fifth embodiment of a hair styling apparatus **130** with the apparatus having an angled handle **132**. In the exemplary embodiment, the hair styling apparatus **130** is substantially similar to the hair styling apparatus **10**, except that the angled handle **132** includes an angle α proximate the free longitudinal ends of the first and second heating assemblies **12**, **14** such that a first portion **134** of the angled handle **132** defines and angle in the range of about 15 degrees to about 90 degrees relative to a second portion **136** of the angled handle **132**.

[0050] FIG. **12** is an isometric schematic of a sixth embodiment of a hair styling apparatus **140** having the cantilevered heating assemblies **12**, **14**, and a spring hinge **142** coupled therebetween. In the exemplary embodiment, the spring hinge **142** includes a first hinge member **144** coupled to the free end of first heating assembly **12**. A second hinge member **146** is rotatably coupled to the first hinge member **144**, and is coupled to the free end of the second heating assembly **14**. A torsion spring **148** includes a first end (not shown) secured relative to the first hinge member **144**, and a second end (not shown) secured relative to the second hinge member **146**. The torsion spring **148** is configured to bias the first hinge member **144** toward the second hinge member **146**, thereby facilitating maintaining the air gaps **16**, **18** when the hair styling apparatus **140** is moved between a closed position and an opened position.

[0051] FIG. **13** is a side view of a seventh embodiment of a hair styling apparatus **150** illustrating flexible hinges **152** and **154** coupled to the first and second heating assemblies **12**, **14**, respectively. FIG. **14** is a partial isometric view of an end of a lower arm assembly **156** of the hair styling apparatus **150**. In the exemplary embodiment, the first heating assembly **12** is pivotably coupled to the lower arm assembly **156** of the hair styling apparatus **150** via the revolute joint **58** located proximate a longitudinal end of the lower arm assembly **156**. The flexible hinge **152** is pivotably coupled to the free end of the first heating assembly **12** and extends into the lower arm assembly **156** through an opening **158** therein. The flexible hinge **152** is configured to slide into the lower arm assembly **156** as the hair styling apparatus **150** is moved from an opened position to a closed position. The flexible hinge **152** facilitates reducing the likelihood that the user's hair will fall into the air gap **16** during use of the hair styling apparatus **150**. The upper arm assembly **158** and the lower arm assembly **156** are substantially identical, and therefore, for ease of explanation, only the lower arm assembly **156** is described in detail herein, with the understanding that the features of the lower arm assembly **156** apply equally to the upper arm assembly **158**.

[0052] FIG. **15** is a side view of an eight embodiment of a hair styling apparatus **160** having heating assemblies **162**, **164** spaced apart from a handle **166** of the apparatus by insulating air gaps **168**, **170**. In the exemplary embodiment, the hair styling apparatus **160** includes two generally elongate heating assemblies **162**, **164** for use in straightening the user's hair when using the apparatus. The heating assemblies **162**, **164** are coupled to handle **166** of the hair styling apparatus **160** such that insulating air gaps **168**, **170** are defined between the respective heating assemblies **162**, **164** and the handle **166**. The air gaps **168**, **170** facilitate reducing the temperature of the handle **166** when the heating assemblies **162**, **164** are producing heat.

[0053] In the exemplary embodiment, the handle **166** of the hair styling apparatus **160** is generally elongate with opposite longitudinal ends, and includes first and second arms (lower and upper arms as illustrated in FIG. **15**), generally indicated at **172** and **174**, respectively. The first and second arms **172**, **174** are pivotably coupled to each other by a suitable pivot connection, generally indicated at **176**, at one of the longitudinal ends of the handle **166**. The first and second arms **172**, **174** are moveable relative to each other about a pivot axis of the pivot connection **176** such that the hair styling apparatus **160** is positionable between a closed position (not shown) and an opened position (FIG. **15**) of the hair styling apparatus **160**.

[0054] In the exemplary embodiment, a biasing member, for example, without limitation, a compression spring (not shown but similar to compression spring **28** of FIGS. **5-7**), is positioned between the first and second arms **172**, **174** adjacent the pivot connection **176**. In particular, the compression spring is seated within opposing spring seats **178** formed on each of the arms **172**, **174** to urge the arms toward the opened position of the hair styling apparatus **160**. It is contemplated that other embodiments of the hair styling apparatus **160** may not include the compression spring, but may include an alternative biasing member, for example, without limitation, a torsion spring integrated with the pivot connection **176**.

[0055] In the exemplary embodiment, a heating assembly housing **180** is coupled to the first arm **172** and forms a bridge with the first arm **172** to define the air gap **168**. In particular, first and second end portions **182**, **184** of the housing **180** are coupled to first arm **172** such that a center portion **186** of the housing **180** is spaced from the first arm **172** to define the insulating air gap **168**. The center portion **186** of the housing **180** includes a framework in which a heat plate **188** is mounted. In one suitable embodiment, the heat plate **188** is rigidly mounted to the housing **180**. In other embodiments, the heat plate **188** is flexibly mounted to the housing **180** such that heat plate is moveable in a direction generally perpendicular to a hair-heating surface **190** of the heat plate **188**. In one suitable embodiment, the flexibly mounted heat plate **188** has a travel distance of about 1 millimeter.

[0056] In the exemplary embodiment, the heat plate **188** is substantially identical to the heat plate assembly **70** of FIGS. **6**, **7**. Alternatively, the heat plate **188** can be any type of heating device that enables hair styling apparatus **160** to function as described herein. The first arm assembly **172** and the second arm assembly **174** are substantially identical, and therefore, for ease of explanation, only the first arm assembly **172** is described in detail herein, with the understanding that the features of the first arm assembly **172** apply equally to the second arm assembly **174**.

[0057] In operation, the heating assemblies **162**, **164** of the first and second arms **172**, **174** are positioned so that in the closed position of the hair styling apparatus **160** they sandwich hair therebetween. The bridge configuration of the heating assemblies **162**, **164** and the first and second arms **172**, **174**, respectively, functions to define the insulating air gaps **168**, **170**, respectively. The air gaps facilitate reducing the heat transferred from the heating assemblies **162**, **164** to the first and second arms **172**, **174**.

[0058] FIG. **16** is a side view of a ninth embodiment of a hair styling apparatus **200** having heating assemblies **162**, **164** spaced apart from the handle **166** of the apparatus by the insulating air gaps **168**, **170**. In this embodiment, a heating assembly housing **202** is coupled to the first arm **172** and forms a fixed cantilever structure with the first arm **172** to define the air gap **168**. In particular, an end portion **204** of the housing **202** is coupled to first arm **172** such that a center portion **206** of the housing **202** is spaced from the first arm **172** to define the insulating air gap **168**. The first arm assembly **172** and the second arm assembly **174** are substantially identical, and therefore, for ease of explanation, only the first arm assembly **172** is described in detail herein, with the understanding that the features of the first arm assembly **172** apply equally to the second arm assembly **174**. Furthermore, other elements of the hair styling apparatus **200** are substantially similar to the elements of the hair styling apparatus **160** of FIGS. **15**.

[0059] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

[0060] As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A hair styling apparatus comprising:

first and second arms each having respective first and second ends, the first and second arms being pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an opened position and a closed position; and

a heating assembly having a first and second end, the second end of the heating assembly being pivotably coupled to the second end of the first arm, the heating assembly comprising a heat plate having a hair-heating surface, wherein the heat plate is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus to define an air gap therebetween.

2. The hair styling apparatus set forth in claim **1**, wherein the heating assembly is pivotably coupled to the first arm by a revolute joint.

3. The hair styling apparatus set forth in claim **2**, wherein the revolute joint comprises a pin coupled to the insulating housing and a pin receiving block coupled to the first arm, the pin receiving block comprising a mounting surface configured to receive the pin to define a pivot axis for the heating assembly.

4. The hair styling apparatus set forth in claim **1**, wherein the heating assembly is pivotably coupled to the first arm using a resilient coupling.

5. The hair styling apparatus set forth in claim **1** further comprising a biasing member configured to bias the heating assembly away from the first arm.

6. The hair styling apparatus set forth in claim **5**, wherein the biasing member comprises a compression spring positioned between the first arm and the heating assembly.

7. The hair styling apparatus set forth in claim **5**, wherein the biasing member comprises a resilient material positioned between the first arm and the heating assembly adjacent the second end of the first arm.

8. The hair styling apparatus set forth in claim **1** further comprising a bumper positioned between the heating assembly and the first arm, the bumper configured to maintain the air gap in the closed position of the hair styling apparatus.

9. The hair styling apparatus set forth in claim **1**, wherein the heating assembly further comprises an insulating housing configured to enclose at least a portion of the heat plate.

10. A hair styling apparatus comprising:

a handle having first and second arms having respective first and second ends, the first and second arms being pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an opened position and a closed position;

a first heating assembly having a first end and a second end, the second end of the first heating assembly being pivotably coupled to the second end of the first arm forming a cantilever, wherein the first heating assembly is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus to define a first air gap therebetween;

a second heating assembly having a first end and a second end, the second end of the second heating assembly being pivotably coupled to the second end of the second arm forming a cantilever, wherein the second heating assembly is spaced from the second arm in both the opened position and the closed position of the hair styling apparatus to define a second air gap therebetween; and

a resilient bridge member coupled to the first ends of the first and second heating assemblies.

11. The hair styling apparatus set forth in claim **10**, wherein the resilient bridge member comprises at least one of an elastomer, a thermoset plastic, a thermoplastic, a fabric-based material, and a natural polymer.

12. The hair styling apparatus set forth in claim **10**, wherein the resilient bridge member is mechanically coupled to the first ends of the first and second heating assemblies using a mechanical fastener.

13. The hair styling apparatus set forth in claim **10**, wherein the resilient bridge member is formed integrally to the first ends of the first and second heating assemblies.

14. The hair styling apparatus set forth in claim **10**, wherein the resilient bridge member comprises a spring hinge having a first hinge member coupled to the first end of the first heating assembly, a second hinge member rotatably coupled to the first hinge member and coupled to the first end of the second heating assembly, and a torsion spring configured to bias the first hinge member toward the second hinge member.

15. The hair styling apparatus set forth in claim **10**, wherein the handle includes an angle proximate the first end of the first and second heating assemblies such that a first portion the handle defines and angle in the range between about 15 degree and about 90 degrees to a second portion of the handle.

16. A hair styling apparatus comprising:

first and second arms each having respective first and second ends, the first and second arms being pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an opened position and a closed position;

a cantilevered first heating assembly having a first end and a second end, the second end of the first heating assembly being pivotably coupled to the second end of the first arm, wherein the first heating assembly is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus to define a first air gap therebetween;

a cantilevered second heating assembly having a first end and a second end, the second end of the second heating assembly being pivotably coupled to the second end of the second arm, wherein the second heating assembly is spaced from the second arm in both the opened position and the closed position of the hair styling apparatus to define an air gap therebetween; and

a spring hinge comprising:

- a first hinge member coupled to the first end of the first heating assembly;
- a second hinge member coupled to the first end of the second heating assembly and rotatably coupled to the first hinge member; and
- a torsion spring having a first end secured relative to the first hinge member and a second end secured relative to the second hinge member.

17. A hair styling apparatus comprising:

first and second arms each having respective first and second ends, the first and second arms being pivotably coupled to each other at least at the first end of the first arm for selective, pivotal movement relative to each other to selectively configure the hair styling apparatus between an opened position and a closed position; and

a heating assembly housing having first and second end portions and a center portion extending therebetween, at least the first end portion being coupled to the second end of the first arm, the center portion being spaced from the first arm to define an air gap therebetween;

a heat plate coupled to the center portion of the heating assembly housing, the heat plate having a hair-heating surface, wherein the heat plate is spaced from the first arm in both the opened position and the closed position of the hair styling apparatus.

18. The hair styling apparatus set forth in claim **17**, wherein the second end portion of the heating assembly is coupled to the first arm of the hair styling apparatus.

19. The hair styling apparatus set forth in claim **17**, wherein the heat plate is rigidly coupled to the heating housing assembly.

20. The hair styling apparatus set forth in claim **17**, wherein the heat plate is flexibly mounted to the heating housing assembly.

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