

A Hair Styling Appliance

The present invention relates to a hair styling appliance. Heated hair styling appliances are designed to use the action of heat and, optionally mechanical means to form hair
5 into a desired shape or style.

In particular the present invention relates to a heating plate for a hair straightener, otherwise known as a hair styling iron. Hair straighteners conventionally include two articulated arms which are pivotally attached to each other at one end and to which one
10 or more heating plates are attached at the other end. Where both arms have a heating plate they are generally positioned on inner opposed surfaces of the arms. The heating plates generally have hair contacting surfaces which are designed to come into contact with hair to be styled during use of the hair straighteners. Such a straightener can be seen in WO2014/056957.

15 Heating plates for hair straighteners are conventionally made from a solid metal, ceramic or a combination of the two. They are also often resiliently mounted to the arm of the hair straightener such that they can move up and down or rock slightly as hair is pressed between the two arms. These resilient mounts help to ensure that hair pressed
20 between the heating plates isn't subjected to too much pressure. They can also help to ensure that the plates remain flat and parallel during use. An example of such a resilient mounting can be seen in EP2745728.

In order to reduce the damage to hair caused by over compression, hair straighteners
25 have been described where the heating plate, or an opposed surface which contacts the heating plate is segmented to help it conform to the hair which is pressed between the arms of the straightener. Examples of such schemes are shown in EP2745728 and US2011/0083695. A problem does exist with such schemes however in that strands of hair can get trapped between the segments during use of the hair straightener.

It is therefore desirable to provide an improved heating plate and hair straightener.

A first aspect of the present invention therefore provides a heating plate for a hair styling appliance, the heating plate having a length a depth and a width, the heating plate comprising a first continuous hair facing surface and a second surface opposite the first surface, the heating plate comprising at least one groove which run across the width of the heating plate, each groove extends from the second surface towards the first surface and allows the heating plate to flex.

This invention is advantageous because the at least one groove allows the heating plate to flex but the first continuous hair facing surface ensures that hair does not get trapped. The word “continuous” means that the first surface has no joints and is unbroken. The first surface is preferably formed from a single piece. In a preferred embodiment there may be a plurality of grooves.

In a preferred embodiment the first surface is smooth. In a preferred embodiment the first surface may be flat. It is possible that the first surface could be slightly curved or have an undulating surface as long as it is continuous. In a particular embodiment the heating plate may be rectangular in shape.

In a particularly preferred embodiment the whole heating plate may be monolithic.

A layer is preferably formed between the first surface and the top of each of the grooves. The layer may have a depth (D2) of from 0.001mm to 1mm. In a preferred embodiment the depth (D2) may be from 0.01mm to 0.1mm. Most preferably the depth (D2) of the layer is 0.05mm. This layer is preferably thin enough to be able to flex.

The depth (D1) of the heating plate may be from 0.01, or 0.06, or 0.5, or 1, or 3 to 5, or 7, or 10mm. In a particular embodiment the depth (D1) of the heating plate may be from 0.06mm to 2cm. In a most preferred embodiment the depth (D1) of the heating

plate is 3mm. Preferably the ratio between the depth (D2) of the layer and the depth (D1) of the heating plate is 1:60.

In a particular embodiment there are from 20, or 30, or 40, or 50 to 60, or 70, or 80, or 90 to 100 grooves. In a preferred embodiment there are 80 grooves. Each groove 16 may be from 0.01, 0.1, or 0.2, or 0.3, or 0.4 to 0.5, or 0.6, or 0.7, or 0.8, or 0.9 mm wide. Ideally each groove is 0.4mm wide. The heating plate is preferably from 20, or 40, or 60, to 80, or 100, or 125, or 150 to 200mm in length. Ideally the heating plate is 90mm in length.

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Walls are preferably present on each side of each groove and the walls define the grooves. The walls are preferably from 0.01, or 0.2, or 0.4, or 0.6, or 1 to 1.2, or 1.4, or 1.6, or 2mm wide. Preferably the walls are 0.6 mm wide. In a particularly preferred embodiment the walls are wider than the grooves as this helps to increase the thermal mass of the heating plate.

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The heating plate may be formed from any suitable material, for example Aluminium, Copper, Steel, Titanium or Beryllium Copper. The heating plate can be manufactured using any suitable method. The layer may be formed in one piece and the walls may then be added to the layer to form the heating plate. Alternatively the whole heating plate may be formed in one piece and may therefore be monolithic.

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The heating plate may be formed using any suitable technique, for example by the use of extrusion, casting, wire cutting, computer numerical control machining (CNC), laser cutting, water jets, electro discharge machining (EDM), precision electro chemical machining (PECM) or additive manufacture.

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The heating plate may further comprise a first channel which runs along the length of a side of the heating plate. Preferably a first channel is arranged on both sides of the heating plate. The first channel(s) ideally house a first strip of material which is softer

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than the remainder of the heating plate. It may have a shore value which is lower than the shore value of the heating plate. The first strip of material may be arranged to protrude slightly from the first channel such that the top of the first strip of material is level with the first surface of the heating plate. This first strip of material can therefore
5 act as a protective smooth edge.

The heating plate may also further comprise a second channel which runs along the length of a side of the heating plate. Ideally a second channel will be arranged on both sides of the heating plate. The second channel(s) preferably house a resilient member.
10 The resilient member may be a strip of resilient material which runs the length of the second channel(s). Alternatively the resilient member may be one or more springs located within the second channel(s). The resilient member is also preferably less conductive than the heating plate. The resilient member advantageously may help to allow the heating plate to flex when pressure is applied to the first surface of the heating
15 plate. The resilient member may help to allow local flexing of an area of the heating plate.

In a particular embodiment the heating plate may further comprise an elongate recess formed in the second surface. The elongate recess may extend the full length (L) of the
20 heating plate.

A second aspect of the present invention provides a hair straightener comprising a heating plate as described above. In a preferred embodiment the hair straighteners comprise first and second arms which are connected such that they can move between
25 an open position and a closed position for the purpose of gripping hair.

Such hair straighteners are advantageous over prior hair straighteners because whilst the heating plate is flexible and therefore hair being straightened is subjected to controlled pressure, the first continuous hair facing surface is formed in one piece and therefore

hairs cannot become trapped. This may advantageously reduce hair breakage and may improve the final style of the straightened hair.

5 Ideally each arm has a heating plate arranged such that the first continuous hair facing surfaces are opposed and are brought together when the arms are moved into the closed position. In a particular embodiment only one of the heating plates may have the structure described above. The additional plate may be a rigid plate or a rigid plate which is resiliently mounted. However in a preferred embodiment both of the heating plates may have the structure described above and they may both therefore be capable
10 of flexing.

In order that the present invention may be more readily understood, an embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

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Figure 1 is a side view of a hair straightener according to the present invention;

Figure 2 is a top view of the hair straightener shown in Figure 1;

20 Figure 3 is a section through line G – G shown in Figure 2;

Figure 4a is a close up of the area H shown in Figure 3;

25 Figure 4b is a perspective view of the hair straighteners shown in Figure 1 with the arms in the closed position;

Figure 4c is a perspective view of the hair straighteners shown in Figure 1 with the arms in the open position;

Figure 5 is a top view of a heating plate according to a first embodiment, showing the hair contacting surface;

Figure 6a is a side view of the heating plate shown in Figure 5;

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Figure 6b is an enlarge view of a portion of the heating plate shown in Figure 6a;

Figure 6c shows the heating plate shown in Figure 5 and 6 flexing under pressure;

10 Figure 7 is a view of the underside of the heating plate shown in Figures 5 and 6;

Figure 8 is a top view of a heating plate according to a second embodiment, showing the hair contacting surface;

15 Figure 9 is a side view of the heating plate shown in Figure 8;

Figure 10 is a view of the underside of the heating plate shown in Figures 8 and 7;

20 Figure 11 is a plan view of a plate carrier having a heating plate as shown in Figures 8 to 10;

Figure 12 is a side view of the plate carrier shown in Figure 11;

25 Figure 13 is a section through the plate carrier shown in Figure 12 taken along line E-E;

Figure 14 is an end view of the plate carrier shown in Figures 11 to 13;

Figure 15 is a perspective view of the plate carrier shown in Figures 11 to 14;

Figure 16 is a section through the plate carrier shown in Figure 11 taken along the line D-D;

5 The hair straightener 1 shown in Figures 1 to 4c can be seen to comprise a first arm 2 and a second arm 4 which are joined together at one end by a hinge 6. A power supply cable 8 is located at the hinge end of the hair straightener.

Each arm 2, 4 further comprises a heating plate 10 located at the end of the arm furthest from the hinge 6. Wiring 9 from the power supply cable 8 connects to a PCB 11 which
10 controls the hair straighteners 1. Each heating plate 10 has a hair contacting surface 12 and an opposed outer surface 14. The hair contacting surfaces 12 on each plate 10 are arranged such that they face each other. The arms 2, 4 are hinged such that they can move between an open position, as shown in Figure 4c, where the hair contacting surfaces 12 are spaced apart and a closed position, as shown in Figure 4b, where the hair
15 contacting surfaces 12 are brought together such that hair to be straightened can be held between the hair contacting surfaces 12.

Figures 5 to 7 show a first embodiment of the heating plate 10 which may be located on each arm 2, 4 of the hair straightener 1.

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It can be seen that the heating plate 10 has a smooth hair contacting surface 12 which is formed in a single piece and in the embodiment shown is flat. The hair contacting surface 12 is rectangular in shape. The heating plate 10 may be formed from any suitable material which can transfer heat from the heating plate 10 to the hair to be
25 straightened. Examples of suitable materials are metals and alloys of metals such as Aluminium, Copper, Steel, Titanium and Beryllium Copper.

The heating plate 10 has an opposed surface 14 which is opposite the hair contacting surface. The whole heating plate 10 is ideally formed in one piece or from one piece of
30 material. The heating plate 10 can be seen to have a length (L) a depth (D1) and a width

- (W). The heating plate 10 can be seen to have a plurality of grooves 16 each of which runs across the full width (W) of the heating plate 10. Each groove 16 extends from the opposed surface 14 towards the hair contacting surface 12. The grooves 16 stop short of the hair contacting surface 12. The grooves 16 allow the heating plate 10 to flex. This flexing can be seen in Figure 6c. It can be seen that when a downward force (F) is applied to the hair contacting surface 12, for example when a tress of hair 19 is sandwiched between the first arm 2 and the second arm 4 and the arms 2, 4 are pressed together, the heating plate 10 flexes.
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- 10 A layer 20, shown best in Figure 6b, of the heating plate 10, is formed between the top 18 of the grooves 16 and the hair contacting surface 12. This layer has a depth (D2) of from 0.001mm to 1mm, ideally the depth (D2) is 0.05mm. The depth (D1) of the heating plate 10 is from 0.01mm to 10cm. Ideally the depth (D1) of the heating plate 10 is 3mm. Preferably the ratio between the depth (D2) of the layer 20 and the depth (D1) of the heating plate 10 is 1:60.
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- Preferably there are from 20 to 100 grooves 16. In a preferred embodiment there are 80 grooves. Each groove 16 may be from 0.01 to 10 mm wide. Ideally each groove is 0.4mm wide. Walls 22 are present on each side of each groove 16. The walls 22 help to define the grooves 16. The walls 22 are preferably from 0.01 mm to 10mm wide. Preferably the walls 22 are 0.6 mm wide. In a particularly preferred embodiment the walls 22 are wider than the grooves 16 as this helps to increase the thermal mass of the heating plate 10.
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- 25 The heating plate 10 is preferably from 20mm to 200mm in length. Ideally the heating plate 10 is 90mm in length.

The heating plate 10 can be manufactured using any suitable method. The layer 20 may be formed in one piece and the walls may then be added to the layer 20 to form the

heating plate 10. Alternatively the whole heating plate 10 may be formed in one piece and may therefore be monolithic.

Suitable methods of manufacture include the use of extrusion, casting, wire cutting, computer numerical control machining (CNC), laser cutting, water jets, electro discharge machining (EDM), precision electro chemical machining (PECM) and additive manufacture.

A second embodiment of the heating plate 10 can be seen in Figures 8 to 10. The heating plate 10 in these figures has the same basic structure as in the first embodiment but it has a few additional features.

In Figure 9 it can be seen that a first channel 24 runs along the length of the side of the heating plate 10. A first channel 24 is preferably arranged on both sides of the heating plate 10. The first channel 24 is bounded by a first protruding wall 26 which runs parallel to the hair contacting surface 12 and a second protruding wall 28 which runs parallel to the first protruding wall. The first protruding wall 26 on each side can be seen in the plan view shown in Figure 8. The first channel 24 on each side of the heating plate 10 is arranged to house a first strip of material 30. The first strip of material 30 preferably has a lower shore value than the remainder of the heating plate 10. The first strip of material 30 can be seen in Figure 13. It can be seen in Figure 13 that the first strip of material 30 protrudes slightly from the first channel 24 such that the top of the first strip of material 30 is level with the hair contacting surface 12 of the heating plate 10. This first strip of material 30 can therefore act as a smooth, soft edge to the hair contacting surface 12. This may help to protect a user during use of the hair straightener 1 as the edge will be softer than the remainder of the hair contacting surface 12.

In Figure 9 it can be seen that a second channel 32 runs along the length of the side of the heating plate 10. A second channel 32 is preferably arranged on both sides of the

heating plate 10. The second channel 32 is bounded by the second protruding wall 28 and a third protruding wall 34 which runs parallel to the first 26 and second 28 protruding walls. The second channel 32 on each side of the heating plate 10 is arranged to house a resilient member 36. The resilient member 36 is also preferably
5 less conductive than the heating plate 10. Ideally the resilient member 36 is formed from silicone rubber. The resilient member 36 is preferably in the form of a strip of material which runs the length of the second channel 32. The resilient member 36 may alternatively may be formed from one or more springs arranged along the length of the second channel 32. The resilient member 36 acts to allow the heating plate 10 to flex
10 when pressure is applied to the hair contacting surface 12, for example when hair to be straightened is clamped between the first and second arms 2, 4 of the hair straightener 1. The resilient member 36 in the form of a strip of material can be seen in Figure 13.

From Figures 10 and 13 to 15 it can be seen that an elongate recess 38 is formed in the
15 opposed surface 14 of the heating plate 10. This elongate recess 38 extends the full length (L) of the heating plate 10 and is bordered on its two long sides by a fourth 42 and a fifth 44 protruding wall.

In Figures 13 to 16 it can be seen that a heater 46 is located in the elongate recess 38
20 such that it is pressed against the opposed surface 14 of the heating plate 10. The heating plate 10 and heater 46 are mounted on a plate carrier 48. A resilient member, for example one or more springs 50 are mounted inside the plate carrier 48. The spring(s) 50 act to push the heater 46 against the opposed surface 14 of the heating plate 10. A first end 52 of the spring(s) 50 contacts the inner surface 54 of the plate carrier 48
25 and a second end 56 of the spring(s) 50 contact the heater 46. The aim is to maximise the amount of contact between the heater 46 and the opposed surface 14 of the heating plate 10.

The plate carrier 48 can be seen in more detail in Figures 11 to 17. The plate carrier 48
30 has an elongate lower wall 58 and a pair of elongate side walls 60 which extend

upwardly from each side of the elongate lower wall 58. The elongate side walls 60 then turn towards the centre of the plate carrier 48 running parallel to the elongate lower wall 58 to provide first runners 62. These first runners 62 can engage with corresponding second runners 64 which are located on the free ends of the fourth and fifth protruding walls 42, 44. These first and second runners 62, 64 run the length (L) of the heating plate 10 and the plate carrier 48 and allow the heating plate 10 to be slid into position on the plate carrier 48 during construction. It can be seen that the second runners 64 are located underneath the first runners 62. This means that the heating plate 10, or a portion of it, can be moved toward the lower wall 58 against the action of the spring(s) 50 and the resilient members 36, if pressure is applied to the hair contacting surface 12 of the heating plate 10.

It can be seen in Figures 11, 12, 14 and 16 that the plate carrier 48 further comprises a pair of tabs 66 which are protrude outwardly from the lower wall 58 of the plate carrier 48. These tabs 66 are designed to engage with the arms 2, 4 of the hair straightener. Figures 3 and 4 show a pair of plate carriers 48 engaged in position on the hair straightener 1. One plate carrier 48 is engaged on the first arm 2 and one plate carrier 48 is engaged on the second arm 4. The tabs 66 engage on the arms 2, 4 behind forward retaining means 68 and rearward retaining means 70 located on the arms 2, 4 of the hair straightener 1. Each arm 2, 4 also has a plurality of resilient supports 72 which are located between the lower walls 58 of the plate carriers 48 and the inner wall 74 of the arms 2,4. These resilient supports 72 may be made of a resilient material for example silicone rubber or they may be in the form of springs. The resilient supports 72 allow the plate carriers 48 to move slightly if subjected to pressure. This means that in addition to the heating plates 10 being able to flex under pressure, they may also move as one piece towards the inner wall 74 of the arms 2, 4.

CLAIMS

1. A heating plate for a hair styling appliance, the heating plate having a length a depth and a width, the heating plate comprising a first continuous hair facing surface and a second surface opposite the first surface, the heating plate comprising at least one groove which runs across the width of the heating plate, each groove extends from the second surface towards the first surface and allows the heating plate to flex.
2. A heating plate according to claim 1, wherein there are a plurality of grooves which run across the width of the heating plate, each groove extends from the second surface towards the first surface and allows the heating plate to flex.
3. A heating plate according to claim 1 or 2, wherein the first surface is flat.
4. A heating plate according to any of claims 1 to 3, which is monolithic.
5. A heating plate according to any preceding claim, wherein the first surface is rectangular in shape.
6. A heating plate according to any preceding claim, formed from Beryllium Copper.
7. A heating plate according to any preceding claim, wherein a distance between the first surface and the top of each of the grooves is depth (D2).
8. A heating plate according to claim 7, wherein depth (D2) is from 0.001mm to 1mm.
9. A heating plate according to claim 8 wherein depth (D2) is from 0.01mm to 0.1mm.

10. A heating plate according to claim 8 or 9, wherein the ratio between depth (D2) and the depth (D1) of the heating plate is 1:60.

5 11. A heating plate according to any preceding claim, wherein there are from 20 to 100 grooves.

12. A heating plate according to any preceding claim, wherein walls are present on each side of each groove and the walls define the grooves.

10 13. A heating plate according to claim 12, wherein the walls are wider than the grooves.

14. A heating plate according to any preceding claim, further comprising a first channel which runs along the length of a side of the heating plate.

15 15. A heating plate according to claim 14, having a first channel arranged on both sides of the heating plate.

16. A heating plate according to claim 14 or 15, wherein the first channel(s) house a first strip of material which is less conductive than the remainder of the heating plate.

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17. A heating plate according to any of claims 14 to 16, further comprising a second channel which runs along the length of a side of the heating plate.

25 18. A heating plate according to claim 17, having a second channel arranged on both sides of the heating plate.

19. A heating plate according to claim 17 or 18, wherein the second channel(s) house a resilient member.

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20. A heating plate according to claim 19, wherein the resilient member is a strip of material which runs the length of the second channel(s).

5 21. A heating plate according to any preceding claim, further comprising an elongate recess formed in the second surface.

22. A heating plate according to claim 21, wherein the elongate recess extends the full length (L) of the heating plate.

10 23. A hair straightener comprising the heating plate according to any preceding claim.

24. A hair straightener according to claim 23, further comprising first and second arms which are connected such that they can move between an open position and a
15 closed position for the purpose of gripping hair.

25. A hair straightener according to claim 23 or 24 wherein at least one of the arms has the heating plate.

20 26. A hair straightener according to claim 25 wherein both arms have the heating plate.