

This invention relates to a heating unit for an appliance, in particular for personal use, according to the prior-art portion of the main claim. A heating unit of this type is already known from DE-A1 27 27 940. This heating unit includes a conductor strip fastened to the plates of the supporting body. Two substantially inelastic legs of the conductor strip provide a slot of substantially constant width. This slot in the conductor strip is flush with a slot in the plate. The heating spiral is received in the slots and is electrically connected to the conductor strip by means of a rivet. The electrical connection between the heating spiral and the conductor strip is accordingly accomplished by the use of an additional fastening element which involves a further operation subsequent to the termination of the winding operation. The manufacture of a heating unit of this type is thus comparatively costly and time-consuming, in addition to necessitating complicated tools.

UK Patent Application GB-A 20 84 840 discloses a heating unit for an electric toaster in which the heating spiral is carried in grooves in the backing plate and in which apertures are provided in the backing plate to accomplish a uniform distribution of heat. Voltage taps are not provided in this heating unit.

AT-B 162 348 shows a sectional heater in which, with a view to enabling the heater to be subjected to a maximum possible load, the heating spiral has the major part of its length carried in grooves. The heater is constructed such that the ceramic heat conductor carriers are arranged between ceramic roll bodies which are filed on a flexible, heat-resisting core and are adapted to roll off relative to each other when the core is flexed, with the shape of the carriers being conformed to the roll bodies with very little clearance only, and with the roll bodies being configured such that, in combination with the heat conductor carriers in the presence of maximum possible engagement, an arrangement results preventing relative twisting of all parts. However, this specification equally relates only to the location of the heating spiral on the carrier body and not to a special configuration of voltage taps.

From U.S. Patent No. US-A 1 686 059 an electric heating unit is disclosed which includes in particular structural means in order to prevent accidental grounding of the heating spiral to the plate supporting the heating unit. To this end, the massive supporting blocks are provided with an undercut recess into which the helically

wound heating wire is inserted. This specification does not suggest a special configuration of voltage taps, because voltage taps are not provided on this heating unit.

Finally, it is generally known in a hair dryer to provide further voltage taps in addition to the power supply connections of the heating spiral of a heating unit, the taps having their terminals connected to the heating wire by crimping or welding. Voltage taps that necessitate manufacture at such high cost and complexity are normally only necessary in cases where the transfer of high power of, for example, up to two kilowatts, is involved (DE-A1 28 37 316).

By contrast, it is an object of the present invention to provide a simplified configuration and arrangement of a voltage tap of a heating unit which incorporates the features of the prior-art portion of the main claim.

This object is accomplished by a heating unit incorporating the features of the main claim. Because the slot opening is tapered in the direction of the inner chamber of the heating unit and the two legs are configured as resilient members for clampingly receiving the heating spiral, a voltage tap affording ease of manufacture is obtained, while on the other hand the electrical connection to the heating spiral may be accomplished without requiring additional operations or additional fastening material. Because the voltage taps are connected to the plates, the heating spiral is capable of threading into the tapering slot openings of the voltage taps during the winding operation, being clampingly held therein by the resilient legs without any further means.

Advantageously, the slot opening of the voltage tap lies in approximately the plane in which also the individual V-shaped openings provided on the outer leading edges of the supporting body are arranged for receiving the heating spiral. In order to establish a perfect contact between the legs and the heating spiral, the voltage taps or their legs are of a resilient structure, causing them to rest firmly against the surface of the heating spiral. The resilient structure of the legs is advantageously obtained by causing the slot opening to widen slightly from its narrowest point, so that the legs are somewhat narrower in the area of the enlargement than the remaining part.

A good clamping effect is also obtained in that an

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elongated slot formed of the opposite parallel edges of the legs adjoins the V-shaped slot opening. By bending the legs apart, the heating spirals can be introduced into this elongated slot, enabling a good contact to be established between the legs and the spirals.

In a further embodiment of the invention, the voltage taps are advantageously made of flat rib members, for example, of sheet-metal strips, with the surfaces of the individual legs being in V-shaped relative alignment, thus affording a simple means of improving the stiffness of the legs. This prevents the legs from being twisted out of their plane when the heating spiral is introduced into the slot opening, which would result in an insufficient contact between the legs and the heating spiral.

In order to enable the heating spiral to be introduced into the slot openings of the voltage taps in a simple manner, the opposite edges of the legs which form the V-shaped slot opening extend advantageously on a radius of curvature, that is, they taper inwardly in arc shape, and the outer ends of the legs are equally radiused.

Further advantageous embodiments of the invention will become apparent from the subclaims.

The invention will now be described in more detail in the following with reference to the accompanying drawings illustrating only one embodiment. In the drawings,

FIG. 1 is a side view of a supporting body having at its respective ends V-shaped indentations for receiving the heating spiral of a heating unit;

FIG. 2 is a side view of the supporting body formed of two plates;

FIG. 3 is a partial view of the plate-shaped supporting body including the voltage taps arranged on the surface thereof which are provided with conically tapering slot openings; and

FIG. 4 is a top plan view of a plate of the supporting body with the associated voltage taps angled in V-shape.

Referring now to the drawings, reference numeral 2 designates a heating unit of a hair dryer having associated to it a fan motor not shown in the drawings. The heating unit 2 is comprised of two plates 4 and 6 fitted

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into each other and extending at relative right angles, providing a supporting body 8 for receiving a heating spiral 12. For this purpose, the plates 4 and 6 may be equipped with longitudinal slots in their respective centers, enabling the plates to be fitted into each other in a simple manner.

As becomes apparent particularly from FIG. 1, the plates 4, 6 have at their outer leading edges a plurality of closely contiguous V-shaped indentations 10 combining to form a serrate profile. The indentations 10 serve to receive the heating spiral 12 which, as becomes apparent from FIG. 2, follows a zigzag course, enabling the outer arcs 14 of the heating spiral 12 to be hooked in the indentations 10 of the supporting body 8. In the embodiment shown, the heating unit 2 is comprised of a single heating spiral 12. However, it is also possible to provide a heating unit 2 comprising multiple heating spirals. At the leading and trailing end of the heating spiral 12 a respective connector structure 20 is provided which is connected through a respective electrical lead 22 and a switch to a plug not shown in the drawings, so that with the switch in the appropriate position electricity may be supplied to the heating unit 2.

In order to transfer high power in the range of, for example, one to two kilowatts to the heating unit 2, the initial and end connectors 20 of the heating unit, that is, the connector structures 20, require a relatively large area to prevent damage from occurring at the contact point of the connector structure with the heating spiral 12 on account of the high currents to be transferred. For this purpose, the ends of the connector structures 20 are provided with two small rib members 41 extending towards each other in U-form and receiving therebetween a short length of the heating spiral 12. By crimping the rib members 41, a perfect connection covering a large area is established between the connector structure 20 and the heating spiral 12, preventing the contact point from overheating due to the prevailing electric current density and becoming damaged as a result.

As becomes apparent from FIGS. 1 and 3, further voltage taps 30 for the transfer of lower electrical power are provided in addition to the two connector structures 20. For example, the voltage taps 30 serve the function of supplying electricity to a fan motor which is designed for a wattage substantially lower than the wattage of the heating unit 2. For example, the wattage of the fan motor may be in the range of between

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10 and 100 watts. Thus, with a maximum permissible electric current density, it is also possible for the contacting areas of the heating spiral 12 and the voltage tap 30 to be smaller than the contacting areas between the connector structures 20 or the end taps and the heating spiral 12. The voltage taps are adapted to be connected to the fan motor by means of respective electrical leads 24.

The voltage taps 30 for the fan motor are fixedly arranged on the surface of the plate 4 and have at their respective ends conically tapering slot openings 32 each formed of two opposite rib members or legs 35 arranged in a plane. The opposite edges 34 of the legs 35 include a curvature, tapering inwardly in arc shape, thus enabling the heating spiral 12 to be introduced into the slot opening 32 in a simple manner. The radius of curvature is substantially smaller in the area of the outer end of the leg 35, causing the leg to have a blunt tip 36. Adjoining the edges 34 are two edges 38 extending parallel to each other whose relative distance is substantially smaller than the relative distance of the edges 34. At the narrowest point 39 of the slot opening, the two parallel edges 38 continue in an enlargement 40 which is bounded by an arc 42 or an inner edge. In the area of the enlargement 40, the width of the leg 35 is smaller than in the area of the edge 38. This results in a resilient arrangement of the two legs 35, enabling them to be bent apart slightly as the heating spiral 12 is introduced. Following insertion of the heating spiral 12 in the slot opening 32, the edges 38 will press against the surface of the heating spiral 12, thus establishing a perfect or sufficient contact between the surface of the heating spiral 12 and the edges 38 and 34 of the leg 35 by the action of pressure and/or cutting in.

Warping or twisting of the two legs 35 out of their plane is prevented in that the two surfaces 44 are in V-shaped arrangement relative to each other, forming an obtuse angle α which is slightly smaller than 180° . This is a simple means of increasing the stiffness of the two legs 35 and prevents tilting of the two legs as the heating spiral 12 is introduced into the slot opening 32. The stiffness of the legs may also be obtained by providing the legs with a different, for example, undulating shape.

Owing to the advantageous configuration of the voltage taps 30 and their arrangement in a plane on the surface of the plate 4, a significant cost reduction may be realized, because a single operation is needed for winding the heating spiral 12 onto the plates 4 and at the same time also onto the voltage taps 30. This eliminates the need for the conventional crimping or welding operation of the voltage taps 30 to the heating spiral 12. The end tap or connector structure 20 and also the voltage tap 30 may be manufactured of thin metal sheeting in a simple manner, for example, by stamping. The stamping operation may also be used simultaneously for producing the slot opening 32. Equally, it is possible to align the two surfaces 44 at a relative angle during the stamping operation.

In the use of a plurality of voltage taps 30, it has proved to be particularly advantageous that, subsequent to the stamping of the plurality of voltage taps 30 in a single operation, connections are maintained between the individual voltage taps 30 which are not severed until after the voltage taps 30 are mounted on the plate (4, 6). This enables a bank of voltage taps to be assembled with extreme ease.

Patent Claims

1. A heating unit (2) for an appliance, in particular for personal use, with plates (4, 6) which provide a supporting body (8) about which a heating spiral (12) is wound, with a voltage tap (30) which is fastened to a plate (4, 6) and includes a slot opening (32) which extends from a leading edge of a plate (4, 6) to an inner chamber of the heating unit (2) and is formed of two legs (35) for receiving the heating spiral (12), characterized in that the slot opening (32) is tapered in the direction of the inner chamber of the heating unit (2) and that the two legs (35) are of a resilient structure for clampingly receiving the heating spiral (12).

2. The heating unit as claimed in claim 1, characterized in that the slot opening (32) is conically tapered.

3. The heating unit as claimed in claim 1, characterized in that the slot opening (32) is V-shaped and that the narrowest point (39) of the slot opening continues in an enlargement (40).

4. The heating unit as claimed in at least one of the preceding claims, characterized in that edges (34) of the slot opening (32) which extend towards each other in V-shape continue in two sides or edges (38) which are in parallel arrangement to each other and which in turn continue in an enlargement (40).

5. The heating unit as claimed in claim 4, characterized in that the mean diameter of the enlargement (40) has a value which is greater than the relative distance of the parallel edges (38) and smaller than the relative distance of the outer ends (36) of the edges (34) of the slot opening (32) extending towards each other in V-shape.

6. The heating unit as claimed in at least one of the preceding claims, characterized in that the voltage taps (30) are formed of flat legs (35) which are equipped with reinforcement members.

7. The heating unit as claimed in claim 6, characterized in that the reinforcement members are formed by twisting the legs (35) about their longitudinal axes.



8. The heating unit as claimed in claim 7, characterized in that the surfaces (44) of the legs (35) are in V-shaped arrangement relative to each other and form an angle (α) which is slightly smaller than 180° .

9. The heating unit as claimed in at least one of the preceding claims, characterized in that the two legs (35) are symmetrically aligned relative to a longitudinal center axis which coincides with a further longitudinal center axis of V-shaped indentations (10) provided in the supporting bodies (8), with the indentations (10) serving the function of receiving the heating spiral (12).

10. The heating unit as claimed in at least one of the preceding claims, characterized in that the edges (34) of the slot opening (32) taper inwardly in arc shape.

11. The heating unit as claimed in claim 3, characterized in that outer ends (36) of the legs (35) are radiused.

12. The heating unit as claimed in claim 1, characterized in that a plurality of voltage taps (30) are arranged in a plane on a single plate (4, 6).

13. The heating unit as claimed in at least one of the preceding claims, characterized in that in the use of a plurality of voltage taps (30) connections remain between the individual voltage taps (30) which are not severed until after the voltage taps (30) are mounted on the plate (4, 6).

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