

IMPROVEMENTS RELATING TO ELECTRICAL APPLIANCES

This invention concerns improvements relating to mains powered electrical appliances and more particularly concerns mains powered electrical appliances of the so-called cordless type which comprise a base part and an appliance part, the base part being adapted to be connected to the mains electrical supply by means of an electrical lead and incorporating a connector part adapted to mate electrically with a complementary connector part provided on the appliance part when the appliance is disposed in the appropriate orientation upon the base, such mating of the connector parts providing for the powering from the mains electrical supply of electrically-operated means, such as a heating element for example, in the appliance part. Such cordless appliances will hereinafter be referred to as mains powered cordless appliances of the kind described and include cordless water-boiling vessels and cordless smoothing irons for example.

The rationale for cordless water-boiling vessels resides in the fact that the appliance part, namely the vessel, can be removed from the base simply by lifting it off the base and is then unfettered by any attachment to an electrical lead. The electrical lead connecting the base to the mains electrical supply, by way of a plug and a socket outlet, can be kept short for the sake of safety without impairing the freedom of movement of the vessel, and the risks that are

conventionally involved with a conventional water boiling vessel in unplugging the lead from the vessel when it is filled with boiling water are completely obviated.

5 In order that the vessel part of a cordless water-boiling vessel may be readily lifted off the base without any tendency for the base also to lift with the vessel part, it is necessary that the electrical contacts that are established when the
10 connector parts provided in the base and in the vessel mate with each other are relatively low-pressure spring contacts as opposed, for example, to the high-pressure contacts that are utilized in a 13 amp plug and socket outlet combination. Since only relatively
15 low-pressure contacts can be utilized, it is considered to be desirable to utilize silver-tipped connectors in order to obtain the requisite low resistance connections between the base part and the vessel part. In the case where, as is not unusual,
20 the vessel part incorporates an element protection control adapted to disconnect the supply of electrical power to the heating element in the vessel in the event of the vessel element overheating by virtue of the vessel being switched on when dry or being
25 permitted to boil dry (assuming that the vessel contains no steam-sensing automatic switch-off device)

and/or incorporates a steam-sensing automatic switch-off device, such devices themselves will conventionally also include silver-tipped contacts so that the number of silver-tipped contacts in the overall appliance is significant and represents a significant cost component to the appliance manufacturer. In the highly competitive domestic appliance market all cost components must of necessity be rigorously scrutinized and the present invention stems from an effort to reduce the silver contact content of a cordless water boiling appliance.

In the currently known cordless water boiling appliances, the vessel part has three male terminal pins projecting therefrom and the base part has female sockets for receiving the terminal pins when the vessel part is set down upon the base, the pins each entering a respective socket and contacting a respective spring terminal within the socket. As outlined above, the terminal pins are conventionally tipped with silver and the contact springs each carry a cooperating silver terminal part. In accordance with an embodiment of the present invention, and as will be explained fully hereinafter, the arrangement is substantially inverted as compared with the conventional arrangement, the live and neutral terminal pins at least being provided in the base within a displaceable safety cover such as to

ensure that the pins cannot be accessed when the vessel part is removed from the base, and the vessel part incorporating contact springs adapted to mate electrically with the terminal pins when the vessel and
5 base are brought together.

In an arrangement embodying the present invention and which is similar in some respects to the arrangement disclosed in Figures 3A, 3B and 3C of our British Patent Application No. 8717871 (Serial No. 2194099), the
10 contact springs in the vessel part are incorporated into a fail-safe type of element protection control device wherein primary protection against overheating of the heating element of the vessel is provided by means of a bimetal coupled to one of the contact springs and
15 arranged to move the spring to break the contact when the bimetal responds to an overtemperature and fail-safe (or secondary) protection is provided by virtue of the positions of one or other or both of the contact springs being dependent upon the condition of a thermally
20 collapsible member in thermal contact with a head portion of the heating element. A steam-sensing device is preferably also provided in the vessel and, in accordance with the teachings of our British Patent Specification No. 2212664, may be coupled to the element
25 protection control device by means of a Bowden cable or other mechanical arrangement and makes use for its

switching apparatus of switch contacts provided in the element protection control device, the steam-sensing device per se being non-electrical and having no electrical contact.

5 The present invention is not limited to cordless water boiling appliances and, accordingly, the present invention more generally provides a mains powered cordless electrical appliance of the kind described wherein the appliance part is adapted to be rested upon
10 the base part whereupon electrical connection is made between the respective parts, the base part being provided with male connector parts and the appliance part being provided with complementary connector parts for connecting to the male connector parts when the
15 appliance part is rested on the base part, the male connector parts in the base part being enclosed within a displaceable cover for restricting access to said male connector parts when the appliance part is not seated upon the base part, and the cover being displaceable by
20 the setting down of the appliance part onto the base part for enabling the connector parts in the base part to project through the cover and mate with those in the appliance part when the appliance part is set down onto the base part.

25 Further features and aspects of the invention are set forth in the appended claims and they, together with advantages thereof, will be better understood from

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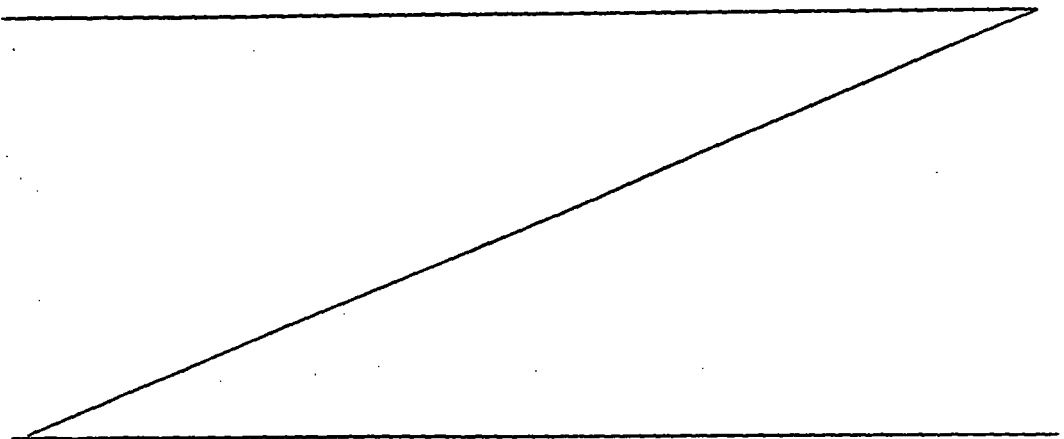
consideration of the following description which is given with reference to the accompanying drawings wherein:

5 Figure 1 is a schematic showing of the interrelationship between the base part and the vessel part of a cordless water boiling vessel in accordance with an exemplary embodiment of the present invention;

10 Figure 2 is a more structural but yet in part schematic, representation of how the schematic arrangement of Figure 1 might be obtained in practice; and

15 Figure 3 is a schematic representation of an exemplary displaceable safety cover arrangement for the base part of a cordless water boiling vessel in accordance with the aforementioned exemplary embodiment of present invention.

20 Referring to Figures 1 and 2, these show in an essentially schematic manner how the base part and the appliance part of a cordless water boiling vessel cooperate with each other, the appliance part being



7.

provided with an element protection device and a steam sensing device, the former being adapted to switch off the supply of electric power to the heating element in the vessel part in response to sensed overheating of the same and the latter being adapted to switch off the supply of electric power to the heating element when steam is generated in response to water boiling in the vessel. As shown in Figure 1, the base part of the appliance is provided with terminal pins 1 and 2 coupled to the mains electrical supply by means of an electrical lead, and the vessel part is provided with spring terminals 3 and 4 adapted to make electrical contact with the terminal pins 1 and 2 when the vessel part is set down upon the base part. As will be described in the following, the base part also has an earth spring (not shown in Figure 1) adapted to be contacted by an earth terminal pin 5 (see Figure 2) provided in the vessel part when the vessel part is set down upon the base. Schematically shown in Figures 1 and 2 is the head plate 6 of an electrical heating element of generally conventional type having a looped heating element proper (not shown) on one side thereof with the hot return portion of the element brazed to the element head and with element cold tails projecting through the head plate, and it will be understood that in the arrangement shown in

8.

Figures 1 and 2 the element cold tails are biased into contact with the leaf springs 3 and 4 so that the heating element can be powered from the terminal pins 1 and 2 via the leaf springs 3 and 4. As shown in 5 Figure 1, the terminal pins 1 and 2 are tipped with silver contacts and the leaf springs 3 and 4 carry cooperating silver contacts.

As shown in Figure 2, the arrangement is inverted as compared to its showing in Figure 1, and it will be 10 appreciated that whereas the heating element proper will be on the upper side of the head plate 6 as viewed in Figure 1 it will be on the lower side of the head plate as viewed in Figure 2. On the opposite side of the head plate to the heating element proper 15 there is provided a four-legged carrier 7 formed of moulded plastics material which is biased towards contact with the surface of the head plate by means of a schematically-illustrated spring 8. A bimetallic blade 9 of snap-acting type is mounted at the ends of 20 the four legs of the carrier 7 so as to be responsive to the temperature of the element head plate 6 in the regions thereof where the element proper hot return portion is brazed to the opposite side of the element head. A lever arm 10 is coupled at one end to the 25 centre of the bimetal 9 and is pivotally connected to the carrier 7, and at its opposite end carries an

9.

abutment 11 which engages the leaf spring 3. The carrier 7 furthermore is formed with a cross-beam 12 having end portions 13 and 14 with respective abutments 15 and 16 engaging the leaf springs 3 and 4 respectively. A further pivoted lever 17 has an abutment 18 engaged with the leaf spring 4 and is coupled by means of a Bowden cable 19 to a steam sensing device (not shown) which can be of any convenient form and might for example be as described in our British Patent Specifications Nos. 2194099 and 2212664 abovementioned.

The arrangement as shown in Figures 1 and 2 operates similarly to the arrangement of Figures 3A, 3B and 3C of our British Patent Specification No. 2194099. In normal operation, the terminal pins 1 and 2 will contact the leaf springs 3 and 4 for supplying electric power to the heating element of the vessel part of the appliance. In the event of the heating element overheating, for example on account of the appliance being switched on when there is no water in the vessel, the bimetal 9 will respond to the increase in the temperature of the element head by snapping into its opposite curvature condition, and the bimetal movement will be transformed by the lever 10 and abutment 11 into a movement of the leaf spring 3 such as to break the contact between the leaf spring 3 and

terminal pin 1 thereby disconnecting the heating element from the electrical power supply. In the event that the element temperature should continue to rise, for whatever reason, a secondary or fail-safe mode of protection comes into play when the moulded plastics carrier 7 begins to melt and collapses towards the element head under the action of the spring 8 thereby causing the abutments 15 and 16 to operate upon the leaf springs 3 and 4 so as to disconnect the heating element from the power supply. When the steam sensor operates in response to water boiling in the vessel, the lever 17 will be operated via the Bowden cable 19 and the abutment 18 will operate upon the leaf spring 4 so as to disconnect the heating element from the power supply.

Referring now to Figure 3, the arrangement schematically shown is a displaceable cover and shutter to be incorporated into the base part of the appliance to ensure that the terminal pins 1 and 2 are not accessible when the vessel part of the appliance is removed from the base part. As shown, the terminal pins 1 and 2 are mounted on a terminal block 20 in the base part 21 together with an earth terminal 22 in the form of a contact-carrying leaf spring. An upper base cover part 23 has an aperture formed therein and a cover moulding 24 is mounted in the aperture so as to

be displaceable downwardly against the action of schematically-illustrated springs 25, openings being provided in the upper surface of the cover 24 in registry with the pins 1 and 2 and with the earth contact. A shutter 26 is provided within the cover 24 and is provided, firstly, with a cam surface 27 adapted to be contacted by the schematically-illustrated earth pins 5 of the arrangement provided in the vessel part of the appliance when the vessel part is set down upon the base part, the camming action of the cam surface 27 serving to move the shutter 26 bodily leftwards so as to bring openings formed in the shutter into registry with the terminal pins and with the earth contact, and, secondly, with an abutment 28 which serves to lock the cover moulding 24 against downward displacement until such time as the shutter has been opened. The shutter 26, as shown, is mounted within the cover moulding 24 by virtue of the provision of a spring foot 29 attached to the lowermost edge of the shutter, such spring foot providing the shutter with the requisite degree of freedom of movement. A latch member 30 is provided in the cover 24 as shown, and is adapted to be released when the vessel part is set down onto the base, thereby permitting the cover moulding 24 to be depressed.

Whilst Figure 3 is merely schematic, it will be appreciated that the act of setting the vessel part of the appliance down onto the base part will cause the earth pin 5 to cam the shutter 26 open and release the latch 30 thereby enabling the cover moulding 24 to be depressed so that the terminal pins 1 and 2 will project through the openings in the cover and will contact the leaf springs 3 and 4 provided in the vessel part, and the earth terminal 5 in the vessel part will project down through the cover moulding and into contact with the earth terminal spring 22 provided in the base part of the appliance.

From the foregoing it will be appreciated that a cordless water boiling vessel can be provided with an element protection control and an automatic steam sensing control without requiring the provision of any more silver contacts than might be considered necessary for ensuring good electrical connection between the vessel part and the base part when the vessel is set down upon the base.

As mentioned herein, the described embodiment is largely schematic and illustrates the principles underlying the present invention rather than a specific working structure. Modifications and variations of the illustrated arrangements will readily occur to those possessed of the requisite

skills without departure from the scope of the present invention as set forth in the appended claims.

In our British Patent Application No. 9326402.6 (Serial No. GB 2272805) which was divided from the present application there is described and claimed a
5 cordless electrical appliance comprising a base part and an appliance part adapted to be seated upon the base for enabling the supply of power through a connector part in the base and a mated connector part in the appliance to
10 electrically-powered means in the appliance, the connector part in the appliance including at least one spring contact adapted to be biased into contact with a terminal part provided in the base connector part when the two connector parts are operatively mated, and a
15 protective device in the appliance part being arranged to operate upon said spring contact for disrupting the supply of power to said electrically-powered means in response to a sensed malfunction of the appliance.

CLAIMS:

1. A mains powered cordless electrical appliance of the kind described wherein the appliance part is adapted to be rested upon the base part whereupon electrical connection is made between the respective parts, the base part being provided with male connector parts and the appliance part being provided with complementary connector parts for connecting to the male connector parts when the appliance part is rested on the base part, the male connector parts in the base part being enclosed within a displaceable cover for restricting access to said male connector parts when the appliance part is not seated upon the base part, and the cover being displaceable by the setting down of the appliance part onto the base part for enabling the connector parts in the base part to project through the cover and mate with those in the appliance part when the appliance part is set down onto the base part.
2. A cordless electrical appliance as claimed in claim 1 wherein the cover has openings therein in registry with said male connector parts so that said male connector parts can project through the cover when the cover is displaced, and a shutter arrangement



15.

is associated with said openings for restricting access therethrough when the vessel is not seated on the base.

5 3. A cordless electrical appliance as claimed in claim 1 or 2 wherein the connector parts in the appliance part include at least one spring contact arranged to be biased into contact with a connector part provided in the base part when the appliance and base parts are operatively mated, and a protective
10 device is provided in the appliance part and is arranged to operate upon said spring contact for disrupting the supply of power to electrically-powered means provided in the appliance part in response to a sensed malfunction of the appliance part.

15 4. A cordless electrical appliance as claimed in claim 3 wherein said electrically-powered means comprises a heating element arranged to be heated by current flowing through the mated connector parts, and the protective device comprises an element
20 overtemperature sensor associated with said heating element and arranged for disconnecting the heating element from its power supply in the event of a sensed element overtemperature condition, the mating connector parts provided in the base part comprising



16.

at least one male terminal part and the mating connector parts provided in the appliance part comprising at least one spring contact arranged to engage with said male terminal part when the appliance part is operatively seated on the base part, and the element overtemperature sensor being arranged to operate upon said spring contact so as to disrupt the engagement thereof with said male terminal part in response to a sensed element overtemperature condition.

5. A cordless electrical appliance as claimed in claim 3 or 4 wherein the connector parts provided in the base part comprise live and neutral male terminal parts each adapted to engage a respective spring contact provided in the appliance part.

6. A cordless electrical appliance as claimed in any of claims 3 to 5 wherein the protective device comprises a bimetallic element and means for transmitting the movement of the same to said spring contact(s).

7. A cordless electrical appliance as claimed in claim 6 wherein the bimetallic element is a snap-acting bimetallic element.



8. A cordless electrical appliance as claimed in any of claims 3 to 7 wherein a fail-safe or back-up protective arrangement is additionally provided in the appliance part and comprises a member adapted to collapse when subjected to a predetermined overtemperature condition, and means responsive to such collapse for disconnecting the electrically powered means from its power supply.

9. A cordless electrical appliance as claimed in claim 8 as dependent upon claim 6 or 7, wherein the bimetallic element is mounted in a carrier which is spring biased towards the electrically powered means that is provided in the appliance part so that both the carrier and the bimetal are subjected to heat from the electrically powered means, and the carrier is itself arranged to be thermally responsive in that it is adapted to collapse under the action of its spring biasing in the event of an overtemperature condition occurring at a temperature exceeding that at which the bimetallic element would normally respond, and means are provided responsive to the collapse of the carrier for disrupting the supply of power to the electrically-powered means.

10. A cordless electrical appliance as claimed in



18.

claim 9 wherein the collapsible carrier is arranged to operate upon respective spring contacts provided in the appliance part and constituting both the live and the neutral terminals of the appliance part for causing the live and/or neutral circuit to the electrically-powered means to break in response to collapse of the carrier.

11. A cordless electrical appliance as claimed in any of the preceding claims wherein said appliance part comprises a water heating vessel incorporating an electrically-powered heating element.

12. A cordless electrical appliance as claimed in claim 11 wherein the water heating vessel further comprises a water temperature sensor responsive to water being heated in the vessel reaching a predetermined temperature for switching off the supply of power to the heating element of the vessel.

13. A cordless electrical appliance as claimed in claim 12 wherein the water temperature sensor comprises a steam sensor responsive to the generation of steam when water boils in the vessel.



19.

14. A cordless electrical appliance as claimed in claim 12 or 13 wherein the water temperature sensor per se comprises no electrical parts for controlling the supply of electrical power to the heating element of the vessel, and a mechanical connection is provided from the water temperature sensor to the mating contact parts of the vessel for controlling the heating element power supply.

15. A cordless electrical appliance substantially as herein described with reference to the accompanying drawings.
