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(54) **Electrical heater element**

Elektrisches Heizelement

Elément de chauffage électrique

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Description

[0001] The present invention relates to an electrical heater element based on PTC (positive temperature coefficient) components. The invention also relates to a method of assembling such a heater element.

[0002] An electrical heater based on PTC components is made in such a way that a pressure is applied on both faces of the PTC component to ensure a good electrical contact and a good thermal contact. Some such heaters elements have a design where the PTC component is enclosed in a tube with insulation devices and it requires a very accurate press-fit process. The good point of this latter assembly is that the tube is grounded and does provide insulation protection regarding, for example, a heating ventilating and air-conditioning (HVAC) module in a motor vehicle. Nevertheless, the draw back is that fitting the various components together can be difficult and can result in poor alignment of the PTC elements within the tube which may comprise thermal and electrical contact. In addition, the fins that transmit the heat to the air are stacked up and require a complex assembly process.

[0003] Another PTC heating device is disclosed in Japanese Patent Publication No 04258982 which describes a heater for a copying machine. The heater has a PTC element positioned directly between first and second electrical terminals.

[0004] The aim of the present invention is to overcome one or more of the above disadvantages.

[0005] The invention provides an electrical heater as defined in claim 1.

[0006] An advantage of such a heater element is that it comprises a minimal number of pieces whilst still providing good retention, good electrical contact between the or each PTC component and the first and second electrical contact members, and good thermal contact. A further advantage of a minimal number of pieces is simplicity of assembly.

[0007] The electrical contact plates may be adapted to be urged into contact with the or each PTC component. For instance, the plates may be generally curved in the direction of the or each PTC component or shaped in a way such that they have an increased tendency to oppose a force that would act to reduce the retention and the electrical contact of the or each PTC component.

[0008] The second electrical contact member may comprise locking means for locking the electrical contact plates together.

[0009] The or each frame member may be adapted to position the or each PTC component by having apertures in which the or each PTC component may be received.

[0010] The invention also provides a method of assembling an electrical heater element as defined by claim 2.

[0011] A heater element according to the invention is particularly well suited to use in an HVAC module of a motor vehicle.

[0012] The invention will now be described, by way of

example, with reference to the following drawings in which:

Figure 1 is a cross-sectional side view of a first embodiment of a heater element according to the invention, in the process of assembly;

Figure 2 is a perspective view of the grounded casing member shown in Figure 1, in the "broken" O-shaped position;

Figure 3 is an exploded perspective view of a second embodiment of a heater element according to the invention;

Figure 4 is an exploded perspective view of the embodiment shown in figure 3, partly assembled; and

Figure 5 is a perspective view of the embodiment shown in figures 3 and 4, fully assembled.

[0013] With reference to figures 1 and 2, a first embodiment of an electrical heater element 1 according to the invention comprises a first electrical contact member in the form of a battery contact strip 2, first and second frame members 4, 6, one on either of the opposing major sides 13, 15 of the battery contact strip 2, PTC elements 8 (only one of which is identifiable in figure 1), and a second electrical contact member in the form of a grounded casing member 10.

[0014] The contact strip 2 may comprise any suitable electrically conductive material, such as brass with tin-silver coating. The first and second frame members 4, 6 may comprise any suitable electrically insulating material, for instance plastic materials, such as PBT GF30. The casing member 10 may comprise any suitable electrically conductive material such as aluminium.

[0015] The contact strip 2 is elongated in the sense that it extends along an axis perpendicular to the plane of figure 1 (as shown in figure 2). The first and second frame members 4, 6 similarly extend, and are so adapted, in this case with mating features 12, 14, so as to "click-fit" together around the contact strip 2. In the assembled electrical heater element 1, one purpose of the frame members 4, 6 is to space the casing member 10 from the contact strip 2.

Also, each of the frame members 4, 6 is provided along its length with a series of apertures 16, 18; that is elongate rectangular openings extending from a side of the respective frame member 4, 6 adjacent the battery contact strip 2 to a side 24 26 opposite (the contact strip 2). Each of the apertures 16, 18 is sized to receive a PTC component 8 (in figure 1, only one of the left-hand apertures 16 is shown with a PTC element 8 slotted therein). PTC components 8 are slightly deeper than the apertures 16 so as to stand proud at A for the purpose of ensuring good electrical contact between the PTC components and the casing member 10.

[0016] The casing member 10, which is shown in figure 1 during the process of assembling the heater element 1, is generally o-shaped in the assembled element 1, but is so adapted, in this case by being made of flexible, resilient material, as to enable the casing member 10 to be manipulated between an "open" o-shape and a "closed" o-shape positions. The casing member 10 has top arms 28, 30 that are adapted to overlap in the assembled heater element and are provided with a series of mating features 32, 34, in this case notches 32 and protrusions 34, for the purpose of locking the casing member 10 in the "closed" o-shape.

[0017] An electrical contact plate is provided by each of the major sides 36, 38 of the casing member 10. In the "open" o-shape of the casing member 10, the contact strip 2 with the click fitted frame members 4, 6 therearound and the PTC components received in the frame members 4, 6, may be slidably received or inserted between the contact plates 36, 38. In the "closed" o-shape of the casing member 10, wherein the contact plates 36, 38 are in effect locked together, the contact strip 2, the frame members 4, 6 and the PTC components 8 are retained between the contact plates 36, 38.

[0018] The contact plates 36, 38, in the assembled heater elements 1, tend to curve inwards, that is to say, away from the viewer, towards the PTC components 8 when looking side on at the contact plates 36, 38. This tendency to curve has the effect of urging the sides 36, 38 into contact with the respective PTC components 8 thereby to apply a transverse force on the PTC components 8 (in effect they are squeezed between the contact plates 36, 38) so as to retain them and prevent them from moving transversely, and so as to promote a good electrical contact with a contact strip 2 and the casing member 10, and good thermal contact. In other words, by being curved, the contact plates 36, 38 have an increased tendency to oppose a force that would act to reduce the retention, electrical contact, of the PTC components 8.

[0019] With reference to figures 3, 4 and 5, a second embodiment of a heater element 1 according to the invention differs from the first embodiment in that there are two second electrical contact members 10, 10' and each of the members 10, 10' has a side 36, 38 providing a contact plate. The remaining parts of the same of those shown with reference to figure 1 and 2, and have been similarly numbered (although frame member 6 is hidden from view by the contact strip 2).

[0020] In respect of assembly, the battery contact strip 2 with the frame member 4 thereon is first placed on a fixture (not shown) that is equipped to crimp the corresponding casing member 10. The PTC components 8 are then positioned, followed by the second casing member 10. Next, the first casing member 10 is crimped, controlling the pressure of the displacement to ensure a good electrical contact between the PTC components 8 respectively with the battery contact strip 2 and the first casing member 10. The sub assembly is turned (actually rotated) through 180° and the same operation is repeat-

ed. This assembly process has the advantage of ensuring that each piece is well assembled.

5 Claims

1. An electrical heater element (1) comprising:

at least one PTC component (8);
a first electrical contact member (2) having opposed sides;
at least one second electrical contact member (10, 10') providing at least two electrical contact plates (36,38);

characterised in that at least one first frame member (4) is provided on one side of the first electrical contact member (2) and at least one second frame member (6) is provided on the opposing side of the first electrical contact member (2), and the or each first and second frame members (4,6) is adapted to position the or each PTC component (8); wherein the first electrical contact member (2), the or each first and second frame members (4,6) and the or each PTC component (8) are retained between the at least two electrical contact plates (36, 38).

2. An HVAC module of a motor vehicle comprising an electrical heater element according to claim 1.

3. A method of assembling an electrical heater element comprising providing at least one PTC component (8), a first electrical contact member (2) having opposed sides, at least a second electrical contact member (10, 10') having at least two electrical contact plates (36, 38); **characterised by** providing at least one first frame member (4) on one side of the first electrical contact member (2) and at least one second frame member on the opposing side of the electrical contact member (2) such that the or each first and second frame members position the or each PTC component wherein the first electrical contact member(2), the or each first and second frame members (4,6) and the or each PTC component are retained between the at least two electrical contact plates (36, 38).

4. An HVAC module of a motor vehicle comprising an electrical heater element assembled according to claim 3.

55 Patentansprüche

1. Ein elektrisches Heizelement (1), das Folgendes beinhaltet:

mindestens ein PTC-Bauteil (8);
 ein erstes elektrisches Kontaktteil (2), das gegenüberliegende Seiten aufweist;
 mindestens ein zweites elektrisches Kontaktteil (10, 10'), das mindestens zwei elektrische Kontaktplatten (36, 38) bereitstellt;

dadurch gekennzeichnet, dass mindestens ein erstes Rahmenteil (4) auf einer Seite des ersten elektrischen Kontaktteils (2) bereitgestellt ist und dass mindestens ein zweites Rahmenteil (6) auf der gegenüberliegenden Seite des ersten elektrischen Kontaktteils (2) bereitgestellt ist, und dass das erste und zweite oder jedes erste und zweite Rahmenteil (4, 6) angepasst sind, um das oder jedes PTC-Bauteil (8) zu positionieren;

wobei das erste elektrische Kontaktteil (2), das erste und zweite oder jedes erste und zweite Rahmenteil (4, 6) und das oder jedes PTC-Bauteil (8) zwischen den mindestens zwei elektrischen Kontaktplatten (36, 38) gehalten werden.

2. Ein HLK-Modul eines Kraftfahrzeugs, das ein elektrisches Heizelement gemäß Anspruch 1 beinhaltet.
3. Ein Verfahren zum Zusammenbau eines elektrischen Heizelements, das die Bereitstellung von mindestens einem PTC-Bauteil (8), einem ersten elektrischen Kontaktteil (2), das gegenüberliegende Seiten aufweist, mindestens einem zweiten elektrischen Kontaktteil (10, 10'), das mindestens zwei elektrische Kontaktplatten (36, 38) aufweist, beinhaltet; **gekennzeichnet durch** die Bereitstellung von mindestens einem ersten Rahmenteil (4) auf einer Seite des ersten elektrischen Kontaktteils (2) und mindestens einem zweiten Rahmenteil auf der gegenüberliegenden Seite des elektrischen Kontaktteils (2), so dass das erste und zweite oder jedes erste und zweite Rahmenteil das oder jedes PTC-Bauteil positionieren, wobei das erste elektrische Kontaktteil (2), das erste und zweite oder jedes erste und zweite Rahmenteil (4, 6) und das oder jedes PTC-Bauteil zwischen den mindestens zwei elektrischen Kontaktplatten (36, 38) gehalten werden.
4. Ein HLK-Modul eines Kraftfahrzeugs, das ein elektrisches Heizelement beinhaltet, welches gemäß Anspruch 3 zusammengebaut wurde.

Revendications

1. Un bloc de chauffage électrique (1) comportant :

au moins un composant à CTP (8) ;
 un premier élément de contact électrique (2) ayant des côtés opposés ;
 au moins un deuxième élément de contact élec-

trique (10, 10') fournissant au moins deux plaques de contact électrique (36, 38) ;

caractérisé en ce qu'au moins un premier élément formant cadre (4) est fourni sur un côté du premier élément de contact électrique (2) et au moins un deuxième élément formant cadre (6) est fourni sur le côté opposé du premier élément de contact électrique (2), et les ou chaque premier et deuxième éléments formant cadre (4, 6) sont adaptés pour positionner le ou chaque composant à CTP (8) ; dans lequel le premier élément de contact électrique (2), les ou chaque premier et deuxième éléments formant cadre (4, 6) et le ou chaque composant à CTP (8) sont retenus entre les au moins deux plaques de contact électrique (36, 38).

2. Un module de CVCA d'un véhicule à moteur comportant un bloc de chauffage électrique selon la revendication 1.
3. Une méthode d'assemblage d'un bloc de chauffage électrique comportant le fait de fournir au moins un composant à CTP (8), un premier élément de contact électrique (2) ayant des côtés opposés, au moins un deuxième élément de contact électrique (10, 10') ayant au moins deux plaques de contact électrique (36, 38) ; **caractérisée par** le fait de fournir au moins un premier élément formant cadre (4) sur un côté du premier élément de contact électrique (2) et au moins un deuxième élément formant cadre sur le côté opposé de l'élément de contact électrique (2) de telle sorte que les ou chaque premier et deuxième éléments formant cadre positionnent le ou chaque composant à CTP, dans laquelle le premier élément de contact électrique (2), les ou chaque premier et deuxième éléments formant cadre (4, 6) et le ou chaque composant à CTP sont retenus entre les au moins deux plaques de contact électriques (36, 38).
4. Un module de CVCA d'un véhicule à moteur comportant un bloc de chauffage électrique assemblé selon la revendication 3.

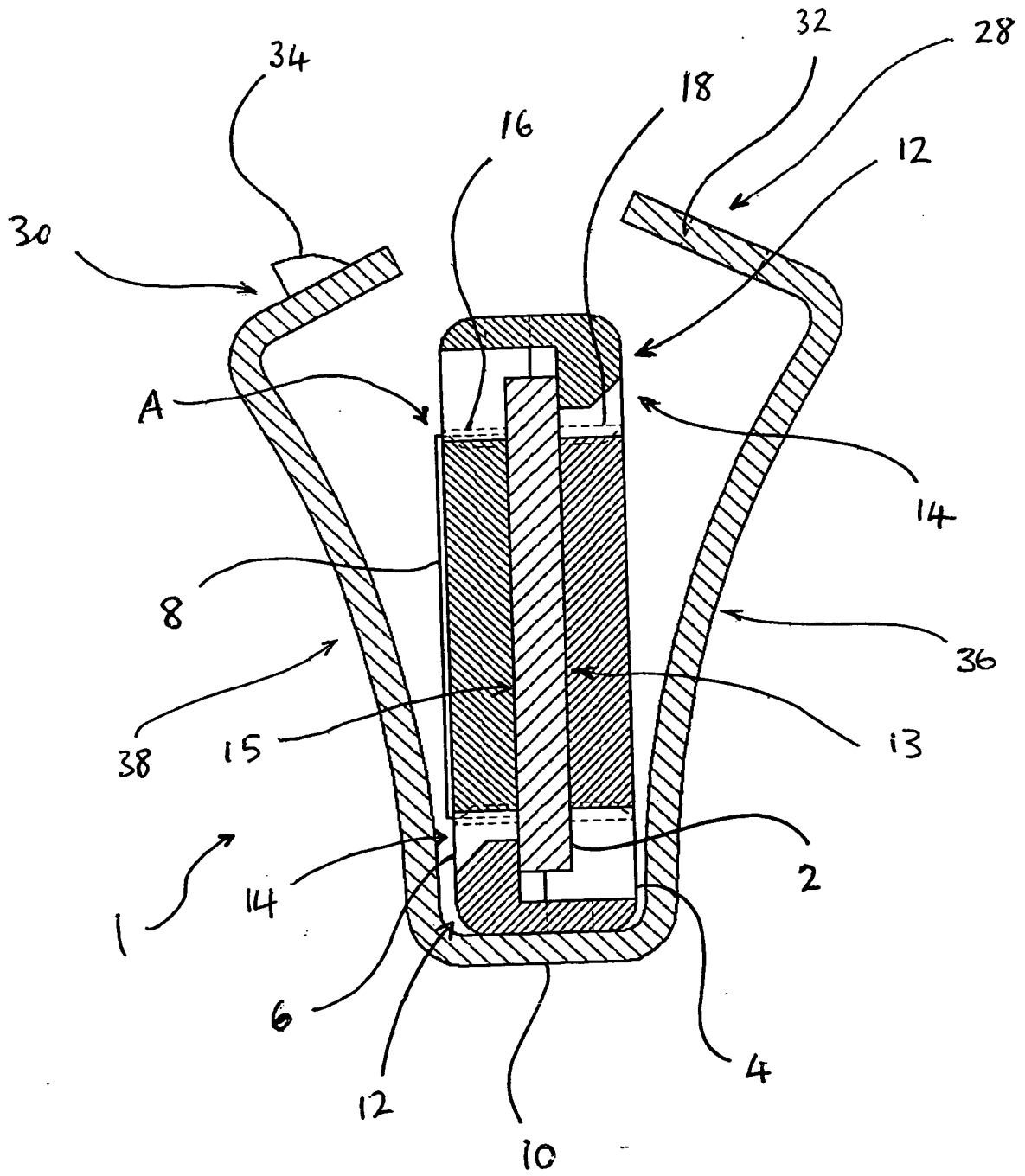


FIG. 1

FIG. 3

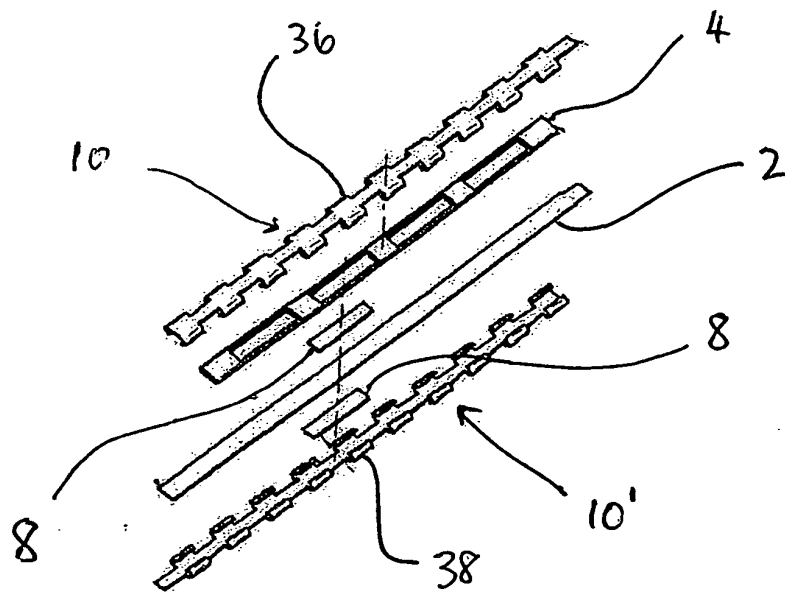
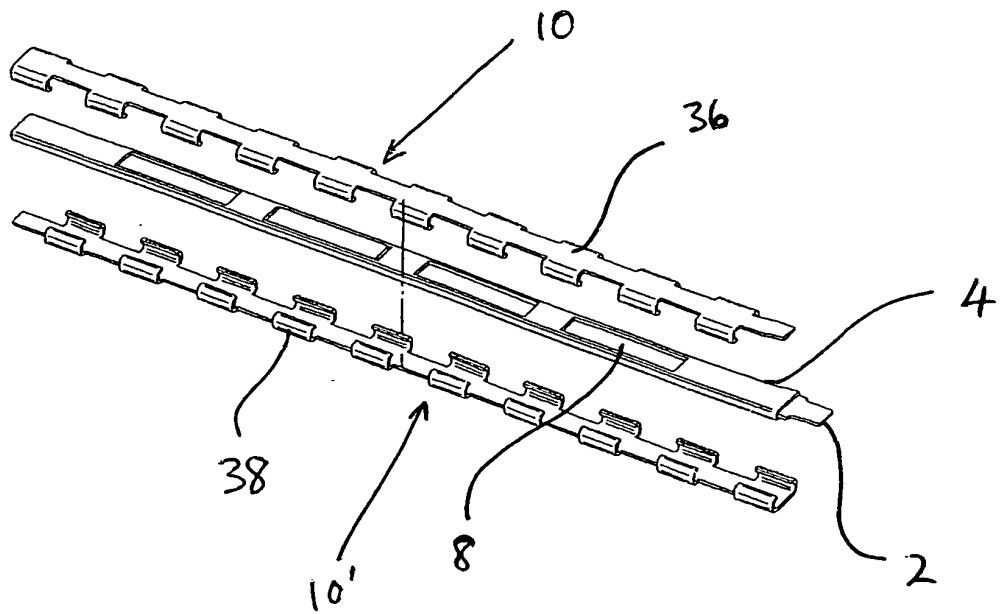


FIG. 4



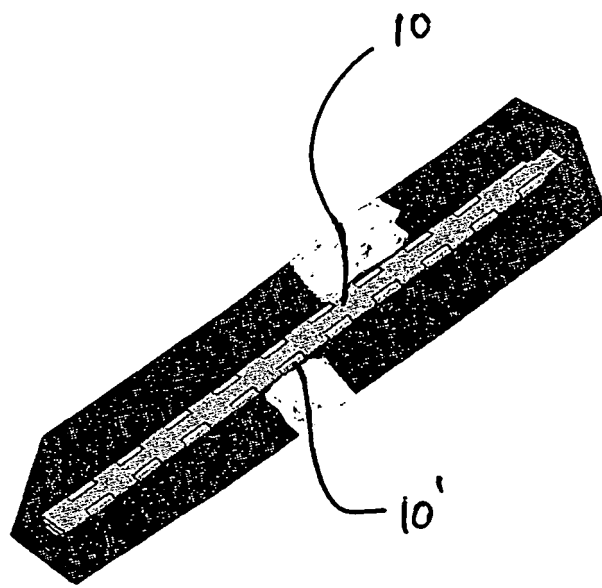


FIG. 5