

Description

The invention refers to a pot-shaped cooking and/or boiling appliance for bottom thermal energy application through thermal conduction or electromagnetic induction with a horizontally round container for the cooking and/or boiling media including a container casing and a container base made of austenitic steel, a plate arranged against the container base made of a high thermoconductive metallic material (i.e. an aluminium or copper alloy) and a metallic plate covering. Cooking and/or boiling appliances of the above type are also referred to as all-oven cooking or boiling appliances and are especially designed for household use.

Proven cooking and/or boiling appliances designed for bottom thermal energy application through thermal conduction contain a plate made of an aluminium or a copper alloy and a steel sheet plate covering made of a suitable austenitic steel alloy. Austenitic steel was chosen for its non-corrosion characteristics. Austenitic steel is, however, not ferromagnetic. This leads to disadvantages for thermal energy application through electromagnetic induction as the plate covering receives only ohmic heating. In comparison a ferromagnetic material absorbs considerably more thermal energy through electromagnetic induction as the so-called hysteresis loss transfers into thermal energy. The transferred electromagnetic power which is transformed into thermal energy can be improved for the above described embodiments of pot-shaped cooking and/or boiling appliances.

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To improve the application of thermal energy through electromagnetic induction in the described cooking and/or boiling appliances of the above design it is known that ferromagnetic plates (DE 86 30 655 U) have been used. Ferromagnetic plates contain an austenitic plate covering or have an exposed base. In the latter form corrosion could occur, although corrosion-resistant ferromagnetic material is normally used. A plate containing an austenitic plate covering interferes with the transferred power of the electromagnetic induction.

Cooking and/or boiling appliances of the above design are known to include perforations in the covering base of the ferromagnetic plate covering, in which the plate material is fitted.

The invention is based on the technical problem of a pot-shaped cooking and/or boiling appliance of the above described basic design, having a high power absorbency for thermal energy supplied by electromagnetic induction but being also well suited for the supply of thermal energy through thermal conduction, i.e. by placing it onto a cooker.

To solve this technical problem the invention consists of a pot-shaped cooking and/or boiling appliance designed for bottom thermal energy application through thermal conduction or electromagnetic induction, - with a horizontally round container for the cooking and/or boiling appliance including a container casing and a container base, made of austenitic steel, a plate arranged against the container base made of a high thermoconductive metallic material

(i.e. an aluminium or copper alloy) and a metallic plate covering, the cooking and/or boiling appliance having the following characteristics:

- 5 a) the plate covering containing a circular discoid covering base with several covering base recesses positioned over the entire surface,
- 10 b) covering base filling pieces being fitted into the covering base recesses, the covering base being made of austenitic sheet steel and the covering base filling pieces of ferromagnetic sheet steel and
- 15 the covering base and the covering base filling pieces being metallicly connected to the plate and this in turn to the container base.

Another solution of this problem is provided by a pot-shaped cooking and/or boiling appliance designed for bottom thermal energy application through thermal conduction or electromagnetic induction, - with a horizontally round container for the cooking and/or boiling appliance including a container casing and a container base, made of austenitic steel, a plate arranged against the container base made of a high thermoconductive metallic material (i.e. an aluminium or copper alloy) and a metallic plate covering, the cooking and/or boiling appliance having the following characteristics:

- a) the plate covering containing a circular discoid covering base with several covering base recesses positioned over the entire surface,
- 5 b) covering base filling pieces being fitted into the covering base recesses, the covering base being made of ferromagnetic sheet steel and the covering base filling pieces of austenitic sheet steel and
- 10 the covering base and the covering base filling pieces being metallicly connected to the plate and this in turn to the container base.

It is obvious that for both above solutions to the technical problem of the invention, corrosion-resistant ferromagnetic steel alloys are used if possible.

The invention is based on the surprising fact, that the ferromagnetic areas in the covering base of the plate covering are heated up with an extreme high power absorption. Although the ferromagnetic areas represent islands or networks, the geometrical proportion in relation to the covering base on one hand and the covering filling pieces on the other can be adjusted in such a way, that an extremely high homogenous heating of the plate and consequently of the container base and the boiling or cooking media is achieved. Surprisingly no disturbing corrosion appears in the contact areas between austenitic and ferromagnetic materials especially in the gaps or seams between the covering base recesses and the covering base filling pieces, which naturally are extremely closely fitted. The covering base recesses and the fitted covering base filling pieces

modify the thermal extension behaviour of the plate covering and the covering base. A special advantage of the invention is that the modification can be adjusted without reducing the power absorption for thermal conduction by electromagnetic induction and in such a way, that during thermal conduction no disturbing deformation of the plate covering, i.e. a slight swelling occurs. Swelling refers in this context to a slight convex bulging. The respective adjustment can be calculated or determined by experiments for the different cooking and/or boiling appliances.

If the induction field is adjusted in a way that a rotationally symmetrical electromagnetic field is created around a central axis and is radiated via the induction plate and if the cooking and/or boiling appliance is positioned onto an induction plate in a way that its vertical geometrical axis coincides more or less exactly with the symmetrical axis of the electromagnetic field, the embodiments of the cooking and/or boiling appliances of the invention are especially recommended. An electromagnetic field being symmetrical in this way can easily be generated by an induction coil containing a helical or flat coil. Under these symmetrical conditions, the basic teaching of the invention suggests, to also shape the covering base recesses and the covering base filling pieces symmetrically. This can be achieved in various ways. The covering base recesses can be circular arc segments with a width of 10 - 20 mm, positioned between two radially arranged covering base webs, with the also circular arc-sectioned covering base filling pieces fitted into the circular arc segments. It is recommended to design this in such a way that the four covering base webs are arranged at right angles to one an-

other, starting at the circular shaped covering base centre. It is, however also possible to design the covering base recesses as circle segments which are separated by radially arranged covering base webs and also for circle-segment shaped covering base filling pieces to be fitted into the circle segments. In this case a design is recommended, limiting the circle segments at the plate covering edge to a semi-circular shape. For this the circle segments are best of equal size.

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As part of the invention the plate covering can consist of a sheet metal disk, can, however, also be a capsular covering (see DE 41 25 115.6 C2).

15 The described embodiments are specially advantageous if, with regards to the differing component thickness, a special adjustment regulation is observed. According to this, the container with the container base has a metal thickness of 0.7 to 1.0 mm, the plate covering a metal thickness of
20 0.7 mm or less and the plate in the aluminium alloy version a thickness of 5 - 9 mm.

Cooking and/or boiling appliances on which the invention is based contain mostly and preferably a covering base cold
25 bottom geometry being slightly concave compared to a level support surface for the cooking and/or boiling appliance, i.e. a cooker. This effects that in its cold condition only the edge of the cooking and/or boiling appliance covering base rests on an assigned level support plate i.e. a
30 cooker. If the covering base shows a cold base geometry being slightly concave compared to a level support surface for a cooking and/or boiling appliance, the invention

teaches that the sheet metal thickness of the container base, the sheet metal thickness of the covering base, the thickness of the plate, the shape of the covering base recesses and the covering base filling pieces are deformation-proof. Deformation-proof means that a slightly convex deformation of the covering base compared to the support surface does not occur during bottom thermal energy application and neither during thermal conduction of thermal energy. - A deformation would effect that the cooking and/or boiling appliance would only rest with its centre on a level support surface i.e. on a cooker, causing the cooking and/or boiling appliance to wobble and would furthermore adversely affect the heat transfer through thermal conduction.

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Within the context of the invention the plate can be connected to the container base and the plate covering in various ways. The plate covering can be especially inter-metallicly connected to the covering base and for embodiments with capsular coverings to its capsular collar and the covering filling pieces to the plate and this in turn to the container base. There is, however, also the option for the plate covering to be soldered to its covering base and for embodiments with a capsular covering to its covering base and the capsular collar and the covering filling pieces to the plate and this in turn to the container base.

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Below the invention is explained in detail according to only one embodiment, in which

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Fig. 1 shows a vertical section through a cooking and/or boiling appliance according to the invention

Fig. 2 shows a plan view of the covering base of the object of Fig. 1 from below

5 Fig. 3 shows corresponding to Fig. 2 another embodiment of a cooking and/or boiling appliance of the invention and

10 Fig. 4 shows corresponding to Fig. 3 a further embodiment of a cooking and/or boiling appliance of the invention.

The pot-shaped cooking and/or boiling appliance 1 shown in these figures, is designed for bottom thermal energy application through thermal conduction or through electromagnetic induction. It contains a horizontally round container 15 2 for the boiling and cooking media with a container casing 3 and container base 4 made of austenitic sheet steel, a plate 5 connected to the container base made of a high thermoconductive metallic material i.e. an aluminium or 20 copper alloy and a metallic plate covering 6.

The plate covering 6 contains a discoid covering base 7 with several covering base recesses 8 over the entire surface and/or the radius. Covering base filling pieces 9 are 25 fitted into the covering base recesses 8. The arrangement may be designed for the covering base 7 to be made of austenitic sheet steel and the covering base filling pieces 9 of ferromagnetic sheet steel, the covering base 7 and the covering base filling pieces 9 being metallicly connected 30 to the plate 5 and this in turn to the container base 4. The arrangement may, however, also be designed for the cover base 7 to be made of ferromagnetic steel and the cov-

ering base filling pieces of austenitic sheet steel. Here, too, the covering base 7 and the covering base filling pieces 9 are metallicly connected to plate 5 and these in turn to the container base 4.

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Within the context of the invention the covering base filling pieces 9 can basically have completely different forms i.e. circular or triangular horizontal projections. It is recommended to shape the covering base filling pieces 9
10 circular and/or radially symmetrical. In this context the embodiments shown in Figs. 1 and 2 are of special importance. It is apparent, that the covering base recesses 8 are designed as circular arc sections with a width of over 10 mm, the circular arc sections being arranged between ra-
15 dially positioned covering base webs 10 and the covering base filling pieces 9 fitted into a circular arc section 8. This embodiment shows four covering base webs 10 being arranged at right angles to one another and starting from a circular shaped covering base centre 11. - It is under-
20 stood, that in the described embodiment the covering base recesses 8 and the covering base filling pieces 9 can also be continuously circular.

In the embodiment shown in Fig. 3 the covering base re-
25 cesses 8 are arranged as circular segments, between which the radially arranged covering base webs 10 are positioned. The also circular segment shaped covering base filling pieces 9 are fitted into the circular segments 8. At the same time the circular segments are limited towards the
30 edge of the plate covering 6 as semi-circles. The circular segments 8 are of equal size.

It is understood that the plate covering 6, can, as already mentioned, be a capsular covering. The sheet metal thicknesses correspond to patent claim 10. The connections of the container base 4, the plate 5 and the plate covering 6 can be intermetallic or a pressure weld. In this respect the embodiment according to DE 41 25 115 C2 is recommended. There is, however, also the option to connect the described components by soldering. The described deformation-stability can always be achieved.



Claims

1. A pot-shaped cooking and/or boiling appliance designed for bottom thermal energy application through thermal conduction or electromagnetic induction, - with a horizontally round container for the cooking and/or boiling appliance including a container casing and a container base, made of austenitic steel, a plate arranged against the container base made of a high thermoconductive metallic material and a metallic plate covering, the cooking and/or boiling appliance having the following characteristics:
 - a) the plate covering containing a circular discoid covering base with several covering base recesses positioned over the entire surface,
 - b) covering base filling pieces being fitted into the covering base recesses, the covering base being made of austenitic sheet steel and the covering base filling pieces of ferromagnetic sheet steel andthe covering base and the covering base filling pieces being metallicly connected to the plate and this in turn to the container base.
2. A pot-shaped cooking and/or boiling appliance designed for bottom thermal energy application through thermal conduction or electromagnetic induction, - with a horizontally round container for the cooking and/or boiling appliance including a container casing and a container



base, made of austenitic steel, a plate arranged against the container base made of a high thermoconductive metallic material and a metallic plate covering, the cooking and/or boiling appliance having the following characteristics:

a) the plate covering containing a circular discoid covering base with several covering base recesses positioned over the entire surface,

b) covering base filling pieces being fitted into the covering base recesses, the covering base being made of ferromagnetic sheet steel and the covering base filling pieces of austenitic sheet steel and

the covering base and the covering base filling pieces being metallicly connected to the plate and this in turn to the container base.

3. A cooking and/or boiling appliance according to claims 1 or 2 in which the covering base recesses and the covering base filling pieces are arranged circular and/or radially symmetrical.

4. A cooking and/or boiling appliance according to claims 1 to 3 in which the covering base recesses are arranged as circular arc segments with a width of 10 to 20 mm between radially arranged covering base webs and the also circular-arc shaped covering base filling pieces being fitted into the circular arc segments.



5. A cooking and/or boiling appliance according to claim 4 in which four covering base webs are arranged at right angles to one another, starting from the covering base centre.
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6. A cooking and/or boiling appliance according to one of the claims 1 to 3, in which the covering base recesses are formed as circular segments between which radially arranged covering base webs are positioned and in which the also circular segment shaped covering base filling pieces are fitted into the circular segments.
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7. A cooking and/or boiling appliance according to claim 6, in which the circular segments are limited towards the edge of the plate coverings to a semi-circular shape.
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8. A cooking and/or boiling appliance according to one of the claims 6 or 7 in which the circular segments are of equal size.
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9. A cooking and/or boiling appliance according to claims 1 to 8 in which the plate covering is a capsular covering.
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10. A cooking and/or boiling appliance according to claims 1 to 8 in which the container and the container base have a metal thickness of 0.7 to 1 mm and the plate covering a metal thickness of approx. 0.7 mm or less and the plate a thickness of 5 to 9 mm.
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11. A cooking and/or boiling appliance according to one of the claims 1 to 10, in which the covering base has a cold base geometry being slightly concave compared to a level support surface for the cooking and/or boiling appliance and in which the sheet metal thickness of the container base, the sheet metal thickness of the covering base, the thickness of the plate, the shape of the covering base recesses and of the covering base filling pieces are arranged as deformation-proof.
12. A cooking and/or boiling appliance according to claims 1 to 11, in which the plate covering is connected intermetallicly to its covering base and for embodiments with capsular coverings to its covering base and the capsular collar and the covering filling pieces to the plate and the container base.
13. A cooking and/or boiling appliance according to claims 1 to 11, in which the plate covering is soldered to its covering base and for embodiments with capsular coverings to the covering base and the capsular collar and the covering filling pieces to the plate and the container base.

Summary

A pot-shaped cooking and/or boiling appliance for bottom thermal energy application through thermal conduction or electromagnetic induction, - with a plate arranged against the container base made of a good thermoconductive metallic material and a metallic plate covering. The plate covering containing a discoid covering base with several covering base recesses arranged over the entire surface and/or the radius. The covering base filling pieces being fitted into the covering base recesses, the covering base being made of austenitic steel and the covering base filling pieces of ferromagnetic steel or vice versa. The covering base and the covering base filling pieces being metallicly connected to the plate and this in turn to the container base.

Publication with Fig. 2

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