



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H05B 6/12	A2	(11) International Publication Number: WO 98/41063 (43) International Publication Date: 17 September 1998 (17.09.98)
(21) International Application Number: PCT/DK98/00098 (22) International Filing Date: 13 March 1998 (13.03.98) (30) Priority Data: 0276/97 13 March 1997 (13.03.97) DK (71) Applicant (for all designated States except US): AKTIEBO- LAGET ELECTROLUX [SE/SE]; Luxbacken 1, Lilla Es- singen, S-105 45 Stockholm (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): ESKILDTSEN, Christian [DK/DK]; Dammen 14, DK-5591 Gelsted (DK). (74) Agent: BROCK-NANNESTAD, George; Electrolux EPDH Tech-Centre, Sjaellandsgade 2, DK-7000 Fredericia (DK).		(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>
(54) Title: INDUCTION COOKING RELUCTANCE REDUCTION		
(57) Abstract A dish-shaped core for an induction heating apparatus is provided with an excess of ferromagnetic material disposed in such a way that an increase in useful flux is obtained, in particular by reducing the reluctance near the central pole piece and near the rim part of the core.		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav	TM	Turkmenistan
BF	Burkina Faso	GR	Greece		Republic of Macedonia	TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

inductance

Induction cooking reluctance reduction.

5 The invention relates to a core structure for an induction heating element for use in a cooker for food.

 Induction heating coils are well-known, comprising as a minimum a flat "pancake" coil fitted below and parallel to the cooking vessel. The magnetic field
10 around such a coil has large stray field which does not contribute to the heating but rather heats up irrelevant metal parts. In order to improve the situation it is known to place a number of radially disposed ferrite rods on the underside of the coil. In order to further
15 improve the functioning of this heating method, a more complete core structure is known, being constituted of a shallow dish-shaped structure having an upwards-facing rim and a central pole piece. It is important to provide a high relative permeability in order to attract as many
20 flux lines as possible, but with a limited permeability the length and the placing of the ferromagnetic material obtains greater importance.

 It is the purpose of the invention to provide a core structure which is improved with respect to the
25 shallow dish-shaped structure and which permits the use of material having a lower permeability (which may in turn mean a lower admixture of high-permeability material).

 This is obtained in a core structure according to
30 the invention which is particular in that the core structure has a thickness of ferromagnetic material in the central region of the bottom which increases towards the centre to from 1.2 to 2.5 times greater than the rim thickness.

35 An advantageous embodiment provides the increase in thickness by means of an inverted frusto-conical extension to the bottom. This extension may be made in

the same ferromagnetic material or in a material with a different relative permeability, preferably a higher relative permeability.

In a further advantageous embodiment the increase
5 is obtained by means of a diametrical extension to the central pole piece which forms part of a toroidal surface. This requires the disc shaped coil to have a larger small diameter, however the coupling to the core material increases.

10 In a further advantageous embodiment a further increase in thickness is obtained near the rim in that the inside region between bottom and rim is formed with a similar part of a toroidal surface. In this way a winding chamber is obtained with an advantageous
15 reduction in reluctance where the lines of force have to bend to conform to the core shape.

A further improvement is obtained in that the outside of the transfer region between bottom and rim is formed with a rounding corresponding to part of a
20 toroidal surface. This in practice means removal of ferromagnetic material which does not contribute greatly to the conduction of flux lines.

The invention will be described in greater detail with reference to the drawing in which

25 Fig. 1 shows a core with a frusto-conical extension,

Fig. 2 shows a core with an extension to the diameter of the central pole piece,

Fig. 3 shows the arrangement providing a winding
30 chamber with reduced reluctance near the rim, and

Fig. 4 shows a core where virtually inactive magnetic material has been removed.

In Fig. 1 is shown a core 1 which has a circular winding space 2 surrounding a central pole 3 and
35 confined within a rim 4. The core is completed by means of a bottom 5. According to one embodiment of the invention, the reluctance in the core is reduced by the

addition of more ferromagnetic material on the bottom 5, as shown at 6.

A different embodiment is shown in Fig. 2 which shows essentially the same dimensions of core as in Fig. 1, but where the central pole 3 obtains an increase of diameter and hence of ferroelectric material near the bottom as shown at 7. In the embodiment shown, the surface delimiting the increased amount of material is part of a torus with a generatrix circle 8.

10 In Fig. 3 the shape of core shown in Fig. 2 is further modified by means of an increase of material where the rim 4 joins the bottom 5, such as it is shown at 9. In the embodiment shown, the surface delimiting the increased amount of material is part of a torus with
15 a generatrix circle 10.

In Fig. 4 the shape of the core is improved with respect to the basic shapes shown in Fig. 2 and Fig. 3, in that the outside edge of the core where the rim 4 joins the bottom 5, such as it is shown at 11. In the
20 embodiment shown, the surface delimiting the saving in material is part of a torus with a generatrix circle 12. The material saved contributes to using the ferromagnetic material better than in the basic core shape 3, 4, 5 shown in Fig. 1, and Fig. 4 shows the
25 application of all the features simultaneously.

P A T E N T C L A I M S

1. A core for an induction heating apparatus comprising a core part having a rim, a bottom, and a central pole piece, c h a r a c t e r i z e d i n
5 that the core structure has a thickness of ferromagnetic material in the central region of the bottom which increases towards the centre to from 1.2 to 2.5 times greater than the rim thickness.
- 10 2. A core according to claim 1, c h a r a c t e r i z e d i n that the thickness increase is obtained by means of an inverted frusto-conical extension to the bottom.
- 15 3. A core according to claim 1, c h a r a c t e r i z e d i n that the thickness increase is obtained by means of a diametrical extension to the central pole piece which forms part of a toroidal surface.
- 20 4. A core according to claim 3, c h a r a c t e r i z e d i n that the inside transfer region between bottom and rim is formed with a similar part of a toroidal surface.
- 25 5. A core according to claim 3, c h a r a c t e r i z e d i n that the outside of the transfer region between bottom and rim is formed with a rounding corresponding to part of a toroidal surface.

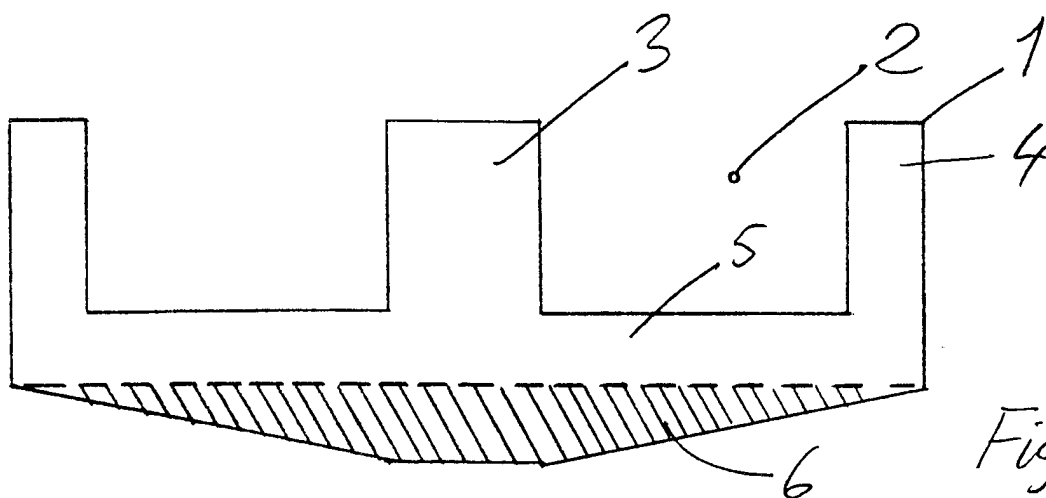


Fig. 1

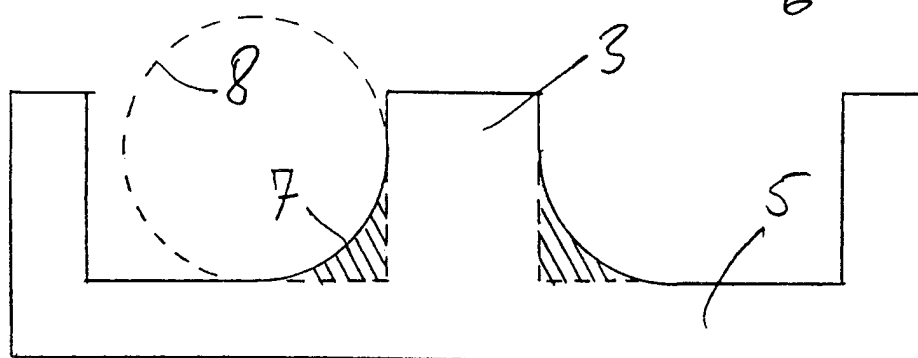


Fig. 2.

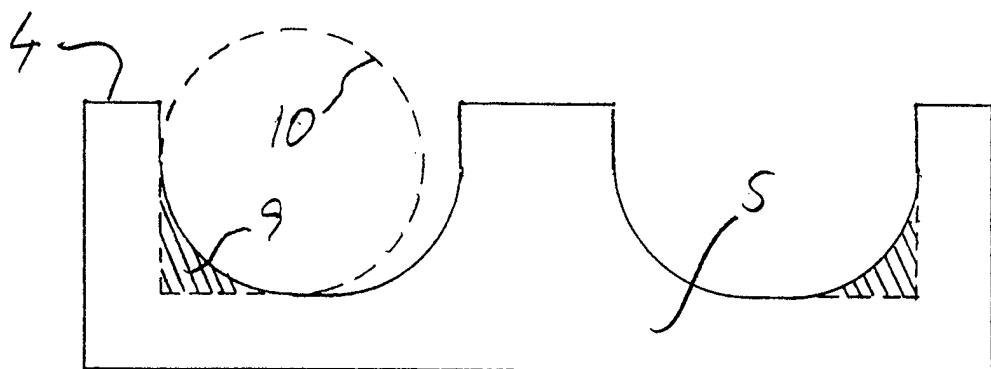


Fig. 3.

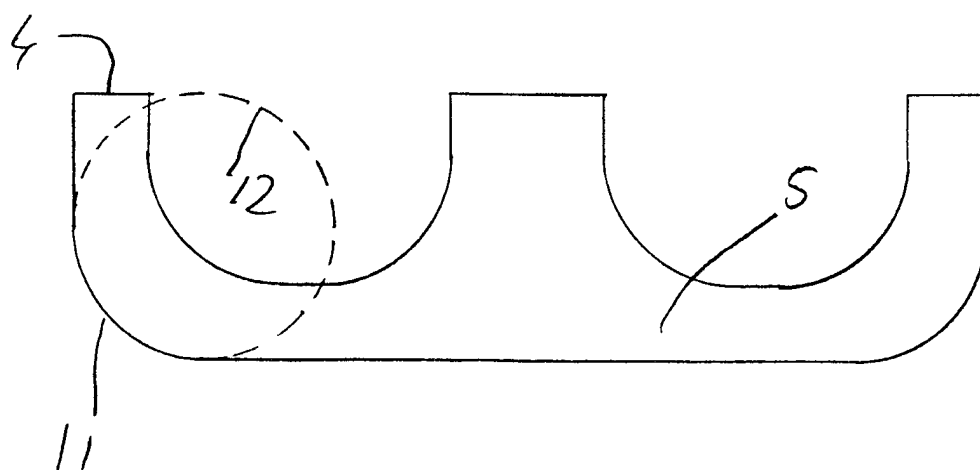


Fig. 4.