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Glass ceramic replacement with HTR Polymer - ID-06124

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1.Summary of the disclosure

The invention relates to a replacement of glass-ceramic plate of induction cooking hob with a high temperature resistance polymer plate. By this solution, integration of more different sensors could be enabled and by this the assisted cooking process would be possible to apply at the induction heating cooking hob. Moreover, the glass ceramic substitution by the HTR polymer plate would eliminate of glass ceramic braking process during the hob appliance transport, installation and use phases.

The solution considers that high temperature resistance polymeric plate would enable a simpler plate manufacture, enabling also the installation of a new and advanced performance sensory system could enable a remote control and assisted multipoint cooking on the cooking hob.

The solution consider that the polymer plate has almost all good performances, that characterize also the glass ceramic plate, with the applicable temperature resistance range plus the advanced performance in terms of manufacturing fracture and breaking resistance. In a preferred embodiment, the new material plate solution includes a better possibility to control the cooking processes and polymeric plate itself through the induction heating.

2. Applicable Patent categorization

F24C7/00	Stoves or ranges heated by electrical energy;
B29C45/14	Injection molding;
H05B3/68	Heating arrangements specially adapted for cooking plates or analogous hot-plates;
F25D23/06	General constriction features-wals;
B05D5/12	Process to obtain coating with specific electric properties;
C08L79/00	Compositions of block copolymers containing at least one sequence of polymer obtained by reactions.

3.Technology domain

The present invention relates to a home induction cooking hob appliance. More specifically, the invention relates to a induction cooking hob with high temperature resistance polymeric plate, installed onto top of induction cooking hob instead of glass ceramic plate, enabling better plate manufacturing and the installation of cooking process monitoring sensors.

4.References

1. CN1563807A; Electromagnetic stove

Abstract

The electromagnetic oven includes oven body with inside winding coil heater and semi-spherical or curve-surfaced face plate on the oven body. The winding coil is in semi-spherical, curve-surfaced or truncated cone shape, and the face plate has embedded temperature sensing probe and 3-12 supporting ceramic pins fixed to the face plate. The present invention has its face plate made of engineering plastic, rather than traditional micro crystalline glass and in non-flat form, so that it may be used in cooking with spherical or curve-surfaced pot and has less scratch of face plate, great magnetic force line covered area and high heating effect.

2. DE19900178C1; Thermoplastic frame with an elastomer content with a relaxation effect to reduce breakages to minimum levels

Abstract

The body of a brittle material, such as glass and compound glass, is contained in a thermoplastic frame of a material containing a proportion of an elastomer with a relaxation effect. The assembly takes up the forces (3) on the frame and the forces (4) in the contained glass body. The shaped body is of glass, ceramic or glass/ceramic materials. The thermoplastic frame material has a relative temperature index (RTI) value of \- 120 deg C and a temporary temperature loading of \- 200 deg C. The thermoplastic material can contain one or more filling materials. The thermoplastic elastomer is treated to give increased adhesion with the glass body, and is incorporated into the thermoplastic material at a rate of 1-50 weight percent. An Independent claim is included for a manufacturing process, where the holder frame is formed by injection molding round the glass body.

3. EP2279648B1; Thick film thermoplastics insulated heating element

Abstract

The present invention provides an integrated thick film heating element on a substrate made from high temperature melt-flowable thermoplastic polymer/powder additive formulations which form an electrically insulating thermoplastic dielectric coating on the substrate, and electrically resistive lead free films and electrically conductive film formulations that are deposited and fired to form an integrated thick film heating element on a substrate at a processing temperature well below 600 degrees centigrade. This thick film heating element is formed on a substrate material coated first with the electrically insulating, filled melt flowable high temperature thermoplastic polymer/powder composite layer on which is deposited the electrically resistive lead free thick film that is capable of operating over a wide range of power densities for consumer and industrial heating element applications, with suitable electrical insulation properties under temperature cycling to for example 250 degrees centigrade.

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5.Problem to be solved

Cooking induction hobs today widely apply the glass-ceramic plate for the induction hob heating top surface. The glass-ceramic plain plates has an elevated temperature resistance performance and an acceptable resistance for the scratches effects. These two features enable its diffused application for the home appliance induction cooking hob heating. Moreover, in parallel to this, the good unit price (in relation with it thickness) makes glass ceramic very favorable material for the application in the cooking induction hob building. The reason more for this application trend is that there is no available a similar or better performances material.

With the time, the good glass ceramic performances become an break for the induction cooking hob functional and design forms evolution. Namely, the glass ceramic is a brittle and fragile material, sensible for the mechanical impact. Its workability is limited mostly to the external border grinding machinability only. In additional, ones installed to the appliance, a glass ceramic panel, despite the well-engineered fixation solution and positioning onto induction hob structure, becomes subject of the breaking effect through the storage, transport, installation and application processes. However, the glass ceramic is easy to clean and very good material for the aesthetic effect obtainment on the top of cooking hob.

Nowadays, there is no a complete alternative for glass ceramic material application on the cooking top. Moreover, there are available a few producers only that limits the cooking hobs diversification options. In additional, the lack of glass ceramic workability features, reduces the possibility to develop a more evolved cooking hob with higher flexibility and new cooking features.

6. Proposed solution

The application of the high temperature resistance plastic material (PEKEKK) for the induction cooking hob plate, would enable, thanks to its good workability, the drilling and performing of cut-outs, the ribbed surface forms and other finishing effects, that are nowadays impossible to realize with glass-ceramic material.

Moreover, the replacement of the glass ceramic plate with the high performances polymer would allow to integrate the sensors system for the cooking process support directly into plate structure, together with the appropriate clips for cables or other assembling elements fixation under the panel.

Accordingly, PEKEKK, the high temperature resistance polymeric material having a lower tendency to spread the temperature, what means reduction of risk to get burned by hot surface keeping the panel specific areas within the secure temperature range. Following this, the installation of the cooking process monitoring sensors in the polymetric cooking hob plate structure, might enable the application of cooking process control and monitoring system for this type of cooking appliance. In additional, the cooking hob solution with polymer panel plate would enable the building of the new hob design, its assembly simplification, less weight and breaking effect through the process of storage, transport, installation and appliance application.

Moreover, the application of the high temperature resistant polymeric material, being less brittle than glass-ceramic one, would enable an effective reduction of the SCR factor. In accordance with previous, the replacement of glass ceramic plate with high performance polymer material plate would enable an evolution of induction cooking hob in terms of its: design, qualitative performance and cooking process. .

7. Description

There is showed up on market new, high temperature resistance (HTR) polymeric material, the PEKEKK. It is a high temperature resistant plastic material that could be the replacement solution for the nowadays widely applied glass-ceramic cooking induction hob plate.

Comparatively to the glass-ceramic material, the PEKEKK polymeric material is more expensive, but essentially as a plastic material, it has much better workability features that could enable a complete plate machining for: sensors installation (drilling the circular and other forms of perforations), the outer edge different profiles finishing and simplification of hob assembling process, including the BOM and cooking hob total cost reduction.

In particular, in case of application of the high temperature resistance polymer material (PEKEKK) for glass-ceramic replacement for cooking induction heating hob, the cooking plate Fig.1., could comprise the functional heating surface (1.2)areas and the plate structural surface (1.1) area.

Accordingly, the user interface UI (1.3) solution, should be installed onto plate structure as a separate section (could not be integrate into the same plate as in case of glass-ceramic), means, fixed into plate structure by gluing or in some mechanical form.

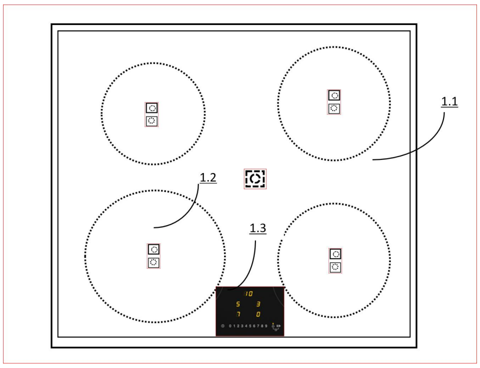

Fig.1.: The architecture of induction heating cooking hob with PEKEKK polymeric plate and
integrated sensors for assisted cooking (UI unit is placed separately);

Moreover, the user interface (1.3) surface in this case, could be specifically colored or have some a basic color with the functional contrasts including the led light points and line led integrated light indicators for the cooking hob cooking status and performances signaling to user when present in proximity or close to same.

Comparatively to glass-ceramic, the high temperature resistance polymer has a lower rate of heat diffusion, means that heat spread around the functional surfaces would be lower than in case of glass ceramic. Accordingly, the non-heating (structural) area (1.1) would be less heated and have the lower temperature around the active heating surface (1.2) border, comparatively to glass-ceramic plate, that diminish the risk to get burned by hot surface.

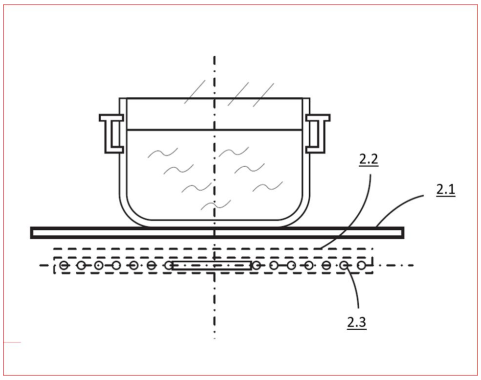

Fig.2.: The glass-ceramic (2.1) induction heating cooktop plate with induction heating coil (2.3) and “mica” insulator (2.2);

Moreover, the high resistance polymer plate (Fig.3,.) fracture effects and its breaking, due the cookware fast placing onto the same or the impacts of different origins onto cooking plate during: the production, storage, transport and appliance application, could be much lower or avoided, thanks to PEKEKK polymer plate high impact resistance.

In an additional embodiment, thanks to the higher level of the PEKEKK polymer machinability (the drilling in particular), a sensors for cooking process monitoring and cooking control in general, could be installed on the high temperature resistant polymer plate (2.4). Accordingly, two groups of cooking process control sensors could be installed onto PEKEKK polymeric plate (3.1) structure.

The first group of two sensors comprises the temperature measurement sensor(3.5) and weight (3.6) measurement sensor, should be installed in the centre each active cooking surfaces (1.2), accordingly, installed in the couple configuration form, enabling a controllable multipoint cooking on the cooking hob.

The second group (see Fig.3) of sensor is comprises the vibration measurement sensor (3.4) only. This type of sensor (applied one sample per cooking hob unit), should be installed in the canter of the cooking hob plate (1.1), with the scope to monitor the boiling effect (with corresponding vibrations intensity) and its evolution during the water heating for boiling effect status, at any one of the functional heating surfaces(1.2), following one cooking place at time.

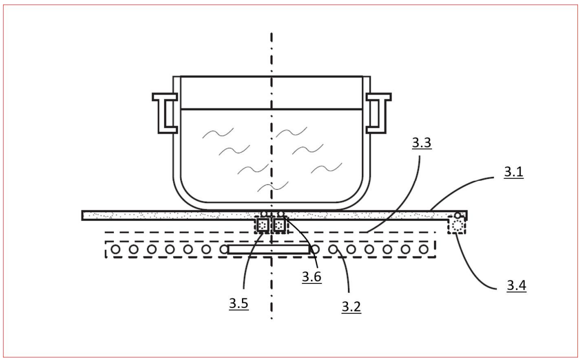

Fig.3.: The induction cooking hob with PEKEKK polymer plate (3.1), induction heating coil (3.2) and "mica" insulator (3.3) and installed sensors for cooking process control: a vibration sensor (3.4), a temperature sensor (3.5) and a weight sensor (3.6);

These two groups of sensors would enable the new possibilities in induction cooking hob process monitoring and control in terms of temperature and weight values status and variation measurements in time. Moreover, the functionality of these sensors would enable an effective programming of induction cooking hob cooking process.