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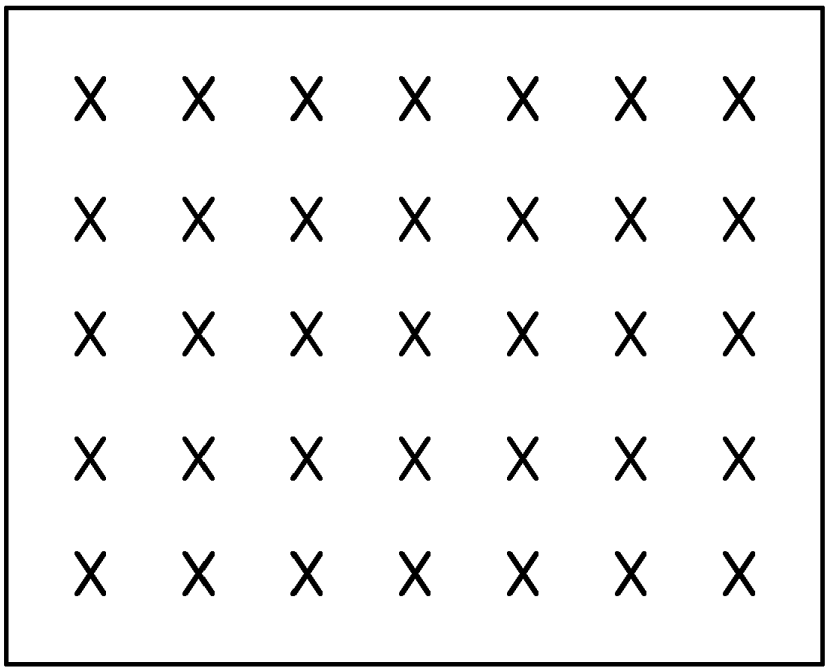
(54) GLASS OR GLASS-CERAMIC ELEMENT AND KITCHEN HOB COMPRISING SUCH ELEMENT

(57) A glass or glass-ceramic element (1) for a kitchen hob, particularly a vitro-ceramic element, comprising an upper side (5) and a bottom side (3), wherein the bottom side (3) comprises at least one first heat conduction element (2), wherein the first heat conduction element (2) is arranged such that it is capable of conducting a heat radiation produced by a heating system (4) towards a bottom side (3) of the glass or glass-ceramic element (1).

FIG 1A



EP 3 270 660 A1

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FIG 1B

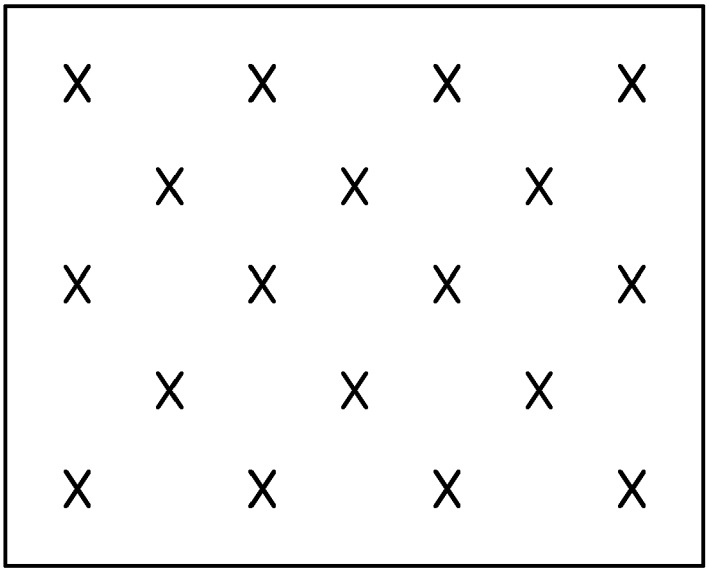
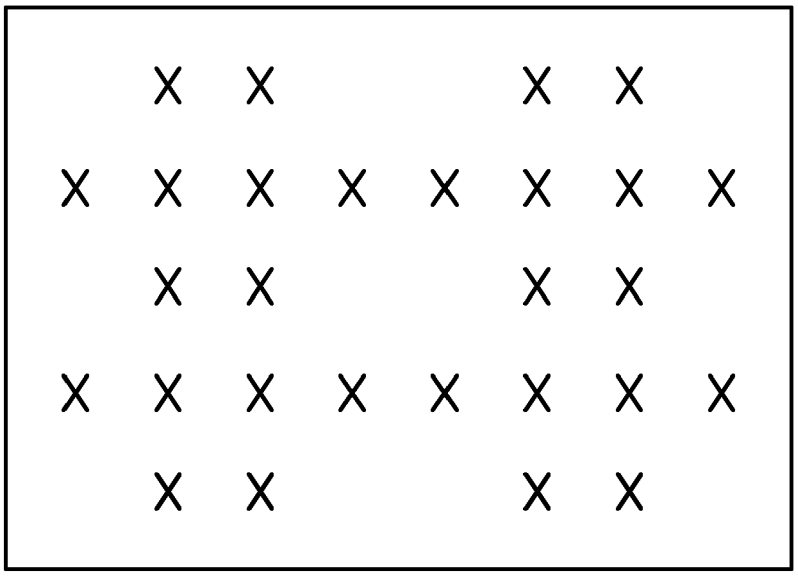


FIG 1C



Description

[0001] The present invention relates to a glass or glass-ceramic element for a kitchen hob, particularly a vitro-ceramic element, comprising an upper side and a bottom side, wherein the bottom side comprises at least one first heat conduction element.

[0002] The present invention relates to a glass or glass-ceramic element for a kitchen hob, particularly a vitro-ceramic element, comprising an upper side and a bottom side, wherein the bottom side comprises at least one first surface portion having an at least partially knobbed surface structure, and an at least one second surface portion, wherein the at least one second surface portion is a knob-free surface portion.

[0003] The present invention still further relates to a kitchen hob, particularly an induction hob, comprising such glass or glass-ceramic element.

[0004] Glass, Ceramic, glass-ceramic and vitro-ceramic elements, particularly in the form of plates, are known to be applied as cooking surfaces of kitchen hobs. For such elements, the strength plays an important role as such plates are prone to breakage and damage during transportation and/or installation.

[0005] Usually such elements are arranged above a heating system, particularly the heating elements, e.g. induction coils, or the like. Within the induction coil, a temperature sensor may be arranged for measuring the temperature of the lower side of the glass ceramic. Usually such temperature sensor has a relatively low contact area of about 5 to 20 mm^2, compared to the area of the induction coil. In use, a piece of cookware, i.e. a pot, pan, or the like, is placed on the ceramic plate and the heat radiation or the electromagnetic field heats the bottom of such cookware and allows for performing a cooking process. A further part of the heat may be absorbed by the element, which is thus heated. Said further heat portion radiates towards the heating system.

[0006] The energy transfer thereby occurs by the electromagnetic field between the induction coil and the bottom of the cookware. During the heating of the bottom of the cookware, a part of the heat thermally conducts into the glass ceramic. Thereby a part of the heat radiation or electromagnetic field generated by the heating system penetrates the element and is transmitted through it, particularly in a hot plate area, where the heat element is located. This thermal conduction penetrates the glass ceramic usually in a delayed manner, however, at the end reaches the temperature sensor. The measured temperature therefore usually is significantly lower compared to the bottom of the cookware (about 50°C to 150°C) and the delay can be up to some seconds.

[0007] Typical cooking processes, e.g. heating of water and a temperature reduction after reaching the desired temperature can be measured by the temperature sensor only relatively imprecisely - due to the delay in the thermal conduction. Using according algorithms, it is known to try to estimate the temperature - which, however, is often possible only in connection with relatively complex and/or expensive sensor arrangements.

[0008] The above-described ideal, however, is only true for relatively flat and even cookware. In the art pots are known comprising an embossed deepening - due to different reasons comprising manufacturing process or in order to allow for the identification of the manufacturer. Such deepening, however, makes a precise temperature measurement significantly more difficult.

[0009] Today's cooking hobs allow the customer to assist the cooking process with various functions. Particularly, in the "temperature cooking" in which not only the power but also the temperature is kept constant, the quality of such functions strongly depends on the above-described temperature measurement.

[0010] The specification of such glass ceramic element, particularly of a vitro-ceramic glass, requests a lot issues for the material and is oriented - mainly - on a customer's point of view. For the upper side of the glass - the surface on which the customer is cooking - it is, for example, desired to have thermal and mechanical robustness, scratch resistance, straightness, evenness or the like.

[0011] The bottom side is less specified. The bottom side, particularly the surface of the bottom side, usually is flat or comprises knobs or pebbles. Such knobs or pebbles are usually not needed for thermal issues. Usually the bottom side is knobbed in order to avoid a direct visibility of internal components arranged below, e.g. electronics, coils, wiring, or the like (diffusion). Such knobs or pebbles are usually integrated during the manufacturing process by extensive roller application. However, this is disadvantageous where an element being at least partially transparent is desired. For example, it is thus difficult or impossible possible to make ads or structures, e.g. to place a user interface below such element, as the view thereon is at least affected.

[0012] Also flat bottom sides of such glass ceramic plates are known. The bottom side may comprise one or more printed layers. In such case, certain regions may be omitted from printing, usually in the area of the user controls. As a further method the application of local coatings are known. The knobbed glass may be partially coated and the "valleys" between the knobs or pebbles are thus filled. For example, it is known in the art, to fill "valleys" between knobs or pebbles of such glass- or glass-ceramic plate with a resin, to achieve a flat bottom side surface, which allows for a transparent view through the element, e.g. a glass-ceramic plate. Thereby the optical quality of an LED and a seven-segment display located below, in the area of the user controls may be improved.

[0013] Such knobs or pebbles are usually added during the production process of the elements, particularly of a glass

ceramic plate.

[0014] Such knob structures usually are arranged such that internal components are not directly visible, e.g. due to the scattering of the light which passes through the glass ceramic plate. This is disadvantageous where an element being at least partially transparent is desired. For example, it is thus difficult or impossible possible to make ads or structures, e.g. to place a user interface below such element, as the view thereon is at least affected.

[0015] It is known in the art, to fill "valleys" between knobs of such glass- or glass-ceramic plate with a resin, to achieve a flat bottom side surface, which allows for a transparent view through the element, e.g. a glass-ceramic plate.

[0016] The document DE 196 33 706 A1 describes a kitchen having a glass ceramic with a knob-free stripe at its bottom side in the area of the capacitive sensor switches.

[0017] The document DE 10 2004 023 847 A1 describes a kitchen hob comprising a heat conduction element, which is arranged such that it is capable of conducting a heat radiation produced by a heating system towards an upper side of a glass or glass-ceramic hob. However, this document does not solve the problem to allow detection of the heat reflected from a cooking ware.

[0018] These and other problems are solved by the subject matter of the attached independent claims.

[0019] It is an object of the present invention to provide a glass or glass-ceramic element for a cooking hob, having a bottom side, which is improved and/or advantageous.

[0020] It is to be understood that, particularly in glass-ceramic elements, the bottom side is - in general - compared to the upper side of the element construed relative simple.

[0021] This invention proposes to arrange and design the bottom side of a glass-ceramic element such that new functions are made possible.

[0022] Particularly, the above objects of the invention are achieved by a glass or glass-ceramic element according to claim 1, a glass or glass-ceramic element according to claim 2, a glass or glass-ceramic element according to claim 3, and a kitchen hob according to claim 12.

[0023] Preferred embodiments may be taken from the dependent claims.

[0024] A glass or glass-ceramic element for a kitchen hob, particularly a vitro-ceramic element, according to claim 1, preferably is a plate or plate-like element, which comprises an upper side and a bottom side, wherein the bottom side comprises at least one first heat conduction element, and wherein the first heat conduction element is arranged such that it is capable of conducting a heat radiation produced by a heating system towards a bottom side of the glass or glass-ceramic element.

[0025] The term "upper side" as used herein, refers to side, preferably a surface, which is the side and/or surface of a glass or glass-ceramic element, particularly in form of a plate, which is directed towards a cookware, which is to be placed on a kitchen hob comprising such glass or glass-ceramic element.

[0026] The term "bottom side" as used herein, refers to side, preferably a surface, which is the side and/or surface of a glass or glass-ceramic element, particularly in form of a plate, which is directed away from a cookware, which is to be placed on a kitchen hob comprising such glass or glass-ceramic element.

[0027] In the context of the present invention, the terms "knob" and "Pebble" are used interchangeably. According to the present invention a knob preferably has a diameter of about 2 mm. A distance between a first knob and another knob in a knobbed portion, is about 0.5mm. According to the present invention has a depth from about 0.05 mm to about 0.3 mm.

[0028] The term "heat conduction element" as used herein, preferably refers to a structural element, which is capable of conducting, preferably increased conducting, of a heat portion. It is to be understood that heat conduction preferably is understood herein as the transfer of thermal energy within a body due to a temperature gradient. A heat conduction element therefore, preferably allows for such thermal conduction within and, particularly through, a glass or glass-ceramic element. However, heat conduction as used herein, more preferably, may also refer to thermal conduction between objects that are in direct or indirect contact with each other. For example, a heat conduction element as used in the context of the various embodiments of the present invention may allow for and/or increase a thermal conduction of a portion of heat generated by a heating system, through a glass or glass-ceramic element according to the present invention and/or a thermal conduction of a portion of heat from a glass or glass-ceramic element according to the present invention to a side of the glass or glass-ceramic element. Such thermal conduction may, depending on the orientation and structure of the heat conduction element be directed towards a bottom side or towards the upper side of the glass or glass-ceramic element. For example, a first heat conduction element as used herein is arranged such that it is capable of conducting a heat radiation produced by a heating system towards a bottom side of the glass or glass-ceramic element.

[0029] It is to be understood that such heating system is usually placed below such glass or glass-ceramic element. Accordingly, the heat irradiation of such heating system may impinge on the glass or glass-ceramic element, which is heated and which is conducting the heat towards the upper side of the glass or glass-ceramic element. Kitchen hobs, particularly induction hobs are usually equipped with a thermal sensor in each coil. There is, however, a problem that such sensor, which is to detect the temperature and to avoid overheating of a piece of cookware, e.g. a pan, placed on the kitchen hob, is not able to measure directly the temperature of the bottom of such cookware. Instead the bottom

surface of the glass or glass-ceramic element is measured and based on that the pan temperature is calculated.

[0030] The present inventors have surprisingly found that providing the bottom side of the glass or glass-ceramic element with at least one first heat conduction element, which is arranged such that it is capable of conducting a heat radiation produced by a heating system towards said bottom side, advantageously allows to conduct a portion of heat back through the glass or glass-ceramic element towards its bottom side. Accordingly, a more precise determination of the temperature, e.g. of a cooking ware and/or the upper side of the glass or glass-ceramic element is made possible.

[0031] It is to be understood that the heat conducted in such way to the bottom side of the inventive glass or glass-ceramic element is not thought to heat in the first place. By contrast, said head conducted by the first heat conduction element towards the bottom side, advantageously allows for detecting said heat, e.g. in the form of a temperature value.

[0032] In an embodiment a heat conduction element, preferably a first and/or second heat conduction element, is arranged at a bottom side of the glass or glass-ceramic element according to the present invention.

[0033] The above described problems are also advantageously solved by a glass or glass-ceramic element for a kitchen hob, particularly a vitro-ceramic element, according to claim 2.

[0034] Such glass or glass-ceramic element comprises an upper side and a bottom side, wherein the bottom side comprises at least one first surface portion having an at least partially knobbed surface structure, and an at least one second surface portion, wherein the at least one second surface portion is a knob-free surface portion. In such glass or glass-ceramic element the bottom side further comprises a knobbed rim, wherein preferably the glass or glass-ceramic element is a glass or glass-ceramic element according to claim 1.

[0035] Moreover, the above described problems are also advantageously solved by a glass or glass-ceramic element for a kitchen hob, particularly a vitro-ceramic element, according to claim 3.

[0036] Such glass or glass-ceramic element comprises an upper side and a bottom side, wherein the bottom side comprises at least one heat conduction device, wherein said heat conduction device is a heat conduction bulge arranged at the bottom side and provided for receiving a thermal sensor, and wherein the heat conduction bulge transfers heat from the glass or glass-ceramic element to the thermal sensor by thermal conduction, and wherein preferably the glass or glass-ceramic element is a glass or glass-ceramic element according to claim 1 or 2. The heat conduction bulge provides the thermal conduction due to the temperature gradient. The heat conduction bulge is obtained by a selective thickening of the glass or glass-ceramic element, wherein said thickening is formed at the bottom side and extends downwards.

The first heat conduction element according to claim 1 is capable of conducting the heat radiation, while the heat conduction bulge transfers heat by thermal conduction.

[0037] Preferably the knobbed surface structure comprises knobs or pebbles, preferably a plurality of knobs or pebbles, more preferably arranged in a regular pattern.

[0038] In an embodiment an at least one second surface portion, wherein the at least one second surface portion is a knob-free surface portion, is preferably achieved by removing the knobs or pebbles in a negative pattern.

[0039] Such removing of the knobs or pebbles in a second surface portion with a negative pattern advantageously allows opening a "window" to look inside of the hob, i.e. through the glass or glass-ceramic element. Such second surface portion may advantageously be used to avoid a backside printing.

[0040] In an embodiment of the glass or glass-ceramic element and/or the kitchen hob according to the present invention such second surface portion may be configured and/or designed to be arrange-able above a user interface of a kitchen hob.

[0041] The bottom side according to a glass or glass-ceramic element according to the present invention further comprises a knobbed rim.

[0042] In a further advantageous embodiment of the inventive glass or glass-ceramic element according the present invention, wherein the bottom side comprises a first surface portion having an at least partially knobbed surface structure, and at least one second surface portion, wherein the at least one second surface portion is a knob-free surface portion, and wherein, preferably, the bottom side further comprises a knobbed rim.

[0043] In an embodiment of the glass or glass-ceramic element according to the present invention, the glass or glass-ceramic element is suitable for an induction hob. In an embodiment of the kitchen hob according to the present invention, the kitchen hob is an induction hob.

[0044] In a further advantageous embodiment of the inventive glass or glass-ceramic element according to the present invention, the bottom side comprises at least one second heat conduction element arranged such that it is capable of conducting a heat radiation produced by a heating system towards an upper side of the glass or glass-ceramic element.

[0045] Such second heat conduction element advantageously allows to focus and/or redirect heat generated by the heating system and escaping the upper side of the glass or glass-ceramic element. Such focus and/or redirection may advantageously allow to enhance heat applied to the cooking ware.

[0046] Preferably, such second heat conduction element is arranged in opposite configuration and orientation compared to the first heat conduction element.

[0047] Such second heat conduction element preferably is arranged at a bottom side of the glass or glass-ceramic

element.

[0048] In a further advantageous embodiment of the inventive glass or glass-ceramic element according to the present invention the first heat conduction element and/or the at least one second heat conduction element are configured as an optical structure, preferably provided as an integral part of the glass or glass-ceramic element.

[0049] Such optical structure may advantageously allow a focussing of the conducted heat portion.

[0050] If the first heat conduction element and/or the at least one second heat conduction element is provided as an integral part of the glass or glass-ceramic element this may be advantageous in the manufacturing process. Particularly, the number of parts and/or costs can significantly be lowered.

[0051] In an alternative embodiment the first heat conduction element and/or the second heat conduction element are provided as a separate part, attached to the bottom side of the glass or glass-ceramic element.

[0052] The direction and/or orientation of the heat portion irradiated or conducted from the glass or glass-ceramic element into the desired direction, may be achieved through the arrangement of the first and/or second heat conduction element, particularly at the bottom side, of the glass or glass-ceramic element according to the present invention.

[0053] In a further advantageous embodiment of the inventive the glass or glass-ceramic element according to the present invention the first heat conduction element and/or the at least one second heat conduction element, preferably the optical structure, is a lens element, preferably a converging lens, more preferably a Fresnel lens.

[0054] In an embodiment of the inventive glass or glass-ceramic element the bottom side is not formed with knobs as known in the art. Particularly, the bottom side comprises a recurrent pattern of optical structures. Said optical structures may particularly be arranged and/or formed in the style of a lens, particularly a Fresnel lens.

[0055] Preferably, the glass or glass-ceramic element according to the present invention is provided with a uniform thickness. More preferably, an upper side of the glass or glass-ceramic element is substantially flat, whereas the bottom side is provided with knobs, and/or first heat conduction element(s) and/or second heat conduction element(s).

[0056] A Fresnel lens is particularly preferred as a first and/or a second heat conduction element.

[0057] A Fresnel lens is a known form of optical lens, which is formed of small individual structural elements, which in their entirety fulfil the function of a collecting lens. The Fresnel lens may particularly be arranged on a flat base area. The

[0058] The depth of one single small individual structural element of a Fresnel lens according to the present invention may be at least 0.05 mm, at least 0.1 mm, at least 0.15 mm, at least 0.15 mm, at least 0.2 mm, at least 0.25 mm. The depth of one single small individual structural element of a Fresnel lens according to the present invention may be not more than 0.3 mm, not more than 0.25 mm, not more than 0.2 mm, not more than 0.15 mm. Preferably, the depth of one single small individual structural element of a Fresnel lens according to the present invention is from about 0.05mm to about 0.3 mm.

[0059] Such Fresnel lens may advantageously focus the thermal radiation from a diameter of about 50 mm having a focal distance of about 10 mm to about 30 mm. An infrared sensor may be placed in the area of the focus and may thus advantageously be provided with significantly increased amount of energy.

[0060] Such Fresnel lens may comprise a central, relatively flat spherical or aspheric lens, which may be surrounded by stacked arranged ring zones. Such configuration advantageously allows for a relatively low thickness of the lens, as usually known collecting lenses, particularly with a high focal ratio, have a high thickness. The individual zones of a Fresnel lens according to the present invention are preferably kept relatively narrow, more preferably below the limit of the resolving power of the eye. The radii of curvature of the individual ring zones may be chosen independently, preferably such that individual focal points are chosen according to the focal point F of the central part of the Fresnel lens. A Fresnel lens is preferably applied in the context of the present invention as such lens is relatively flat and can create a focus.

[0061] In a further advantageous embodiment of the inventive glass or glass-ceramic element according to the present invention the bottom side comprises at least one first surface portion having an at least partially knobbed surface structure, and/or an at least one second surface portion, wherein the at least one second surface portion is a knob-free surface portion, and wherein the at least one second surface portion comprises at least one first heat conduction element and/or at least one second heat conduction element.

[0062] Such knob-free surface portion allows for a window view inside of the hob, which may comprise first heat conduction element(s) and/or second heat conduction element(s), particularly in the form of small lenses.

[0063] In order to dimension such knob-free surface portion to the desired application, such knob-free surface portion may comprise, preferably locally, a black print. From such black print, the relatively exact desired transparent area may be compensated.

[0064] In a further advantageous embodiment of the inventive glass or glass-ceramic element according to the present invention the bottom side comprises a plurality of knobs or pebbles and/or a plurality of first heat conduction elements and/or a plurality of second heat conduction elements, which are arranged in a regular pattern.

[0065] This advantageously allows that the inventive glass or glass-ceramic element may be cut relative to the pattern In an embodiment of the present invention the at least one second surface portion comprises a plurality of first heat conduction elements and/or a plurality of second heat conduction elements, and the the at least one second surface portion comprises a plurality of knobs or pebbles, wherein the plurality of first heat conduction elements and/or the

plurality of second heat conduction elements are arranged in a regular pattern, and wherein the plurality of knobs or pebbles are arranged in a regular pattern.

[0066] Particularly, a plurality of Fresnel lenses, preferably arranged in a regular pattern, may increase the emission area.

[0067] A regular pattern, as used herein, preferably comprises an arrangement of individual elements in straight and/or diagonal lines, which may be arranged essentially parallel to and at a distance from one another, in vertical and/or horizontal orientation, as a matrix, or the like.

[0068] In a preferred embodiment an at least one first surface portion comprises knobs or pebbles arranged in a regular pattern.

[0069] In a preferred embodiment a knobbed rim comprises knobs or pebbles arranged in a regular pattern. Preferably, said knobs or pebbles have a diameter between 1 mm and 2 mm, in particular 1.5 mm. Further, the height of said knobs or pebbles may be between 0.1 mm and 0.3 mm, in particular 0.2 mm. Moreover, the distance between neighbored knobs or pebbles may be between 2 mm and 4 mm, in particular 3 mm.

[0070] In a preferred embodiment a second surface portion comprises a plurality of first heat conduction elements and/or a plurality of second heat conduction elements arranged in a regular pattern.

[0071] In connection therewith, it will be understood that a bottom side according to the various embodiments of the present invention may comprise first heat conduction elements and/or second heat conduction elements arranged each or together in a regular pattern.

[0072] For example, the at least one heat conduction bulge includes a plurality of ridges connected to each other. Preferably, said ridges have sloped surface structures and are arranged in a star-shaped form, so that the Fresnel lens is formed. The ridges are obtained by a selective thickening of the glass or glass-ceramic element. Said thickening is formed at the bottom side and extends downwards. The ridges allow an increased thermal conduction from the glass or glass-ceramic element to the thermal sensor.

[0073] According to another example, which also may be combined with the example mentioned above, the at least one heat conduction bulge includes a plurality of punctual bumps. Preferably, said punctual bumps have sloped surface structures and are arranged in a star-shaped form, so that the Fresnel lens is formed. The punctual bumps are obtained by selective thickenings of the glass or glass-ceramic element. Said thickenings are formed at the bottom side and extend downwards. The punctual bumps allow also an increased thermal conduction from the glass or glass-ceramic element to the thermal sensor.

[0074] The above-described problems are also advantageously solved by a kitchen hob, particularly an induction hob, according to the present invention

Such kitchen hob comprises a glass or glass-ceramic element according to the present invention, wherein the glass or glass-ceramic element is arranged above a heating system, wherein the heating system is for heating at least one hot plate area of the glass or glass-ceramic element.

[0075] In a further advantageous embodiment of the inventive kitchen hob according to the present invention the first heat conduction element and/or the at least one second heat conduction element is arranged in a hot plate area, preferably in a regular pattern.

[0076] In a further advantageous embodiment of the inventive kitchen hob according to the present invention, said kitchen hob comprises at least one thermal sensor arranged below the glass or glass-ceramic element for detection and/or control of a heat radiation produced by the heating system and conducting towards the bottom side of the glass or glass-ceramic element.

Such thermal sensor is advantageously applied to detect the temperature and to avoid overheating of a cooking ware placed on the kitchen hob, e.g. a pan. It is immediately evident, that the direct temperature measurement of the bottom of the pan is not possible. The bottom surface of the vitro-ceramic glass is measured and based on that the pan temperature is calculated.

[0077] A kitchen hob according to the present invention may comprise a pattern of such Fresnel lenses, particularly arranged at the bottom side of a glass or glass-ceramic element according to the present invention. Preferably, the cutting of such glass is such that a Fresnel lens upon assembly may correlate with a respective sensor. Fresnel lenses, which are not correlated with a sensor, still serve the purpose that the visibility of elements below the glass plate is prevented. Accordingly, in an embodiment of the present kitchen hob a thermal sensor is correlated to one Fresnel lens. Preferably, the spaces between the Fresnel lenses may comprise knobs or pebbles.

[0078] In the kitchen hob according to the present invention, preferably the maximal number of coils is correlated to the number of Fresnel lenses. The respective thermal sensor, particularly an IR sensor, may be arranged within the respective coil. Additionally or alternatively, the, particularly the IR sensor, may be arranged on a separate carrier element.

[0079] Advantageously, the present invention allows for both providing a kitchen hob according to the present invention, having a standard cooking zone arrangement, comprising for example, 2, 3 or 4 cooking zones, and moreover, providing a kitchen hob according to the present invention, having a an area surface cook-top having a matrix of various coils.

[0080] In a further advantageous embodiment of the inventive kitchen hob according to the present invention, said

kitchen hob comprises a plurality of thermal sensors arranged below the glass or glass-ceramic element for detection and/or control of a heat radiation produced by the heating system and conducting towards the bottom side of the glass or glass-ceramic element, wherein below each first heat conduction element a thermal sensor is arranged.

[0081] In a further advantageous embodiment of the inventive kitchen hob according to the present invention, wherein a thermal sensor is arranged below the glass or glass-ceramic element for detection and/or control of a heat radiation produced by the heating system and conducting towards the bottom side of the glass or glass-ceramic element, wherein thermal sensor is arranged in a coil, preferably in the center of a coil or hot plate.

[0082] In an embodiment of the kitchen hob according to the present invention the thermal sensor is selected from the group comprising NTC sensor, or IR sensor.

[0083] A thermal sensor according to the present invention may be, for example, a NTC sensor in a glass housing, whereby the contact surface is small with medium reaction speed; a NTC sensor in a T-shape housing, whereby larger contact surface with better reaction speed is provided; an IR Sensor, which may measure only the IR radiation, whereby no thermal flow from the glass to the sensor, would occur and whereby the area of IR emission is limited.

[0084] Preferably, an IR sensor is applied below each first heat conduction element. In an embodiment, an array of optical/IR sensors is applied. This advantageously allows no additional costs for the glass or glass-ceramic elements.

[0085] Preferably, a thermal sensor according to the present invention is positioned and/or arranged in the coil center.

[0086] Such coil center usually may have a diameter of about 40 mm to about 50 mm. Preferably such coil center has no windings.

[0087] Preferably, such winding-free area of a coil is used for sensor placement.

[0088] In a further advantageous embodiment of the inventive kitchen hob according to the present invention, the first heat conduction element and/or the second heat conduction element is arranged and/or configured corresponding to the diameter of a hot plate area.

[0089] Preferably, the glass or glass-ceramic element, according to the present invention comprises a bottom side, particularly a bottom surface, which is essentially coating-free.

[0090] If the bubbles in the outer area are done in a different defined height - the gluing distance can be guaranteed and the glue is distributed more easily during dropping the frame.

[0091] Example: the pattern is used near the outline; for small glasses the same pattern can be used.

[0092] All described embodiments of the invention have the advantage, that a bottom surface, and/or bottom side of a glass or glass-ceramic element for a kitchen hob is improved.

[0093] The present invention will be described in further detail with reference to the drawings from which further features, embodiments and advantages may be taken, and in which:

FIGs 1A, 1B and 1C	illustrate schematic views of examples of regular patterns;
FIG. 2	illustrates a schematic perspective view of a Fresnel lens, showing a first inventive embodiment;
FIG 3	illustrates a schematic perspective view of a segment of a regular pattern of Fresnel lenses;
FIGs 4A to 4D	illustrate schematic views of arrangements of different portions of a glass- or glass-ceramic element, according to the present invention; and
FIGs 5A to 5D	illustrate schematic bottom views of portions of the glass or glass ceramic element according to a further embodiment of the present invention.

[0094] FIGs 1A to 1C show three segments of regular patterns according to the arrangement of knobs or pebbles, first heat conduction elements, and/or second heat conduction elements, according to the glass- or glass-ceramic elements according to the present invention. As may be taken therefrom various arrangements are possible, and particularly, it should be understood that the regular patterns, which may be applied according to the present invention may not be limited to the regular patterns shown in the Figs. 1A to 1C. In said Figs. 1A to 1C each position marked with "X" each individually may represent a knob, first or second heat conduction element, depending on the portion of the bottom side of the glass or glass-ceramic element, which is desired. It may be taken therefrom that knobs or pebbles, first and/or second heat conduction elements, may be arranged, for example, in horizontal, vertical and/or diagonal lines, which are in regular or irregular distance to each other.

[0095] In Fig. 2 a single Fresnel lens is shown, which may be advantageously applied as first conduction element according to the present invention.

[0096] Such Fresnel lens as shown in Fig. 2 may be arranged in a regular pattern, for example as shown in Figs. 1A to 1C, for the purpose of the present invention. An exemplary section of such regular pattern of Fresnel lenses, here arranged in a regular checker-board pattern, is shown in Fig. 3.

[0097] Figs. 4A to 4D show different embodiments of arrangements of first surface portions 7, comprising knobs or pebbles; second knob-free surface portion 8, and knobbed rim portion 9.

[0098] In the embodiment shown in Fig. 4A, the glass- or glass-ceramic element, here a vitro-ceramic plate, comprises a first surface portions 7, comprising knobs or pebbles, which are preferably arranged in a regular pattern, and which create a diffuse optical view of the bottom side; the glossy top surface is mainly visible. Removing the bubbles with a negative pattern allows to open a "window" to look inside of the hob, in form of a - here three rectangular shaped - second knob-free surface portion(s) 8, which are advantageously surrounded by a knobbed rim portion 9. Such arrangement may advantageously be used to avoid a backside printing. For example, a user interface may be placed under each such window of second knob-free surface portion 8.

[0099] In Fig. 4B the same arrangement is shown as in Fig. 4A, whereby the second knob-free surface portion(s) 8 comprises a plurality of first heat conduction elements, in form of Fresnel lenses 2, which are arranged such that each Fresnel lens 2 is capable of conducting a heat radiation produced by a heating system 4 towards a bottom side 3 of the glass or glass-ceramic element 1. The plurality of Fresnel lenses is arranged in a regular pattern. Such arrangement is advantageous as more and more consumers request, for example, white LEDs in the user interface. Such white LED needs higher power to create the same light impression. In an embodiment as shown in Fig. 4B, where a regular pattern of small Fresnel lenses is included this could advantageously be provided.

[0100] From the embodiments shown in Fig. 4C and 4D, it may be taken, that a gluing area for the frame may be advantageously be prepared. It is to be understood that usually a frame is glued on the bottom side of, e.g. a virto ceramic, glass. The glue needs a defined thickness. To guarantee the thickness spacers are used. Embossments in the frame parts are convenient as well. If the knobs or pebbles in the outer area are done in a different defined height - the gluing distance can be guaranteed and the glue is distributed more easily during dropping the frame. In the shown embodiments, a rim portion 9 having a regular pattern of knobs or pebbles is used near the outline of the glass or glass-ceramic plate. As may be seen from Fig. 4C compared to Fig. 4D, the arrangement of patterns may advantageously be used for different sizes of plates - also for small glasses the same pattern can be used.

[0101] For example, the diameters of the knobs or pebbles 6 are between 1 mm and 2 mm, preferably 1.5 mm. Further, the heights of said knobs or pebbles 6 may be between 0.1 mm and 0.3 mm, preferably 0.2 mm. The distances between neighbored knobs or pebbles 6 may be between 2 mm and 4 mm, preferably 3 mm. These dimensions contribute to a sufficient stability of the glass or glass-ceramic element 1. Moreover, these dimensions provide an advantageous aesthetic of the bottom side 3 of the glass or glass-ceramic element 1.

[0102] FIGs 5A to 5D illustrate schematic bottom views of portions of the glass or glass ceramic element 1 according to a further embodiment of the present invention. FIG 5A to 5D show a heat conduction bulge 15 in each case. Said heat conduction bulge 15 is formed at the bottom side 3 of the glass or glass-ceramic element 1. The heat conduction bulge 15 provides the thermal conduction from the glass or glass-ceramic element 1 to the thermal sensor 13 due to the temperature gradient. The heat conduction bulge 15 is obtained by a selective thickening of the glass or glass-ceramic element 1, wherein said thickening is formed at the bottom side 3 of the glass or glass-ceramic element 1. The heat conduction bulge 15 extends downwards. The heat conduction bulge 15 transfers heat by thermal conduction. In contrast, the first heat conduction element 2 mentioned above is capable of conducting the heat radiation.

[0103] FIG 5A illustrates a first example of the heat conduction bulge 15. The heat conduction bulge 15 according to the first example includes a plurality of ridges 16 connected to each other. One central ridge 16 is formed circularly and a number of peripheral ridges 16 extend radially from said central ridge 15. Thus, the heat conduction bulge 15 is star-shaped. The thermal sensor 13 is arranged within and/or beneath the central ridge 15.

[0104] FIG 5B illustrates a second example of the heat conduction bulge 15. The heat conduction bulge 15 according to the second example includes a plurality of punctual bumps 17. The heat conduction bulge 15 with the plurality of punctual bumps 17 forms a Fresnel lens. A number of central punctual bumps 17 are arranged circularly and enclose the thermal sensor 13. A plurality of peripheral punctual bumps 17 forms a number of series 16. Said series 16 of peripheral punctual bumps 17 extend radially from said central punctual bumps 17. Thus, also the heat conduction bulge 15 of the second example is star-shaped. The thermal sensor 13 is arranged within and/or beneath the central punctual bumps 17.

[0105] FIG 5C illustrates a third example of the heat conduction bulge 15. The heat conduction bulge 15 of the third example also includes the plurality of ridges 16 connected to each other. In this example, the central ridge 16 is oval or elliptic. The number of peripheral ridges 16 extends radially from said central ridge 15. Also in this case, the heat conduction bulge 15 is substantially star-shaped. The thermal sensor 13 is arranged within and/or beneath the central ridge 15.

[0106] FIG 5D illustrates a fourth example of the heat conduction bulge 15. The heat conduction bulge 15 of the fourth example includes the plurality of punctual bumps 17. The central punctual bumps 17 are arranged elliptically and enclose the thermal sensor 13. The plurality of peripheral punctual bumps 17 forms a number of series, wherein said series extend radially from said central punctual bumps 17. Also the heat conduction bulge 15 of the fourth example is substantially star-shaped. The thermal sensor 13 is arranged within and/or beneath the central punctual bumps 17.

[0107] For example, the thermal sensor 13 may be an NTC sensor. The NTC sensor may be embedded in a T-shaped housing. Further, a U-shaped sensor, for example an NTC sensor may be used.

[0108] The heat conduction bulge 15 according to the present invention allows that the thermal sensor 13 may be attached at the glass or glass-ceramic element 1 without any glue or with a reduced amount of glue. Further, the heat conduction bulge 15 allows either that a metal conduction element between the glass or glass-ceramic element 1 and the thermal sensor 13 is not required or a smaller metal conduction element between the glass or glass-ceramic element 1 and the thermal sensor 13 is sufficient.

[0109] Preferably, the glass or glass-ceramic element 1 is provided as rolled glass. In particular, the structure at the bottom side 3 of the glass or glass-ceramic element 1, e.g. with the knobs or pebbles 6 or bumps 17, is obtained by rolling the glass or glass-ceramic element 1. Additionally or alternatively, the "windows" or second knob-free surface portions 8 may also be formed by rolling the glass or glass-ceramic element 1.

[0110] In other words, the "windows" or second knob-free surface portions 8 are formed by recesses within the structure with knobs or pebbles 6 or bumps 17 of the bottom side 3 of the glass or glass-ceramic element 1, but not by applying any elements onto said glass or glass-ceramic element 1 in order to obtain the knobbed surface structure.

[0111] The features of the present invention disclosed in the specification, the claims, and/or the figures may both separately and in any combination thereof be material for realizing the invention in various forms thereof.

List of reference numerals

[0112]

1	glass or glass-ceramic element
2	first heat conduction element
3	bottom side of the glass or glass-ceramic element
4	heating system
5	upper side of the glass or glass-ceramic element
6	knob
7	first surface portion (knobs)
8	second knob-free surface portion (knob-free)
9	knobbed rim
10	second heat conduction element
11	hot plate area
12	kitchen hob
13	thermal sensor
14	coil
15	heat conducting bulge
16	ridge
17	punctual bump

Claims

1. A glass or glass-ceramic element (1) for a kitchen hob, particularly a vitro-ceramic element, comprising
an upper side (5) and
a bottom side (3), wherein the bottom side (3) comprises

at least one first heat conduction element (2)

characterized in that
the first heat conduction element (2) is arranged such that it is capable of conducting a heat radiation produced by a heating system (4) towards a bottom side (3) of the glass or glass-ceramic element (1).

2. A glass or glass-ceramic element (1) for a kitchen hob, particularly a vitro-ceramic element, comprising an upper side (5) and a bottom side (3), wherein the bottom side (3) comprises

at least one first surface portion (7) having an at least partially knobbed surface structure, and
an at least one second surface portion (8), wherein the at least one second surface portion (8) is a knob-free

surface portion

characterized in that
the bottom side (3) further comprises a knobbed rim (9), wherein preferably the glass or glass-ceramic element (1) is a glass or glass-ceramic element (1) element according to claim 1.

3. A glass or glass-ceramic element (1) for a kitchen hob, particularly a vitro-ceramic element, comprising an upper side (5) and a bottom side (3), wherein the bottom side (3) comprises at least one heat conduction device (15),
characterized in that
the heat conduction device is a heat conduction bulge (15) arranged at the bottom side (3) and provided for receiving a thermal sensor (13), wherein the heat conduction bulge (15) transfers heat from the glass or glass-ceramic element (1) to the thermal sensor (13) by thermal conduction, and wherein preferably the glass or glass-ceramic element (1) is a glass or glass-ceramic element (1) element according to claim 1 or 2.

4. The glass or glass-ceramic element (1) according to claim 1, wherein the bottom side (3) comprises
a first surface portion (7) having an at least partially knobbed surface structure, and
at least one second surface portion (8), wherein the at least one second surface portion (8) is a knob-free surface portion, and
wherein, preferably, the bottom side (3) further comprises a knobbed rim (9).

5. The glass or glass-ceramic element (1) according to any one of claims 1 to 4, wherein the bottom side (3) comprises at least one second heat conduction element (10) arranged such that it is capable of conducting a heat radiation produced by a heating system (4) towards an upper side (5) of the glass or glass-ceramic element (1).

6. The glass or glass-ceramic element (1) according to any one of claims 1 to 5, wherein the first heat conduction element (2) and/or the at least one second heat conduction element (10) are configured as an optical structure, preferably provided as an integral part of the glass or glass-ceramic element (1).

7. The glass or glass-ceramic element (1) according to any one of claims 1 to 6, preferably claim 6, wherein the first heat conduction element (2) and/or the at least one second heat conduction element (10), preferably the optical structure, is a lens element, preferably a converging lens, more preferably a Fresnel lens.

8. The glass or glass-ceramic element (1) according to any one of claims 1 to 7, wherein the bottom side (3) comprises at least one first surface portion (7) having an at least partially knobbed surface structure, and/or
an at least one second surface portion (8), wherein the at least one second surface portion (8) is a knob-free surface portion, and
wherein the at least one second surface portion (8) comprises at least one first heat conduction element (2) and/or at least one second heat conduction element (10).

9. The glass or glass-ceramic element (1) according to any one of claims 1 to 8, wherein the bottom side (3) comprises a plurality of knobs or pebbles (6) and/or first heat conduction element (2) and/or second heat conduction element (10) are arranged in a regular pattern, wherein preferably said knobs or pebbles (6) have a diameter between 1 mm and 2 mm, in particular 1.5 mm, a height between 0.1 mm and 0.3 mm, in particular 0.2 mm, and a distance to the neighbored knobs or pebbles (6) between 2 mm and 4 mm, in particular 3 mm.

10. The glass or glass-ceramic element (1) according to any one of claims 3 to 9, wherein the at least one heat conduction bulge (15) includes a plurality of ridges (16) connected to each other, wherein preferably said ridges (16) have sloped surface structures and are arranged in a star-shaped form, so that a Fresnel lens is formed.

11. The glass or glass-ceramic element (1) according to any one of claims 3 to 10, wherein the at least one heat conduction bulge (15) includes a plurality of punctual bumps (17), wherein preferably said punctual bumps (17) have sloped surface structures and are arranged in a star-shaped form, so that a Fresnel lens is formed.

12. A kitchen hob (12), particularly an induction hob, comprising a glass or glass-ceramic element (1) according to any one of claims 1 to 11, wherein the glass or glass-ceramic element (1) is arranged above a heating system (4), wherein the heating system (4) is for heating at least one hot plate area (11) of the glass or glass-ceramic element (1), and wherein particularly the first heat conduction element (2) and/or the at least one second heat conduction

element (10) is arranged in a hot plate area (11), preferably in a regular pattern.

13. The kitchen hob (12) according to claim12, comprising at least one thermal sensor (13) arranged below the glass or glass-ceramic element (1) for detection and/or control of a heat radiation produced by the heating system (4) and conducting towards the bottom side (3) of the glass or glass-ceramic element (1), wherein preferably the kitchen hob (12) comprises a plurality of thermal sensors (13) arranged below the glass or glass-ceramic element (1) for detection and/or control of a heat radiation produced by the heating system (4) and conducting towards the bottom side (3) of the glass or glass-ceramic element (1), and wherein below each first heat conduction element (2) a thermal sensor (13) is arranged.

14. The kitchen hob (12) according to claim 12 or 13, wherein a thermal sensor (13) is arranged below the glass or glass-ceramic element (1) for detection and/or control of a heat radiation produced by the heating system (4) and conducting towards the bottom side (3) of the glass or glass-ceramic element (1), wherein thermal sensor (13) is arranged in a coil (14), preferably in the center of a coil (14).

15. The kitchen hob (12) according to any one of claims 12 to 14, wherein the first heat conduction element (2) and/or the second heat conduction element (10) is arranged and/or configured corresponding to the diameter of a hot plate area (11).

FIG 1A

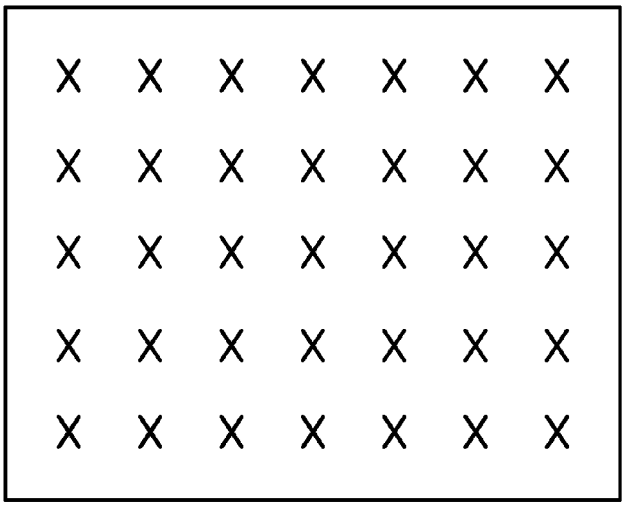


FIG 1B

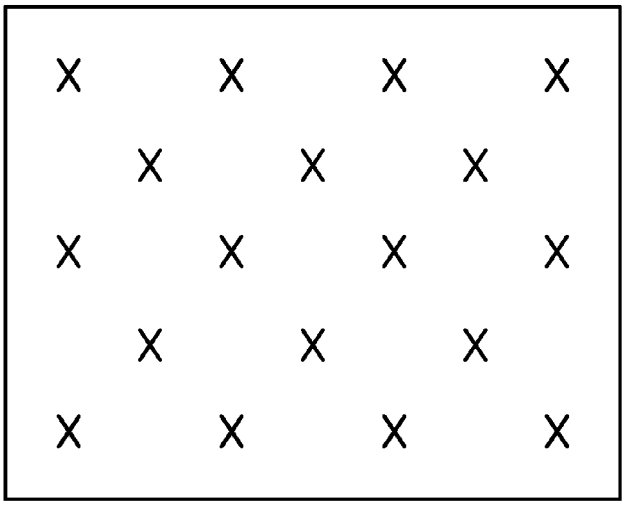


FIG 1C

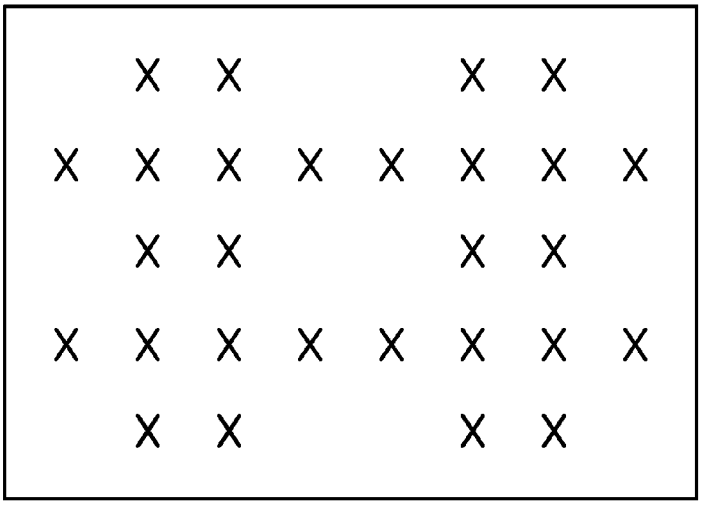


FIG 2

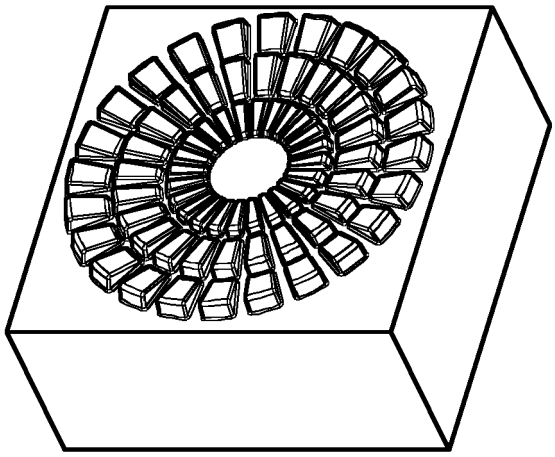


FIG 3

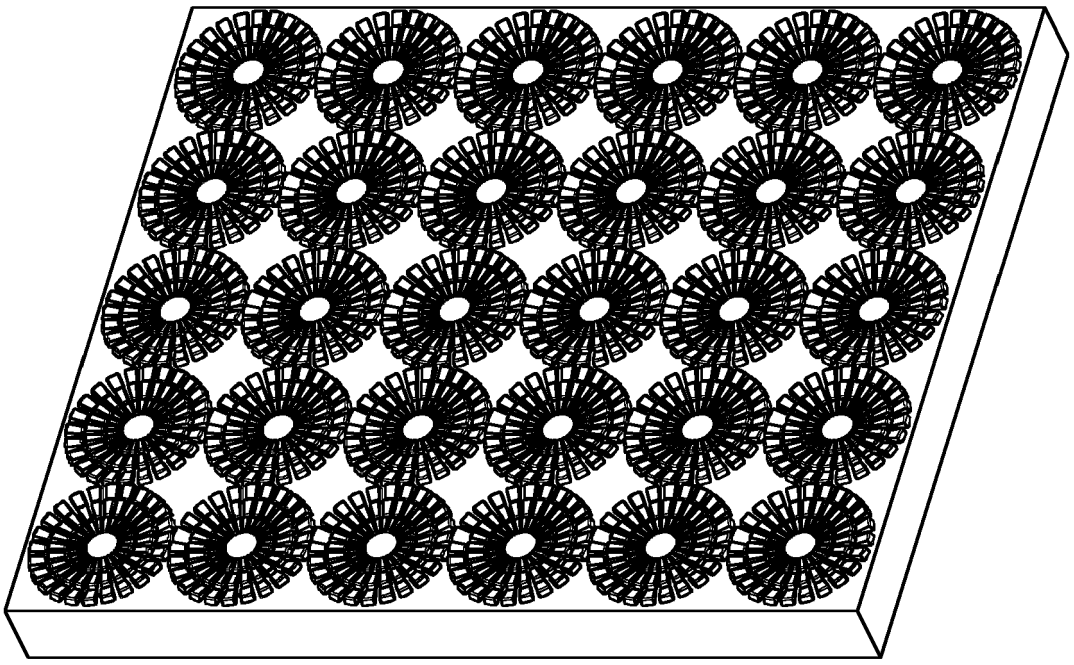


FIG 4A

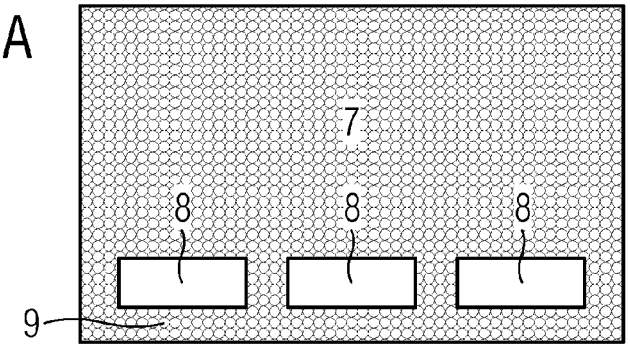


FIG 4B

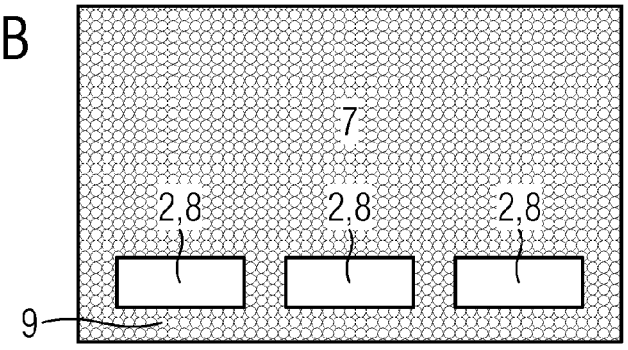


FIG 4C

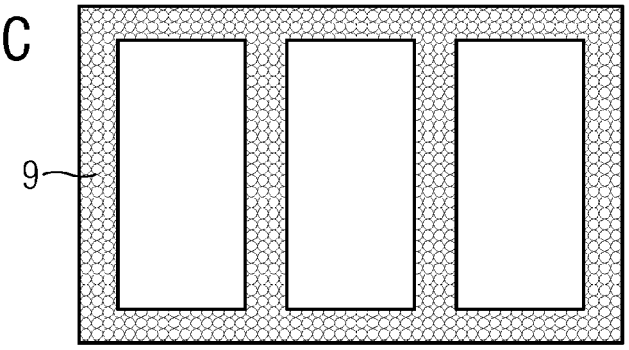


FIG 4D

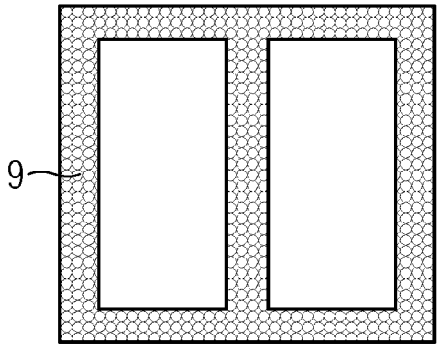


FIG 5A

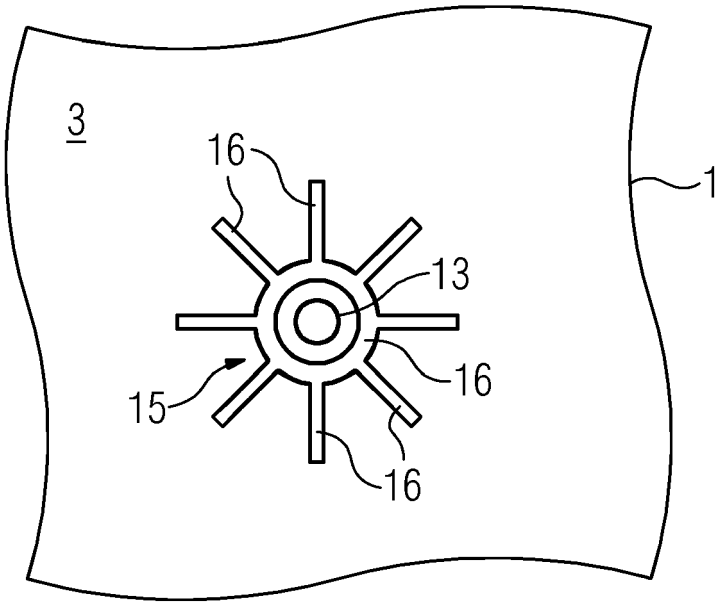


FIG 5B

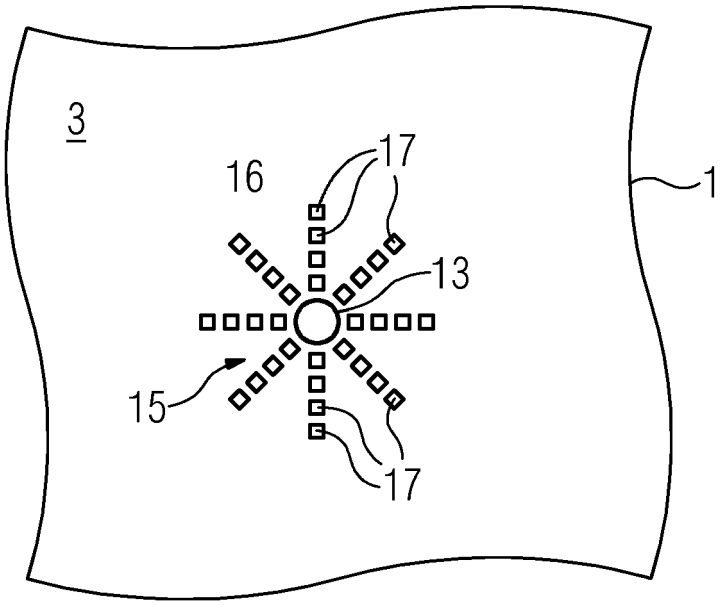


FIG 5C

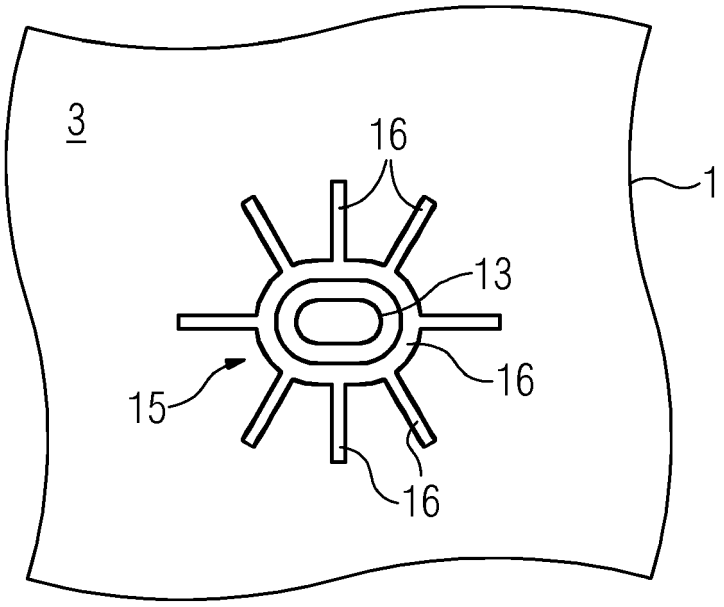
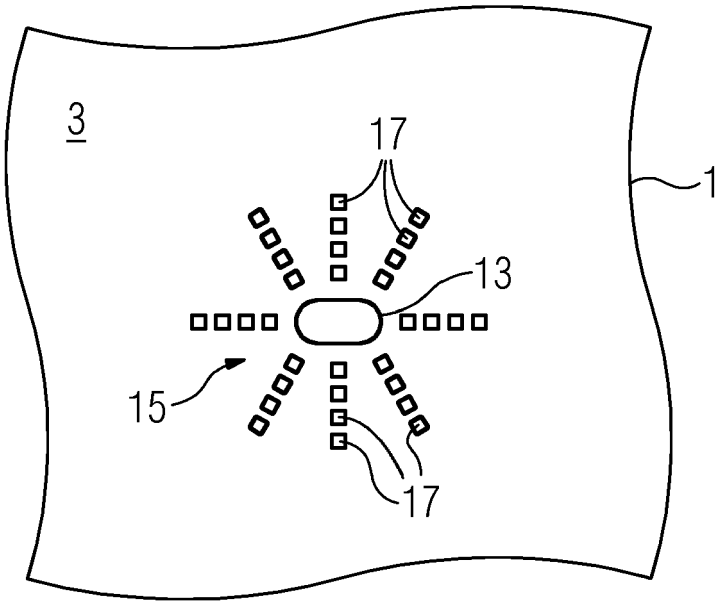


FIG 5D



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EUROPEAN SEARCH REPORT

Application Number
EP 16 17 8985

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* paragraph [0016]; figures 2,3,7 *	2,3	
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Y	* column 5, lines 16-41; figures 2,8 *	2	
X	US 6 281 481 B1 (TIEMANN JEROME JOHNSON [US]) 28 August 2001 (2001-08-28)	1-15	
Y	* figure 2 *	3	

TECHNICAL FIELDS SEARCHED (IPC)
H05B
F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 February 2017	Pierron, Christophe

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EPO FORM 1503 03.82 (P04C01)

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01-02-2017

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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