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(54) **Household broiling and/or baking oven**

(57) The invention relates to a broiling, roasting and/or baking oven, in particular to a household broiling, roasting and/or baking oven that encompasses at least one light source in particular for illuminating an interior space of the broiling, roasting and/or baking oven, for which at least one electroluminescent light source (2) is provided, as well as a method for illuminating the broiling, roasting and/or baking oven and in particular a broiling, roasting and/or baking oven.

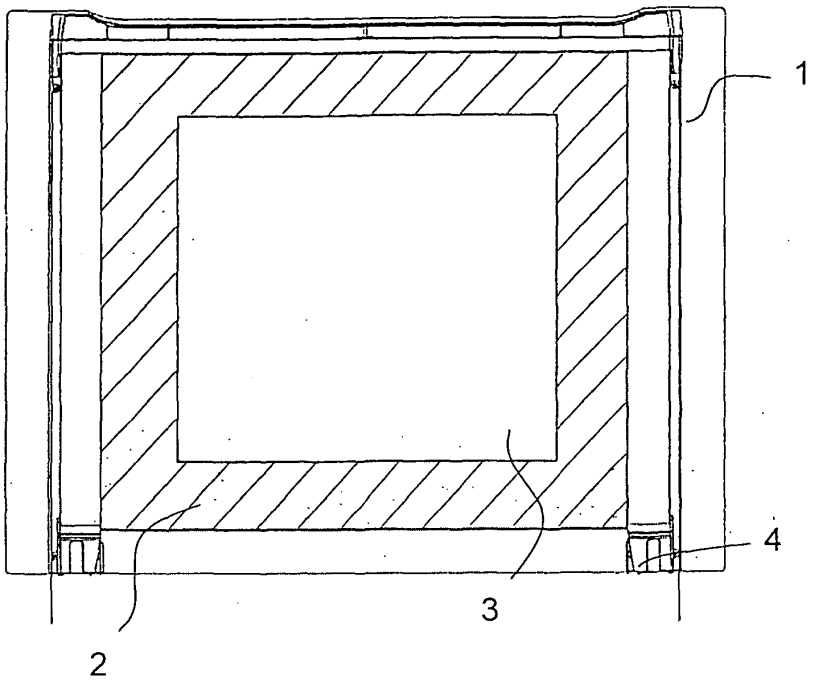

FIG 1

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Description

[0001] This invention relates to a household broiling and/or baking oven and a method for the interior illumination of said broiling and/or baking oven.

[0002] Lighting the interior of a broiling, baking or roasting oven typically employs incandescent or halogen lamps. For installing these lamps, i.e. for illuminating the interior of the oven, it is necessary to punch holes in the oven wall or inner oven chamber. Production tolerances may leave a gap between the lamp and the chamber or between the enclosure and the chamber. It is there that moisture from the oven interior can penetrate into the insulation where it can cause problems. That gap can also lead to unwanted heat loss from inside the oven. Moreover, the lamps are often mounted on the oven back or side wall so that, from an outside observer's view, the food is illuminated only indirectly. In the worst case, the observer is even blinded when looking inside the oven through the glass door.

[0003] DE 38 08 717 A1, for example, describes a roasting and baking oven chamber in which the lighting system is mounted behind a side wall of the chamber. The lighting system consists of an elongated reflector housing serving as the lamp support fixture and a protective glass plate shielding the lamp from the baking or cooking chamber of the oven. To further improve the illuminating range of the light source and to avoid blinding the observer looking into the cooking area, the lighting system is positioned in the front section of the oven chamber. The light source employed is a halogen lamp.

[0004] The lighting system described in DE 38 08 717 A1 may well provide better illumination of the oven interior and reduce the blinding effect, yet it still has to be installed through an opening in the oven chamber.

[0005] Then, too, halogen and incandescent lamps suffer from considerable power dissipation, meaning that only a small portion of the power is converted into light while the remaining energy undesirably exits into the surroundings outside the oven in the form of heat. Since the lamps are restricted to certain temperatures, they cannot be insulated on the enclosure side.

[0006] It is therefore the objective of this invention to improve the illumination in the interior of a broiling, baking or roasting oven in a manner whereby the aforementioned prior-art shortcomings are at least in part avoided or at least minimized. In particular, the invention is also intended to provide good full-range illumination while at the same time saving energy to the best extent possible.

[0007] This objective is achieved with a broiling, roasting and/or baking oven according to claim 1 and the method described in claim 13. Advantageous design variations and enhancements are covered in the dependent sub-claims to claims 1 and 13.

[0008] The novel broiling, roasting and/or baking oven, in particular a household appliance-type broiling, roasting and/or baking oven according to claim 1, includes at least one lighting system, in particular for illuminating at least one interior space of the broiling, roasting and/or baking oven, said illumination system incorporating at least one electroluminescent light source.

[0009] The term electroluminescence refers to the direct luminescent excitation of luminescence pigments or luminophores by means of an electric alternating field. Known examples include electroluminescence elements based on inorganic luminescent pigments or luminophores stimulated with alternating-current. The luminescent pigments or luminophores may be embedded in a transparent organic or ceramic i.e. inorganic bonding compound. Among others, these may be in the form of foils, lacquers or even ceramic and other suitable support materials. An electric current stimulates the pigments into luminescence. The higher the voltage applied, the greater the potential luminance or light intensity of these light sources. A change in the frequency of the alternating field can bring about a color shift. Electroluminescent light sources of this type have been described for instance in DE 10 2004 019 611 A1 or DE 10 2004 016 709 A1.

[0010] The advantage of electroluminescent light sources lies in the fact that they emit relatively non-dazzling, flicker-free light and offer homogeneous luminosity over their entire surface. They also permit implementation in different colors. Another advantage of electroluminescent light sources is their modest energy consumption and near-absent heat generation. Moreover, they are extremely robust.

[0011] The use of an electroluminescent light source permits the illumination of an oven chamber without the need to punch holes into the oven wall of chamber to accommodate the installation of lamps. It also means that condensation problems or heat loss due to air movement can be prevented. In addition, it permits uninterrupted insulation of the oven chamber and oven walls, ensuring improved energy efficiency. Finally, an electroluminescent light source permits better and more even illumination of the oven interior, perhaps from several sides if so desired.

[0012] In a particularly preferred embodiment of this invention the minimum of one electroluminescent light source is positioned on at least one section of at least one wall delimiting the oven interior and/or it constitutes at least one section of at least one wall delimiting the oven interior. This may mean that the electroluminescent light source is mounted directly on a wall of the oven interior, illuminating that interior space from there or through the wall if the latter is at least in part transmissive to light, or that the light source is integrated or embedded in a section of a wall or in a wall element of a wall composed of several elements, or mounted thereon. The reference to a wall delimiting the oven interior includes all oven walls such as side walls, bottom and top panels, partitions and even doors etc. The wall may be composed of one wall element or of several wall elements, which may be positioned side-by-side or one behind the other as viewed from the interior. The wall often encompasses at least one wall element directly adjoining the oven in-

terior, at least one insulating element or at least one insulating air space and at least one wall element separating the oven from the outside. The heating device serving to heat the oven interior may on its part perhaps be at least partially integrated into a wall element.

[0013] As another possible, particularly advantageous feature the minimum of one wall delimiting the interior is an access door to the interior and the minimum of one electroluminescent light source is provided on at least a partial section of that door and/or constitutes a partial section of the door. As described above, the door on its part may be composed of several door elements.

[0014] In addition, as a particularly preferred feature, the minimum of one wall and/or the door, and especially a section of the wall or door facing the oven interior, consists at least in part of at least one transparent material. Accordingly, it is possible for the electroluminescent light source to emit enough light into the interior of the broiling, roasting and/or baking oven, illuminating its contents of food that is being cooked, roasted or baked.

[0015] In a preferred embodiment, the minimum of one electroluminescent light source is covered or surrounded by a transparent material, especially glass. At least one transparent material, especially in the form of at least one pane or at least one coating, is preferably positioned between the minimum of one electroluminescent light source and the interior of the household broiling and/or baking oven. This is to ensure that the light emitted by the light source reaches the inside of the oven. It also prevents the light source from being directly exposed to the atmosphere in the oven interior which may not only be very hot but may also contain moisture as well as other substances such as oil droplets or particles etc. emanating from the food being cooked. While on the one hand protecting the light source from soiling or damage, it also protects the food in the oven from contamination by abrasion particles or fumes released by the light source.

[0016] In a particularly advantageous design version of the household broiling and/or baking oven according to the invention, at least a partial section of the minimum of one wall or of the minimum of one door consists of a transparent material over its entire area. It is thus possible, even when the oven chamber is closed, to see the oven interior from the outside, which interior can preferably be illuminated even when closed.

[0017] It may also be particularly advantageous to provide a cooling system for cooling the minimum of one electroluminescent light source. As a rule, electroluminescent light sources are restricted to a maximum operating temperature beyond which their performance may deteriorate. A cooling system can make certain that, when the temperature prevailing inside the broiling or roasting oven is very hot, that maximum operating temperature of the light source is not exceeded. For example, such cooling can be achieved by means of a fluid such as air, gas or a suitable liquid caused to flow directly along the light source or along the adjoining material. It is equally possible, however, to suitably cool a wall or door section positioned at a distance from the light source but in contact with or near the oven interior, so that the heat does not even reach the light source in the first place. It is further possible to specially configure the glass panes in a way as to protect the light source from overheating. Ultimately, the glass pane or window functions as thermal insulation as well. The air cushion between the panes reinforces this thermal insulation.

[0018] In a particularly advantageous form of implementation, the minimum of one electroluminescent light source is constituted of at least one electroluminescent foil applied in particular on a glass, ceramic or synthetic-material element, preferably on a glass, ceramic or plastic disk. Specifically, the electroluminescent foil may be up to 1 mm thick and/or carry an operating voltage of 60V to 100V. The operating frequency is preferably in a range between 50 Hz and 3000 Hz. This permits the attainment of a high luminance level and thus good and even illumination of the oven interior. Using an electroluminescent foil has the advantage that it is easy to process in a manufacturing operation and that by relatively simple methods it can be produced in a variety of shapes. It would also be possible in the event of a malfunction of the electroluminescent foil to replace it with a new foil.

[0019] In another, equally preferred form of implementation, the minimum of one electroluminescent light source consists of an electrode layer, preferably a lacquer containing electroluminophores, that is applied in particular on a glass, ceramic or synthetic-material element, preferably on a glass, ceramic or plastic disk. A layer of this type may be embedded in or between several transparent panes. The result is a very robust light source. It also allows for a lighting effect in two mutually opposite directions.

[0020] As another perhaps preferred possibility, one or several electroluminescent light sources may be implemented in one or several shapes and/or colors. The light sources may be mounted on only one or on several walls bounding on the oven interior. For example, different colors or configurations can indicate different operating phases or operating programs.

[0021] It may also be desirable to be able to vary the luminance or light intensity and/or luminous color of the electroluminescent light source. Such difference may be effected for instance by the open and, respectively, closed state of the oven. For example, the brightness may be lower when the oven is opened so as not to blind the user. Or, when the oven is opened, the luminous color may change to one that is more pleasing on the eye or indicates that the oven door is open. In addition, different light intensities may serve to indicate different operating phases or operating programs.

[0022] In a particularly preferred design version of the household broiling and/or baking oven the minimum of one electroluminescent light source is mounted, farthest from the oven interior, on a section of a glass, ceramic or synthetic-material element of a wall and/or door con-

sisting at least in part of transparent elements and adjoining at least one interior space, with the wall and/or door section encompassing the minimum of one electroluminescent light source being opaque toward the outside, while another section of the wall and/or door, preferably not encompassing an electroluminescent light source, consists entirely of a transparent material. Positioning the light source on a section, farthest from the oven interior, of a glass, ceramic or synthetic-material element of a door consisting of several at least in part transparent elements has the advantage that it is farthest removed from the heat source. The interpositioned door elements alone, or an air space, can shield the light source from exposure to the heat. Alternatively, a cooling system may be provided in the intervening space. Since the section of the wall and/or door encompassing the minimum of one electroluminescent light source is opaque toward the outside, the light will not radiate toward the outside and the user of the oven will not be blinded. At that particular point the light penetrates into the oven interior only. Through the section that is entirely transparent the user can look into the oven interior and observe the broiling, roasting and/or baking process, again without being blinded.

[0023] It may also be particularly advantageous to provide at least one power supply for the electroluminescent light source feeding power through the wall and/or door adjoining the minimum of one oven interior, and in particular through at least one door hinge. This obviates the need for providing an opening in the wall or door to the oven interior to accommodate for instance a cable or wires. It also prevents heat loss, or moisture penetration, through the wall or door.

[0024] Preferably, the power input is controlled by a microswitch specifically activated by opening and/or closing the door. That microswitch may be positioned in the door hinge or at some other point in the door frame, etc. It may also be particularly desirable if at least part of the minimum of one light source, especially of the light source located on the door, is switched on or off, and/or its brightness is increased or lowered, in a predefined or predefinable position of the door. This means that, specifically from a predefined or predefinable opening angle of the door, at least part of the light source in or on the door is switched off or dimmed so as not to blind the user. The microswitch serves to turn the light on or off, and to vary the light intensity or luminance or even the luminous color. Preferably, however, the minimum of one oven interior remains illuminated in both the open and the closed state. This can be achieved for instance by providing several electroluminescent light sources, perhaps in the door for directly activated illumination and on the lateral walls or ceiling of the oven interior for illumination even in the open state. Alternatively it may be desirable if the electroluminescent light sources on the lateral walls or on the interior ceiling as well are turned on or off or their brightness increased or dimmed in the predefined or predefinable position of the door. In that case, for example, primarily the light source in the door may be lit when the interior is closed while the light sources on the other walls would be on when the interior is open.

[0025] In another preferred design version at least one electroluminescent light source of a predefined or predefinable shape and/or color is provided on a transparent section of a door. That light source may be activated perhaps by switching on the broiling or baking oven and may for instance indicate an operating state, an operating program, or even the manufacturer's logo, etc.

[0026] In applying the method according to claim 13, a broiling, roasting and/or baking oven and in particular a household broiling, roasting and/or baking oven preferably as described in one of the claims 1 to 12, is illuminated by at least one electroluminescent light source.

[0027] The electroluminescent light source employed is preferably at least one electroluminescent foil applied in particular on a glass, ceramic or synthetic-material element and/or an electrode layer preferably in the form of a lacquer containing electroluminophores, applied in particular on a glass, ceramic or synthetic-material element.

[0028] In a particularly preferred form of implementation of the device the minimum of one electroluminescent light source is specifically cooled by means of an appropriate cooling system.

[0029] As an additional desirable feature, at least one microswitch serves to turn the power to at least one electroluminescent light source on or off or to regulate it up or down, in particular when at least one door to the interior of the broiling, roasting and/or baking oven is closed and/or opened.

[0030] The following will explain the invention in more detail with the aid of an implementation example and with reference to the attached schematic illustrations in which:

FIG. 1 depicts one advantageous design version of a house- hold broiling, roasting and/or baking oven according to the invention;

FIG. 2 is a perpendicular view of part of the household broiling, roasting and/or baking oven in FIG. 1.

[0031] Identical parts and parameters in FIG. 1 and 2 bear identical reference numbers.

[0032] FIG. 1 shows a door 1 to the interior of a household broiling, roasting and/or baking oven. One section of the door 1 is equipped with an electroluminescent foil 2 serving as the electroluminescent light source. This type of electroluminescent foil can have a life span for instance of 2,500 hours, withstanding an operating temperature from -50°C to 65°C and a storage temperature from -65°C to 85°C. The foil may be about 1 mm thick. The operating voltage is preferably in the range between 60 V and 100 V, the operating frequency in the range between 50 Hz and 3000 Hz. FIG. 1 is a top view of the inside 6 of the door (also refer to FIG. 2). The light source transmits light into the oven interior. The outside 7 of the door is opaque at least in the section encompassing the electroluminescent foil 2 so as not to blind the operator

of the oven. Another section 3 of the door, not equipped with an electroluminescent foil 2, consists entirely of a transparent material, which in this case is glass, allowing the operator to view the illuminated oven interior from the outside. The power for the electroluminescent foil 2 is fed in by way of a door hinge 4 which also encompasses the microswitch, not illustrated, that deactivates the electroluminescent foil 2 when the door 1 is opened at a predefined opening angle and reactivates it when the door 1 is closed.

[0033] FIG 2 is a bottom view of the door 1. It shows, among others, the door hinges 4. The door is composed of several door elements, in this case several transparent glass panes 5 with insulating air spaces 8. The electroluminescent foil 2 is mounted on the door element 8 that is farthest from the inside 6 of the door, thus protecting it from direct exposure to the heat in the oven.

Claims

1. Broiling, roasting and/or baking oven, in particular a household broiling, roasting and/or baking oven, comprising at least one light source serving in particular to illuminate at least one interior space of the broiling, roasting and/or baking oven, and featuring at least one electroluminescent light source.

2. Broiling, roasting and/or baking oven as in claim 1, in which the said minimum of one electroluminescent light source is installed on at least one section of at least one of the walls delimiting the oven interior and/or it constitutes at least one section of at least one wall delimiting the oven interior.

3. Broiling, roasting and/or baking oven as in claim 1 or 2, in which at least one of the walls delimiting the oven interior is a door to that interior and the minimum of one electroluminescent light source is mounted on at least one section of said door and/or constitutes at least one section of the door.

4. Broiling, roasting and/or baking oven as in one of the preceding claims, in which the minimum of one wall and/or door, especially a section of the wall and/or door facing the interior, consist(s) at least in part of a transparent material, in which in particular the minimum of one electroluminescent light source is covered or surrounded by a transparent material, in particular glass and/or in which in particular at least one transparent material, especially in the form of at least one pane or one coating, is situated between the minimum of one electroluminescent light source and the interior of the broiling, roasting and/or baking oven.

5. Broiling, roasting and/or baking oven as in one of the preceding claims,
   - the minimum of one electroluminescent light (2) source being mounted on at least one door section of a door (1) delimiting the at least one oven interior,
   - the door (1) consisting of several at least partly transparent door elements (5), and
   - the minimum of one electroluminescent light source (2) being mounted on the one door element (8) being farthest from the oven interior, on a glass-, ceramic- or synthetic-material element,
   - the door section (7) encompassing the minimum of one electroluminescent light source (2) being opaque toward the outside, while another section (5) of the door consists entirely of a transparent material.

6. Broiling, roasting and/or baking oven as in claim 5, in which the door (1), especially a section of the door (1) facing the interior, consists at least in part of a transparent material (5), in which in particular the minimum of one electroluminescent light source (2) is covered or surrounded by a transparent material, in particular glass and/or in which in particular at least one transparent material, especially in the form of at least one pane (5) or one coating, is situated between the minimum of one electroluminescent light source (2) and the interior of the broiling, roasting and/or baking oven.

7. Broiling, roasting and/or baking oven as in one of the preceding claims, in which at least one section of the minimum of one wall and/or the minimum of one door consists entirely of a transparent material and/or in which at least one cooling system, in particular using air, gas or fluid caused to flow directly along the light source, is provided for cooling the electroluminescent light source (2).

8. Broiling, roasting and/or baking oven as in one of the preceding claims, in which the minimum of one electroluminescent light source consists of an electroluminescent foil applied in particular on a glass, ceramic or synthetic-material element, wherein in particular the electroluminescent foil is up to 1 mm thick and/or carries an operating voltage of 60 V to 100 V and/or with an operating frequency of between 50 Hz and 3000 Hz.

9. Broiling, roasting and/or baking oven as in one of the preceding claims, in which the minimum of one electroluminescent light source encompasses an electrode layer, preferably in the form of a lacquer containing electroluminophores, applied in particular on a glass, ceramic or synthetic-material element and/or in which one or several electroluminescent light sources is/are provided in one or several forms and/or colors and/or in which the luminance and/or

luminous color of at least one electroluminescent light source can be varied.

10. Broiling, roasting and/or baking oven as in one of the preceding claims, in which the minimum of one electroluminescent light source is mounted on a section, farthest from the oven interior, of a glass, ceramic or synthetic-material element of a wall consisting of several at least partly transparent elements and/or door to the minimum of one oven interior, said wall and/or door section encompassing the minimum of one electroluminescent light source being opaque toward the outside, while another section of the wall and/or door consists entirely of a transparent material.

11. Broiling, roasting and/or baking oven as in one of the preceding claims, in which at least one power supply for the electroluminescent light source connects through at least one wall and/or door, and in particular through at least one door hinge, to the minimum of one oven interior, wherein in particular the broiling, roasting and/or baking oven is provided with a microswitch which especially by the opening and/or closing of a door makes or breaks the contact with the interior and/or in which in particular at least part of the minimum of one electroluminescent light source, especially of the light source on the door, is switched on or off, and/or is brightness is regulated up or down, when the door is in a predefined or predefinable position.

12. Broiling, roasting and/or baking oven as in one of the preceding claims, in which at least one electroluminescent light source of a predefined or predefinable shape and/or color is provided on a door section that is transparent toward the outside.

13. Method for illuminating a broiling, roasting and/or baking oven, in particular a household broiling, roasting and/or baking oven, preferably as described in one of the preceding claims, by means of at least one electroluminescent light source.

14. Method as in claim 13, employing as the said minimum of one electroluminescent light source an electroluminescent foil applied in particular on a glass, ceramic or synthetic-material element, and/or an electrode layer, preferably in the form of a lacquer containing electroluminophores, applied on a glass, ceramic or synthetic-material element and/or as part of which the minimum of one electroluminescent light source is cooled preferably via air, gas or liquid caused to flow directly along the light source and/or whereby, via at least one microswitch, the opening and/or closing of at least one door to the interior of the broiling, roasting and/or baking oven activates or deactivates the power supply to at least one electroluminescent light source and/or regulates the power up or down.

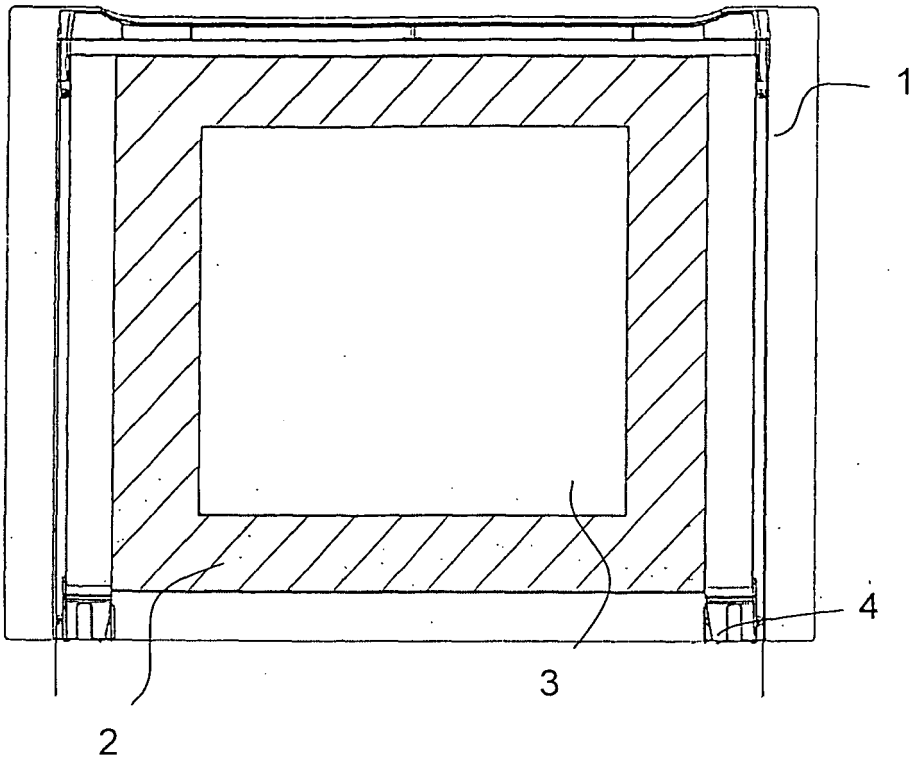

FIG 1

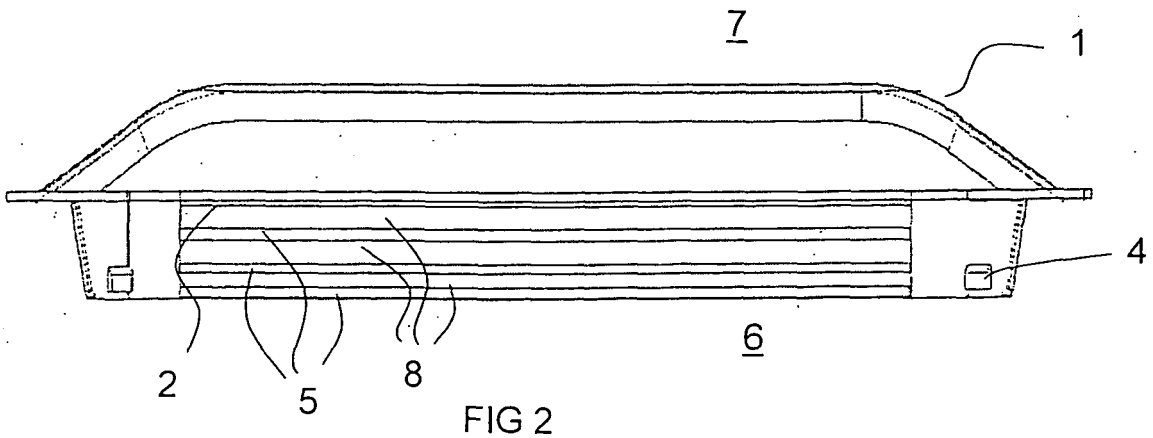

FIG 2

REFERENCES CITED IN THE DESCRIPTION

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