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(54) **Oven, especially domestic oven**

(57) The invention relates to an oven (1), especially to a domestic oven, having a cooking cavity (2) and means (3) for illuminating the cavity (2), wherein the means (3) for illuminating comprise at least one lamp (4) and have at least one light emission surface (6) for the light facing the cooking cavity (2). To avoid any blinding of the user by the means for illuminating, the invention is **characterized in that** the means (3) for illuminating comprise a light guide element (5, 7) which consists of a transparent material, especially of glass.

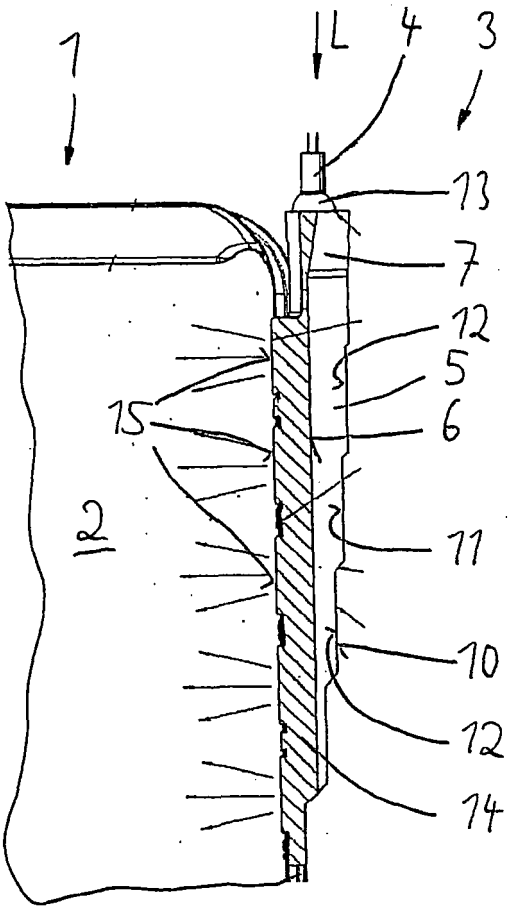

FIG 4

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Description

[0001] The invention relates to an oven, especially to a domestic oven, having a cooking cavity and means for illuminating the cavity, wherein the means for illuminating comprise at least one lamp and have at least one light emission surface for the light facing the cooking cavity.

[0002] Ovens of this kind are well known in the art. To ensure proper working conditions for the user of the oven the cavity must be duly illuminated. For doing so different solutions are known in the prior part.

[0003] DE 299 08 990 U1 shows an illumination system for the cavity' of an oven, which has a reflector of a substantial prismatic shape. Within the reflector element a plurality of reflectors are arranged having a saddle-shaped form.

[0004] DE 103 18 859 A1, DE 103 18 860 A1, DE 103 18 861 A1 and DE 103 14 543 A1 show means for illumination having also a prismatic reflector element.

[0005] In DE 103 47 763 A1 illumination means for an oven are disclosed by which diffused light is produced to illuminate the cavity.

[0006] In DE 102 04 612 A1 a container element is shown which is part of means for illuminating the cavity and which has a substantial prismatic form. A plurality of mirrors is arranged in longitudinal direction of the container element.

[0007] A substantial classical reflector with lamp is used in DE 101 22 878 A1, in DE 86 02 774 U1 and in DE 34 04 430 A1 to illuminate the cavity.

[0008] Other solutions for illuminating the cavity of the oven are shown in DE 38 08 717 A1, in EP 0 922 910 B1, in EP 0 513 758 A2 and in FR 2 826 707 A1.

[0009] It has been found detrimental that the pre-known means for illumination of the cavity have often a quite complex design. Thus, the costs for producing and mounting the systems are high, accordingly. Furthermore, the pre-known solutions do not always ensure that a blind-free illumination of the cavity can be obtained. Also, it is disadvantageously that in some cases glass fibres are necessary to guide the light from the light source to the location where the light is needed. In other cases a plurality of lamps is necessary to sufficiently illuminate the whole cavity of the oven in all levels.

[0010] Therefore, it is an object of the invention to,propose a concept for means for illumination of a cavity of an oven which can be produced in an economical way and which makes sure that the illumination of the cavity can take place without any blinding of the user. Furthermore, it is aimed that the whole cavity is illuminated equally in vertical direction. By doing so all baking trays on different levels within the cavity should be illuminated equally. Also, it should become possible to employ only one lamp per illumination element. Finally, a slim design is desired which gives a certain degree of freedom for designing the oven.

[0011] The solution of this object according to the invention is **characterized in that** the means for illuminating comprise a light guide element which consists of a transparent material, especially of glass.

[0012] The light guide element can comprises a volume of prismatic, conical or cylindrical shape.

[0013] The light guide element can have flat and/or bow-shaped wall elements. An inner reverse side of the light guide element can comprise a plurality of segmented reflector areas. Preferably, the light guide element is made as a one-piece element.

[0014] According to a preferred embodiment of the invention only one single lamp is arranged adjacent to the light guide element. The lamp can comprise a bulb. Also, using a halogen lamp can be beneficially. It is also possible that the lamp comprises a light emitting diode (LED).

[0015] An alternative solution is **characterized in that** at least two lamps are arranged adjacent to the light guide element, wherein each lamp comprises a light emitting diode (LED). In the latter case the at least two light emitting diodes (LED) can have different colours. By this feature different modes of operation can be displayed by different colours. It is also possible by this design to adjust the desired colour in the cavity.

[0016] At least a part of the wall elements of the light guide element can be coated.

[0017] A concentration element can be employed between the lamp and the light guide element. The concentration element can be part of the socket or of the housing of the lamp. The concentration element can also be made of a coating on the lamp or its socket.

[0018] Preferably, a transparent plate as a part of the light guide element is arranged at the light emission surface of the light guide element. The transparent plate is usually made of glass.

[0019] The transparent plate can have a flat surface at its side facing the cavity. But it is also possible that the transparent plate has a convex surface at its side facing the cavity. In this case the light emission surface for the light from the lamp and the reflector has the shape of a lens. It can also be structured to improve the distribution of the light. By different structures, indentations or risings texts or ciphers (e. g. the number of the level for the baking tray) can be displayed.

[0020] A blind can be arranged on or at the transparent plate. The blind can be made of sheet metal or of a foil. Also, the blind can be printed on the transparent plate.

[0021] The blind can also be a part of the cavity.

[0022] At least one radiating surface can be formed on the transparent plate. The radiating surface can have a substantial square form or can have the shape of an alphabetic character or of a cipher.

[0023] Preferably, the light guide element is arranged remote from a rear wall of the cavity. It can be arranged in the front side region of the cavity. Preferably, two light guide elements are arranged in both side region of the cavity.

[0024] Preferably the longitudinal direction of the light guide element is extending vertically.

[0025] With the suggested solution it is made sure, that

a quite easy design is obtained which can be manufactured and assembled in an easy and thus cheap way.

[0026] Furthermore, the illumination of the cavity can occur with a minimum of lamps.

[0027] It is surely prevented that a blinding of the user takes place due to the illumination means, as the light is guided from the lamp into the light guide element and further to the cavity by means of the light guide element.

[0028] Advantageously, all levels of the cavity in vertical direction can sufficiently be illuminated with the proposed design.

[0029] It is also possible to easily illuminate a cipher or character within the cavity. For doing so no additional lamp is required.

[0030] The light from the lamp leaves the means for illumination by being reflected by the walls of the light guide element and not directly via the lamp, i. e. an indirect illumination of the cavity takes place. Therefore, no "hot spot" exists which can be the source for blinding.

[0031] As the lamp is not visible from the cavity due to the use of the light guide element no blinding effect can come into being.

[0032] The whole vertical extension of the cavity can be sufficiently illuminated by the means, i. e. ,all levels where baking trays are arranged.

[0033] When a respective blind with apertures is employed is becomes possible to illuminate specific regions of the cavity in a quite specific way. More specifically, light can be emitted between two baking trays.

[0034] The light emitting surfaces of the transparent plate (glass plate, being a part of the light guide element) can be divided into segments. By doing this specific areas within the cavity can be illuminated. Also texts can be displayed (e. g. a logo) by machining respective openings into the cavity wall which are then illuminated by the means for illumination.

[0035] The proposed means for illuminating can also be used to display the baking levels in the front region of the oven.

[0036] The means for illuminating can by arranged in a slanted way relatively to the cavity to improve the illumination of the cavity.

[0037] Further, by employing the light guide element it becomes possible to arrange the lamp with distance to the cavity. So, the use of LEDs is supported as the temperature at the location of the lamps becomes lower.

[0038] The slim design of the means for illumination allows a higher degree of freedom when designing the oven and a better insulation. It is possible e. g. to illuminate each level for baking with separate segments or to illuminate only via an illuminated text or cipher. A housing is not mandatory.

[0039] In the drawings embodiments of the invention are depicted.

FIG 1 shows a sectional top plan view of a domestic oven, i. e. a section viewed from the top,

FIG 2 shows a sectional bottom plan view of the oven according to FIG 1, i. e. a section viewed from the bottom,

FIG 3 shows a front view of means for illuminating before assembly into the oven,

FIG 4 shows the sectional view A-B according to FIG 1,

FIG 5 shows a front view of an alternative design of the means for illuminating according to FIG 3,

FIG 6 shows a top plan sectional view according to section D-E of FIG 7 through the means for illuminating mounted in the oven,

FIG 7 shows the sectional view A-B according to FIG 1 in the alternative design to FIG 4,

FIG 8 shows a side view of a further alternative design of the means for illuminating,

FIG 9 shows the view C according to FIG 8 of the means for illuminating according FIG 8, mounted into the oven,

FIG 10 shows a perspective view of an alternative design of the means for illuminating according to FIG 3,

FIG 11 shows the front view of the means for illuminating according to FIG 10,

FIG 12 shows the means for illuminating according to FIG 10 and 11 in a mounted state in the wall of a cavity,

FIG 13 shows the means for illuminating similar to those means shown in FIG 3 mounted in the ceiling region of a cavity and

FIG 14 shows a perspective view of the oven according to FIG 1.

[0040] In FIG 1 and in FIG 2 a domestic oven 1 is depicted having a cooking cavity 2 as usual. While FIG 1 shows a sectional top plan view of the oven, i. e. viewed from the top, FIG 2 shows a sectional bottom plan view of the oven, i. e. viewed from the bottom. The cavity 2 is closable by a not depicted door and has a rear wall 16. To illuminate the cavity 2 means 3 for illuminating are employed. Those means 3 are arranged on both side regions of the cavity 2, remote from the rear wall 16, i. e. in the front region of the cavity.

[0041] The means 3 for illuminating the cavity 2 are depicted in detail in FIG 3 till FIG 5 according to a first embodiment of the invention.

[0042] The means 3 have a light guide element 5 which consists substantially from glass. The light guide element 5 has a substantial oblong shape which extends into a longitudinal direction L. At one side the light guide element 5 has a light emission surface 6 from which light can be emitted into the cavity 2.

[0043] At one end of the part 5 of the light guide element, another part of the light guide element 7 is located which has in turn a lamp 4 at one of its ends. Thus, both parts 5 and 7 form the whole light guide element.

[0044] As can be seen from FIG 3 the part 7 of the light guide element has an extension in longitudinal direction L denoted with L_G. The other part 5 of the light guide element has an extension L_R. Preferably, the length L_G of the first part of the light guide element 7 is between 8 % and 25 % of the length L_R of the second part 5 of the light guide element.

[0045] The second part of the light guide element 5 is formed by three walls 8, 9 and 10 which form a volume in which the light from the first part of the light guide element 7 is emitted. The inner sides of the walls reflect the light from the lamp 4 and emit it via the light emission surface 6 into the cavity 2.

[0046] For controlling this emission of light the reverse side 11 of the light guide element 5 can be designed accordingly. As can be seen from FIG 4 the reverse side 11 can be supplied with segmented reflector areas 12. Thus, the major part of the light is reflected from the reverse side 11 to the light emission surface 6. For this purpose the surface of the reverse side 11 (as well as of the other wall elements) can be structured or coated to improve the distribution of light. The reverse side 11 can have slants or radii also to improve the distribution of light or to guide the light to certain desired areas. The remainder of the light is emitted directly to the light emission surface 6. There, a transparent plate (glass plate) 14, which is also part of the light guide element, is arranged to make sure that no dirt from the cavity can enter into the means 3 for illuminating.

[0047] A concentration element 13 is employed to focus the light of the lamp 4 and to lead it into the light guide element 7. The concentration element 13 can be a part of the socket of the lamp 4.

[0048] Thus, the light enters - focussed by the concentration element 13 - from the lamp 4 into the first part of the light guide element 7 and from this element into the second part of the light guide element 5. At the transition from the lamp 4 and the concentration element 13 respectively to the light guide element 7 a couple area for the light is formed by which the light is coupled into the light guide element 7.

[0049] As can'be seen in FIG 4 the transparent plate 14 has a radiating surface 15 by which the light is emitted into the cavity 2. The radiating surface 15 can be formed according to a desired shape. It can be seen in FIG 5 that the surfaces 15 can have a substantial square form 15' or the form of a character of cipher 15''.

[0050] An alternative embodiment of the invention is shown in FIG 6 and FIG 7. Here the whole means 3 for illuminating are mounted under a certain angle to the cavity 2. Furthermore, the transparent plate 14 has a convex radiating surface 15, i. e. the form of a lens to illuminate the cavity 2.

[0051] A further alternative embodiment of the invention is shown in FIG 8 and FIG 9. Here the light guiding element 7 has a substantial conical shape; the axis 17 of the light guiding element 7 is arranged under an acute angle to the longitudinal direction L. Here is can also be seen that a wall element 10 of the second part of the light guide element 5 can have a bow-shaped (or curved) form. In FIG 9 is can be seen that the whole means 3 for illuminating are again arranged under a certain angle to the cavity 2.

[0052] In FIG 10 and 11 an alternative design of the means for illuminating 3 is shown. As can be seen in FIG 12 the means 3 can be mounted by putting the means 3 through an opening or recess in the cavity wall from the inner of the cavity.

[0053] Also, the arrangement of the means 3 in the ceiling region of the cavity 2 is possible as can be seen in FIG 13. Here beside the means 3 mounted in the ceiling of the cavity 2 another means 3 is mounted in the side region of the cavity.

[0054] A perspective view of the oven according to FIG 1 is shown in FIG 14. The arrangement of the means for illuminating 3 at both sides of the cavity 2 can be seen.

[0055] The light guide element 5, 7 can be made from pressed glass. It can have a simple design so that its production is cheap. Additional parts like cover glasses or other light guiding element can be avoided.

[0056] As said earlier, the light source can be e. g. a halogen lamp or Light Emitting Diodes (LEDs). The location of coupling the light into the means for illuminating is beneficially in a cooler region and thus remote from the reflector element. When halogen lamps are used a concentration element 13 has advantages. Alternatively, the use of a halogen lamp can be taken into consideration which is evaporated at one side.

[0057] The whole means for illuminating 3 can be mounted by inserting the same into a recess in the cavity wall from the side of the cavity or by mounting it from the outside of the cavity to a recess in the cavity wall. It is a special advantage that the mounting of the light guide element can be facilitated by inserting it from the inner of the cavity into its final position in the cavity wall.

[0058] The guidance, the distribution and the transfer of the light from the lamp into the cavity is influenced substantially by the form and the surface structure of the light guide element.

[0059] The light guide element is preferably oriented to guide the light from the front region of the cavity to the rear region of it. By this any blinding of the light can be avoided.

Reference Numerals

[0060]

1	Oven
2	Cooking cavity
3	Means for illuminating
4	Lamp
5	Light guide element (first part)
6	Light emission surface (opening)
7	Light guide element (second part)
8	Wall element
9	Wall element
10	Wall element
11	Reverse side of the light guide element
12	Segmented reflector areas
13	Concentration element
14	Transparent plate
15	Radiating surface
15'	Radiating surface with square form
15''	Radiating surface (alphabetic character / cipher)
16	Rear wall
17	Axis

L_G	Length of the first part of the light guide element
L_R	Length of the second part of the light guide element
L	Longitudinal direction

Claims

1. Oven (1), especially domestic oven, having a cooking cavity (2) and means (3) for illuminating the cavity (2), wherein the means (3) for illuminating comprise at least one lamp (4) and have at least one light emission surface (6) for the light facing the cooking cavity (2),
characterized in that
the means (3) for illuminating comprise a light guide element (5, 7) which consists of a transparent material, especially of glass.

2. Oven according to claims 1, **characterized in that** the light guide element (7) comprises a volume of prismatic, conical or cylindrical shape.

3. Oven according to claims 1 or 2, **characterized in that** the light guide element (5) has flat and/or bow-shaped wall elements (8, 9, 10).

4. Oven according to claim 3, **characterized in that** an inner reverse side (11) of the light guide element (5) comprises a plurality of segmented reflector areas (12).

5. Oven according to at least one of claims 1 to 4, **characterized in that** the light guide element (5, 7) is made as a one-piece element.

6. Oven according to at least one of claims 1 to 5, **characterized in that** one single lamp (4) is arranged adjacent to the light guide element (5, 7).

7. Oven according to claim 6, **characterized in that** the lamp (4) comprises at least one of a bulb, a halogen lamp or a light emitting diode (LED).

8. Oven according to at least one of claims 1 to 5, **characterized in that** at least two lamps (4) are arranged adjacent to the light guide element (5, 7), wherein each lamp (4) comprises a light emitting diode (LED), wherein in particular the at least two light emitting diodes (LED) have different colours.

9. Oven according to at least one of claims 1 to 8, **characterized in that** at least a part of the wall elements (8, 9, 10) of the light guide element (5) is coated or covered and/or **in that** a concentration element (13) is arranged between the lamp (4) and the light guide element (7), wherein in particular the concentration element (13) is part of the socket or of the housing of the lamp (4) or the concentration element (13) is made of a coating on the lamp (4) or its socket.

10. Oven according to at least one of claims 1 to 9, **characterized in that** a transparent.plate (14) as a part of the light guide element (5) is arranged at the light emission surface (6) of the light guide element (5), wherein in particular the transparent plate (14) is made of glass and/or the transparent plate (14) has a flat surface at its side facing the cavity (2) or the transparent plate (14) has a convex surface at its side facing the cavity (2), wherein in particular a blind is arranged on or at the transparent plate (14), wherein in particular the blind is made of sheet metal or of a foil or the blind is printed on the transparent plate (14).

11. Oven according to claim 10, **characterized in that** at least one radiating surface (15) is formed on the transparent plate (14), wherein in particular the radiating surface (15) has a substantial square form (15') or the radiating surface (15) has the shape of an alphabetic character or of a cipher (15'').

12. Oven according to at least one of claims 1 to 11, **characterized in that** the longitudinal direction (L) of the light guide element (5) is extending vertically.

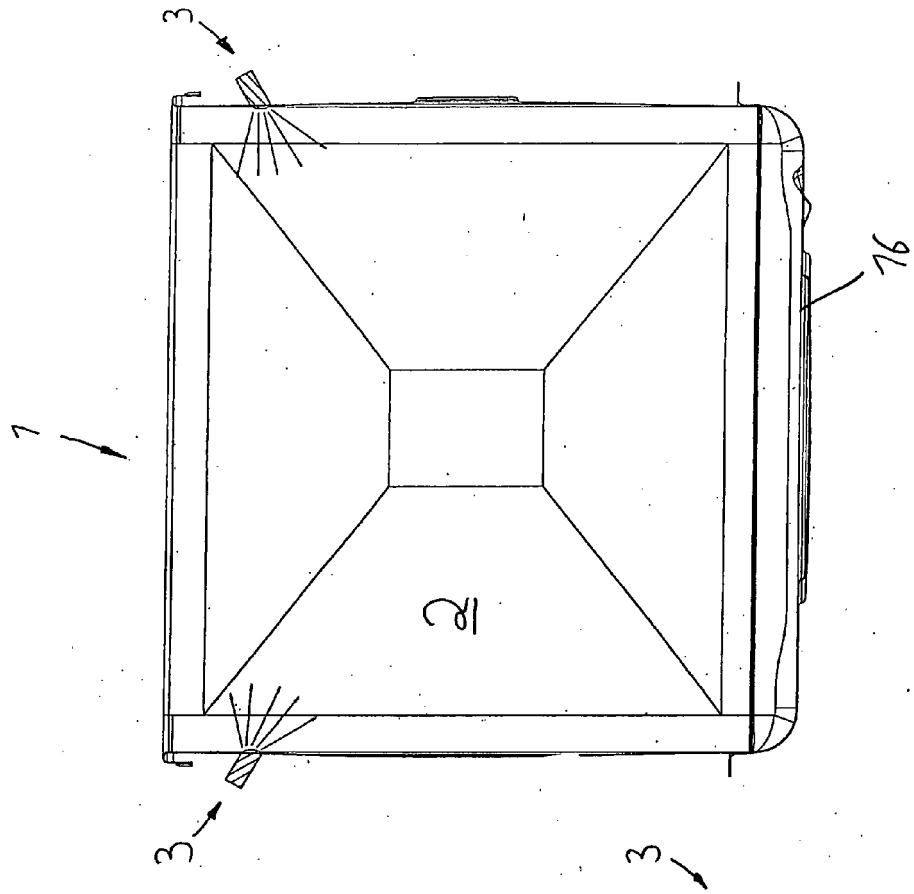

FIG 2

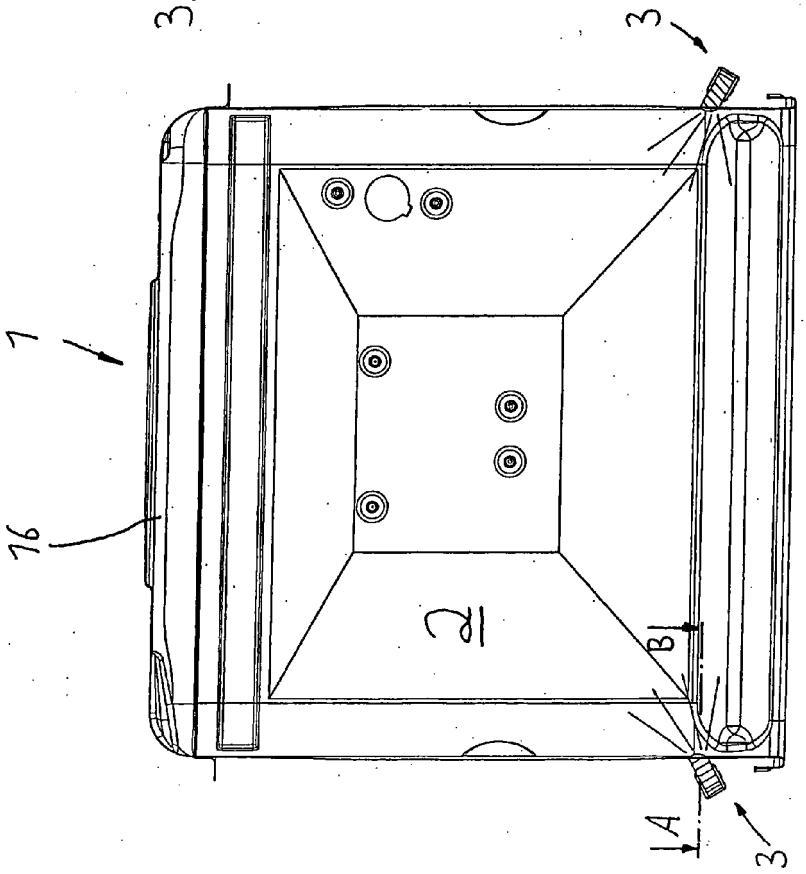

FIG 1

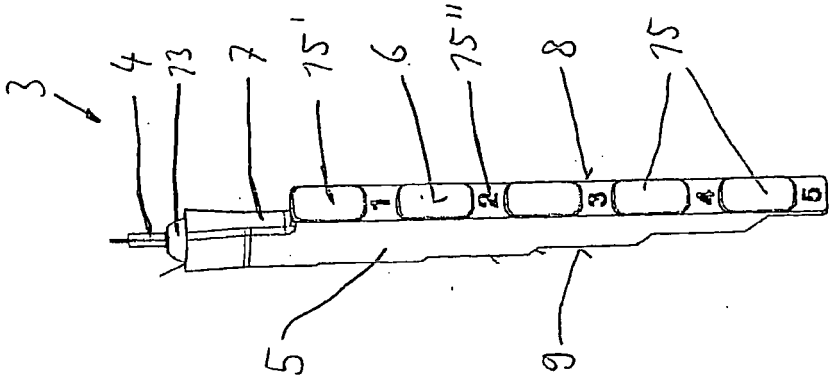

FIG 5

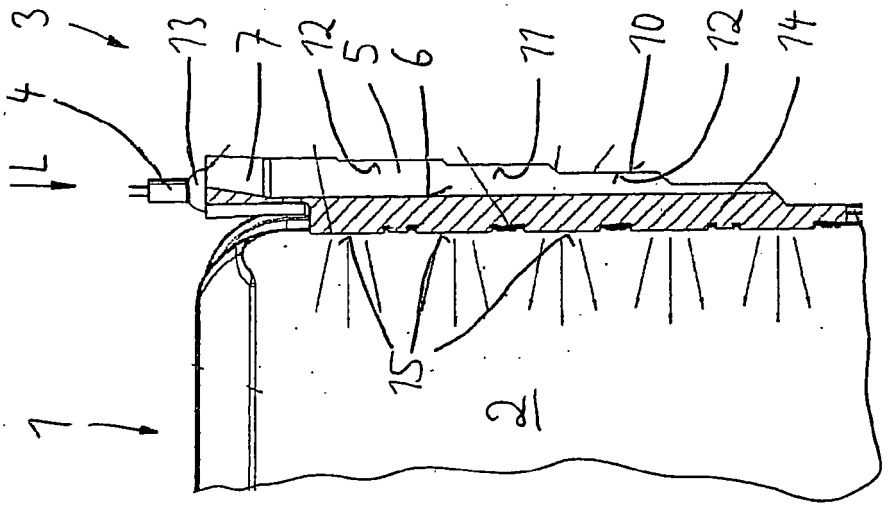

FIG 4

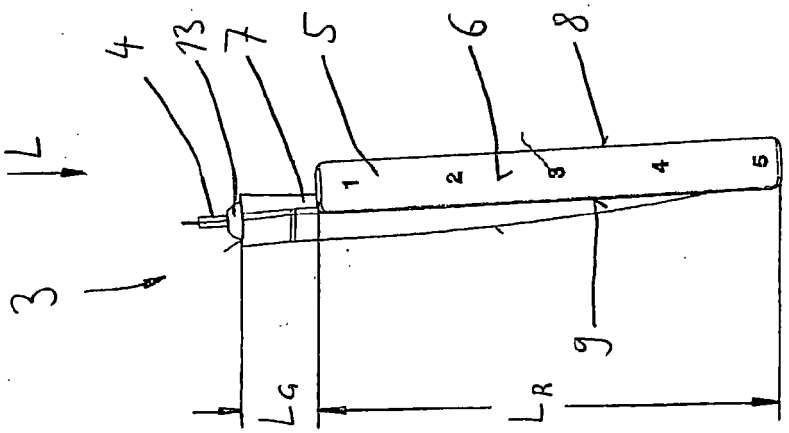

FIG 3

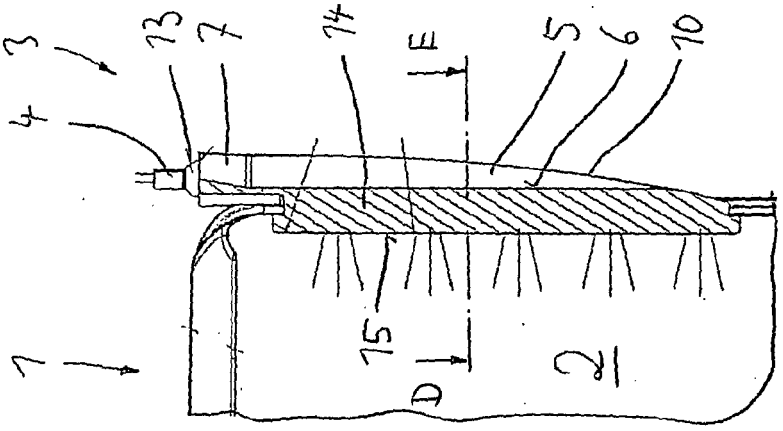

FIG 7

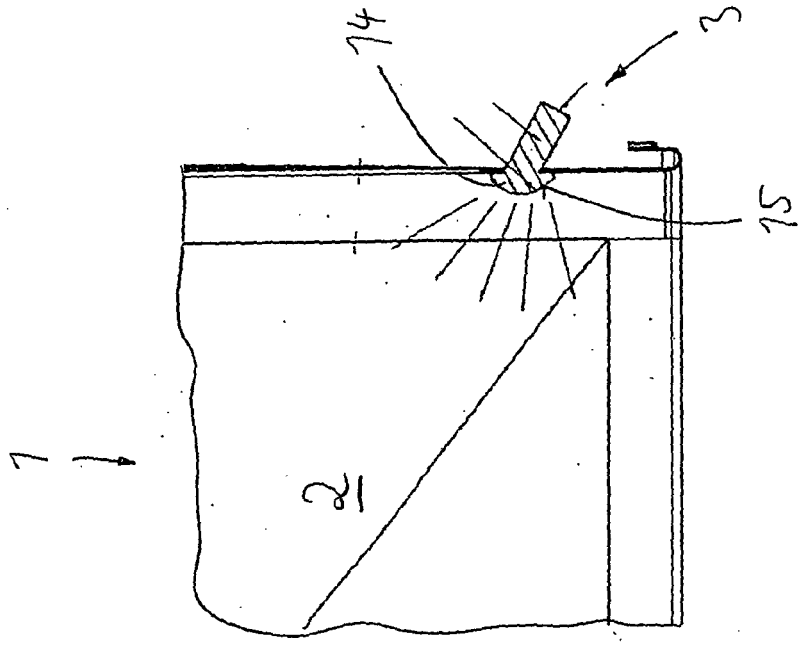

FIG 9

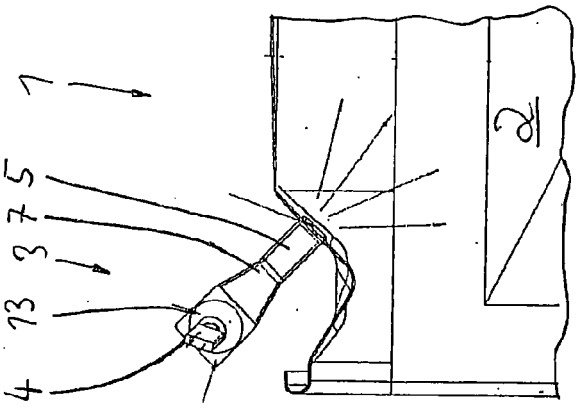

FIG 9

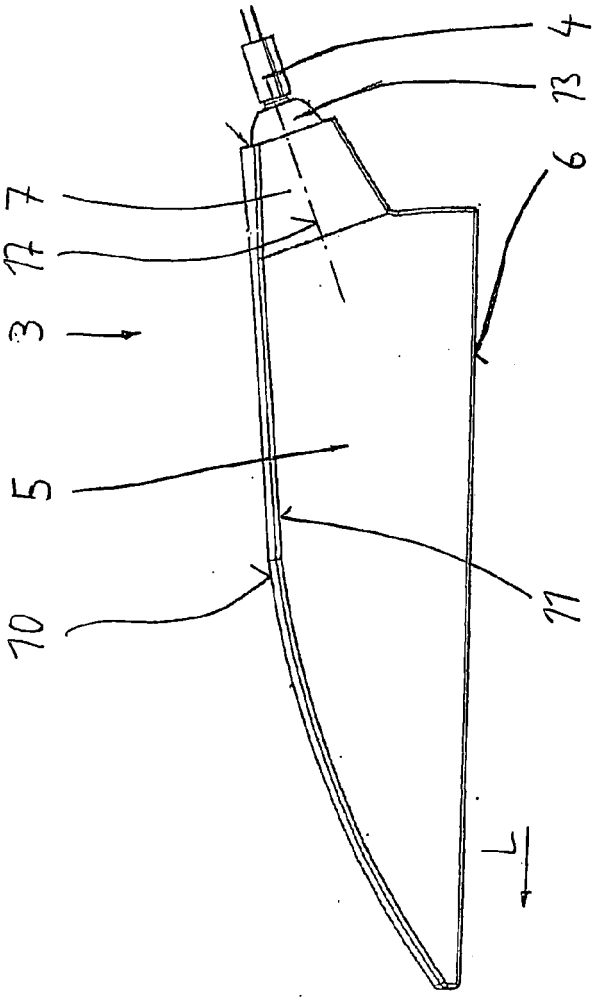

FIG 8

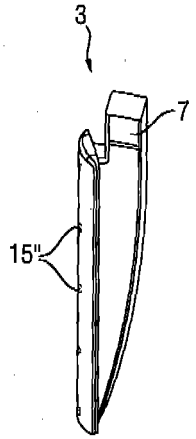

Fig. 10

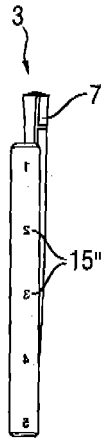

Fig. 11

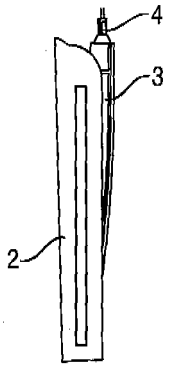

Fig. 12

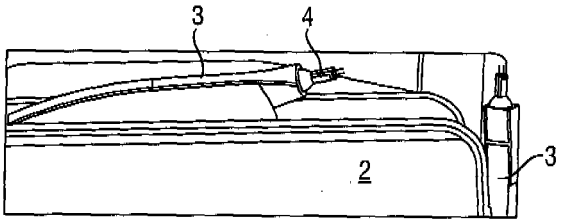

Fig. 13

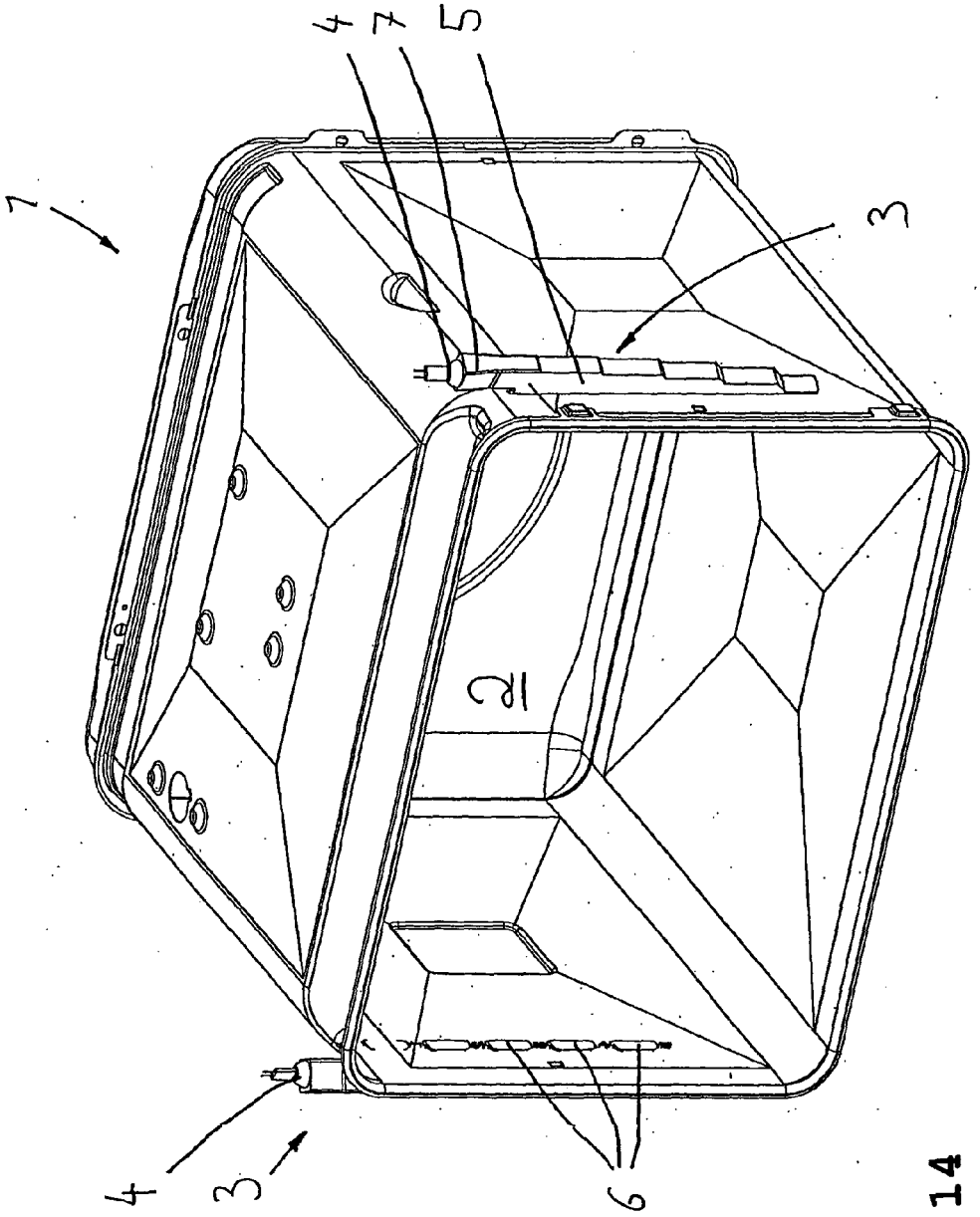

FIG 14

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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 9995

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A		11	
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E	DE 10 2006 061739 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 3 July 2008 (2008-07-03) * abstract *	1,2	
			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 February 2009	Rohr, Peter

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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13-02-2009

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

REFERENCES CITED IN THE DESCRIPTION

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