



(11) **EP 2 336 644 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.06.2011 Bulletin 2011/25

(51) Int Cl.:
F24C 15/00 (2006.01) F24C 15/02 (2006.01)

(21) Application number: **10195019.4**

(22) Date of filing: **14.12.2010**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **17.12.2009 IT TO20090999**

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(54) **Lighting system for a household oven, and household oven equipped with such a lighting system**

(57) The present invention relates to a lighting system for a household oven (1), wherein the oven comprises a frame (2) that defines a muffle (4) having an opening that can be closed by a door (3), which door comprises at least a first and a second glass panes (6,7) between which a gasket (9,90,900) is arranged, and wherein the system comprises at least one light source (10) associated with said door (3), wherein the light source (10) is housed within said gasket (9,90,900), said gasket (9,90,900) being at least partly transparent so as to let through a light beam generated by said light source (10) and directed towards said muffle (4) when the latter is closed by the door (3).

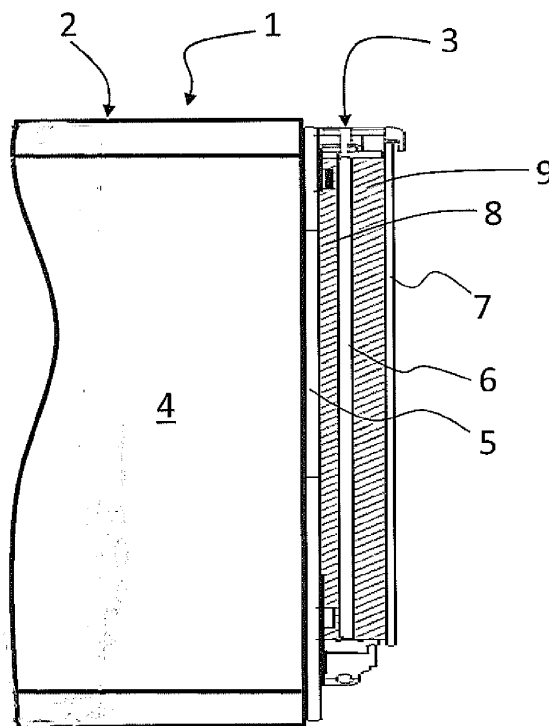


Fig. 1

Description

[0001] The present invention relates to a lighting system for a household oven and to an oven equipped with such a lighting system.

[0002] As known, household ovens are fitted with a lighting system adapted to illuminate their cooking chamber, or muffle, so that a user can see the food being cooked.

[0003] Lighting systems typically comprise a light source placed inside the muffle, which can be turned on at will by the user or based on the operation of the oven.

[0004] This solution however takes up room inside the muffle, thus reducing its usable volume, and also exposes the light source to the high temperatures which are normally found in that region of the oven.

[0005] In order to solve this problem, a number of solutions have been conceived like the one described in patent application EP1995522 by CANDY Spa.

[0006] In this solution, the light sources are mounted on the door that closes the cooking chamber, so as not to take up useful space in the muffle.

[0007] More in particular, the door that closes the muffle is provided with a double glass, and the light sources are installed within the chamber formed between the two glass panes, supported by suitably shaped brackets, so that the light beam is oriented towards the centre of the muffle when the door is in the closed position.

[0008] Although effective, this solution suffers from a number of drawbacks.

[0009] In fact, though lower than in the muffle, the temperature in the chamber formed between the two glass panes of the oven door is still relatively high (approx. 200°C) and may damage the light sources or the electronic power circuits.

[0010] In addition, in certain oven types, e.g. like the one shown in document IT1237294 by the present Applicant, the air coming from the muffle is directed into the chamber between the two panes: in addition to being relatively hot, this air is also often loaded with pollutants like oil or grease particles (since it has been in contact with the food being prepared in the muffle), which particles tend to deposit onto the light sources, thus reducing their efficiency and forcing the user to clean them very frequently, despite the difficulty incurred during this task due to the position of said light sources.

[0011] In these oven types, therefore, it is not advisable to arrange the light sources as described in document EP1995522, since significant problems may arise.

[0012] The present invention aims at overcoming this drawback by providing a lighting system for a household oven which takes up no space in the muffle and cannot be damaged by the heat of the oven or fouled by the air coming from within the muffle.

[0013] The object of the present invention is a lighting system for a household oven according to claim 1 appended hereto, as well as a household oven equipped with such a lighting system.

[0014] The present invention is based upon the idea of arranging light sources within the gasket interposed between two glass panes of the oven door; to this end, the gasket is transparent at least in the area facing the light sources, so as to let through the light beam generated by the light sources and directed towards the muffle when the latter is closed by the door.

[0015] This eliminates the above-mentioned drawbacks of the prior art, in that the gasket material completely surrounds the light sources, thereby protecting them from both the heat and the dirt carried by the air circulating in the chamber between the two glass panes.

[0016] This solution may therefore be easily installed in any type of household oven, whether or not there is ventilation in the chamber between the glass panes.

[0017] According to another advantageous feature, in addition to incorporating the light sources the gasket also incorporates that part of the power supply line which extends along the oven door, thus also protecting the latter from possible damage caused by heat and dirt.

[0018] According to a further variant, the same gasket material may advantageously also be used for insulating the power supply line, with significant savings in terms of production and assembly times.

[0019] Further advantageous features of the lighting system will be set out in the appended claims.

[0020] These features as well as further advantages of the present invention will become apparent from the following description of an embodiment thereof as shown in the annexed drawings, which are supplied by way of non-limiting example, wherein:

Fig. 1 is a sectional view of a portion of a household oven equipped with a lighting system according to the present invention;

Fig. 2 is a plan view of a gasket mounted on the door of the oven of Fig. 1, within which the light sources are housed;

Fig. 3 is a perspective view of a portion of the gasket of Fig. 2;

Fig. 4 is a cross-sectional view of the gasket of Fig. 2; Fig. 5 is a cross-sectional view of a variant of the gasket of Fig. 4;

Fig. 6 shows a variant of the gasket of Fig. 4.

[0021] Referring now to Fig. 1, there is shown a sectional view of a portion of a household oven 1.

[0022] The oven 1 comprises a frame 2 within which a muffle 4 is defined which opens outwards to be accessible to a user.

[0023] The opening of the muffle 4 can be closed by a door 3, which in the present example has three glass panes: an inner glass pane 5 close to the muffle 4, an intermediate glass pane 6, and an outer glass pane 7.

[0024] The glass panes 5, 6, 7 are normally enclosed by a frame made of plastic, metal or another material (not shown) which supports the glass panes 5, 6, 7 so as to keep them parallel to and spaced from one another.

[0025] In substance, the frame includes seats into which the edges of the glass panes 5, 6 and 7 engage, thus staying locked in position.

[0026] The intermediate glass pane 6 is positioned between the inner glass pane 5 and the outer glass pane 7, parallel thereto.

[0027] A gasket is arranged at least between two contiguous glass panes (intermediate 6 and inner 5 or intermediate 6 and outer 7).

[0028] The non-limiting example shown herein includes two gaskets: an inner one designated by reference numeral 8 and an outer one designated by reference numeral 9.

[0029] The inner gasket 8 is interposed between the inner glass pane 5 and the intermediate glass pane 6, whereas the outer gasket 9 is interposed between the intermediate glass pane 6 and the outer glass pane 7.

[0030] In a preferred embodiment only the gasket 9 is used, to which reference will be made hereafter.

[0031] The gasket 9 comprises two upright parts 9A and 9B which, when the door is vertical (i.e. closing the muffle 4), extend vertically as shown in Fig. 2.

[0032] The gasket 9 is interposed between the intermediate glass pane 6 and the outer one 7 and in contact with both, and prevents hot air from escaping from the door sides while leaving an upper aperture and a lower aperture for the air to flow from the muffle 4 to the outside.

[0033] The gasket 9 thus defines the side walls of the chamber between the two glass panes 6 and 7 and, in accordance with the teachings of the present invention, houses the light sources 10 shown schematically in Fig. 2, so as to provide the advantages discussed above.

[0034] In principle, the gasket 9 may have any cross section, whether shaped like a regular polygon or not.

[0035] In the example shown in Figs. 3 and 4, the gasket 9 has a substantially triangular cross-section with smoothed edges.

[0036] Thus the gasket is held in position by the frame and by both glass panes 6 and 7, the area in contact with the glass pane 6 (which is hotter) being smaller than the one in contact with the glass pane 7 (which is colder).

[0037] This solution reduces the thermal exchange occurring by conduction between the gasket 9 and the intermediate glass pane 6 compared to the thermal exchange occurring between the outer glass pane 7 and the gasket 9.

[0038] The light sources 10 may be of any type, e.g. incandescent lamps or the like; however, in order to minimise their thermal contribution, the preferred solution uses LEDs (Light Emission Diodes), which produce very little heat.

[0039] Said light sources 10 are arranged in a housing 15 obtained within the gasket 9, so that they are completely surrounded by the material of the gasket 9, which acts as a thermal insulator, a mechanical insulator (it prevents the light sources from getting fouled by insulating them from the air circulating in the chamber between the two panes) and possibly also an electric insulator, as will

be described hereafter.

[0040] The housing 15 may be provided as a separate housing for each light source 10, as shown in Fig. 3, or else as a single housing common to multiple (even all) light sources 10.

[0041] This latter solution, shown in Fig. 6 and described in detail below, is in principle preferable because it allows the gasket to be manufactured through a simple extrusion and cutting process.

[0042] The gasket 9 advantageously also performs the function of positioning, supporting and centering the light sources 10.

[0043] The latter, in fact, must be appropriately oriented in order to properly illuminate the chosen region of the muffle (when the door 3 is closing the muffle 4): preferably the light sources are oriented in a manner such that the light is diffused evenly onto the different horizontal levels, e.g. corresponding to the various heights where dripping pans, trays or grills can be positioned.

[0044] The light sources 10 (whether LEDs or lamps of another kind) typically have a body 10B and a luminous end 10A from which the light beam originates.

[0045] Since the material of the gasket 9 is elastic, and the gasket 9 is normally manufactured by moulding or extrusion, the light source 10 can be secured into the gasket 9 in several ways.

[0046] In a first case, the gasket 9 can be moulded or directly extruded over the light sources 10, which therefore will remain buried or incorporated in the material of the gasket 9 itself, thus ensuring adequate sealing.

[0047] In this case, the material of the gasket 9 is closely adherent to the light source 10, as shown in Fig. 4.

[0048] This solution may also be implemented by extruding the gasket directly over the light sources, and possibly also over the conductors.

[0049] The light sources 10 are thus fixed along their whole perimeter by the material of the gasket 10 that incorporates them, and can be oriented by appropriately arranging the light sources 10 prior to the overmoulding process.

[0050] In this case a significant advantage is given by the fact that each light source 10 is sealingly insulated from the outside environment because it is buried in the very material of the gasket 9.

[0051] In a second case, all the single housings 15 needed for the light sources are obtained as the gasket 9 is being moulded, and the gasket 90 is made up of two parts 90' and 90" which can be mutually coupled together, each comprising a portion of the walls that define the housing 15, as shown in Fig. 5.

[0052] In this case, the light sources 10 can be easily fixed by sizing the housing 15 in a manner such that the body 10B of each light source 10 fits into it by interference, thus staying locked in position.

[0053] The correct orientation of the light sources 10 will in this case depend on the orientation of the housing 15.

[0054] Here the assembly stage is longer than in the

preceding case, but this solution has the advantage that the single light sources 10 can be replaced individually, if damaged.

[0055] Yet another variant is the one shown in Fig. 6: in this case the gasket 900' is made by extrusion; during the same extrusion step the single housing 15' is advantageously made as well, which houses all light sources. The latter are then placed into the housing 15', which is subsequently closed with a second gasket portion (not shown) laid over it as a cover, similarly to the portion 90" of Fig. 5.

[0056] As far as the gasket 9 is concerned, it may be made of a suitable synthetic material, e.g. a platinic silicone rubber compound for food use having the following properties:

density: 1,180 kg/m³, measured according to the ASTM D 297 standard;
 hardness: 60° Shore A/3, measured according to the ASTM D2240 standard;
 tensile strength: 9 MPa, measured according to the ASTM D412 standard;
 ultimate elongation: 600%, measured according to the ASTM D412 standard;
 operating temperature: -50°C to +250°C.

[0057] Such a material is available on the market under the commercial name DYNASIL ® 1460.

[0058] This material is transparent, and therefore the gasket 9 will be wholly transparent as well: the light beam generated by each light source 10 will go through it, thus illuminating the muffle.

[0059] As an alternative, instead of a wholly transparent gasket 9 it is conceivable to use a transparent gasket only at the section that must be crossed by the light beams of the sources 10 (so that the muffle 4 can be illuminated when the door 3 is closed).

[0060] Such a variant may be implemented by using two distinct materials for the gasket, one of which is transparent, or just one material coloured in some areas and transparent elsewhere.

[0061] For example, in the embodiment shown in Fig. 5 or Fig. 6 it is conceivable that the portion 90', 900' of the gasket 90, 900 is opaque or anyway not transparent, while the portion 90", i.e. the one facing the muffle 4, is transparent.

[0062] In this latter case there is the additional advantage that no areas are illuminated at the edge of the glass pane 7 close to the light sources, thereby avoiding that possible reflections or refractions of the light beam might impair the vision through the various glass panes.

[0063] Referring now to Figs. 4, 5 and 6, there is shown the power supply line of each light source.

[0064] In this case, the power supply line comprises two electric conductors 11 and 12 buried in the material of the gasket 9.

[0065] The two electric conductors 11 and 12 may be, for example, two simple electric wires, as in the example

of Fig. 6, or, alternatively, thin metal strips (e.g. made of aluminium or the like) or, especially when the sources 10 are LEDs, parts of a printed circuit adapted to supply power to said LEDs.

[0066] The conductors 11 and 12 may establish a parallel connection between the light sources or, alternatively, the light sources 10 may be connected in series.

[0067] The parallel connection has the drawback that two conductors are needed, but has the advantage that, should one light source fail, the other ones will continue to operate; vice versa, the series connection is less expensive (it may even employ just one conductor), but in the event of a faulty light source all other sources connected in series thereto will go off.

[0068] According to another variant, the electric conductors 11 and 12 have no insulation, since this is provided by the very material of the gasket 9.

[0069] As concerns the orientation of the various light sources 10 installed in the gasket, they can be oriented in parallel directions lying in horizontal planes (when the door is closed).

[0070] This will ensure a diffused illumination of the muffle at the various levels where shelves can be placed.

[0071] Furthermore, although single punctiform light sources 10 have been described so far, said light sources may of course be replaced with a single elongated light source, e.g. a neon lamp or the like.

[0072] According to another variant, the light sources may be arranged along the gasket 8, in the same manner as described above.

[0073] In yet another variant, the gasket 9 is made as one piece with the gasket 8.

[0074] In a different embodiment, instead of three glass panes 5, 6 and 7 there are only two glass panes, e.g. the glass panes 6 and 7 with the gasket 9 in between housing the light sources 10 as previously described; in this case, of course, the glass pane 6 performs the function of the above-described glass pane 5.

[0075] Based on the teachings provided herein, those skilled in the art may conceive further variants which will nevertheless still fall within the scope of the present invention.

45 Claims

1. A lighting system for a household oven (1), wherein the oven comprises a frame (2) that defines a muffle (4) having an opening that can be closed by a door (3), which door comprises at least a first and a second glass panes (6,7) between which a gasket (9,90,900) is arranged, the system comprising at least one light source (10) associated with said door (3),

55 characterised in that

said light source (10) is housed within said gasket (9,90,900), said gasket (9,90,900) being at least partly transparent, so as to let through a light beam

generated by said light source (10) and directed towards said muffle (4) when the latter is closed by the door (3).

2. A system according to claim 1, wherein said gasket (9,90,900) is made of a synthetic material that completely surrounds said light source (10). 5

3. A system according to claim 1 or 2, wherein said door (3) comprises three glass panes, i.e. an inner glass pane (5) facing the muffle, an outer glass pane (7) facing the outside environment of the oven (1) and an intermediate glass pane (6) arranged between the inner one (5) and the outer one (7), said three glass panes (5,6,7) being substantially parallel to and at a distance from one another, and wherein said gasket (9,90,900) is arranged between said intermediate glass pane (6) and said outer glass pane (7). 10
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4. A system according to one or more of the preceding claims, wherein said gasket (9,90,900) is wholly transparent.

5. A system according to one or more of the preceding claims, wherein said light source (10) is housed within said gasket (90,900) in a housing (15,15') obtained when manufacturing said gasket (90,900). 25

6. A system according to the preceding claim, wherein said gasket (90,900) comprises a first portion (90', 900') and a second portion (90'') which can be mutually coupled together, each comprising a part of the housing (15,15'). 30
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7. A system according to one or more of claims 1 to 4, wherein said gasket (9) is moulded over said light sources (10).

8. A system according to one or more of the preceding claims, comprising a plurality of light sources (10), wherein said light sources (10) are LEDs, Light Emission Diodes. 40

9. A system according to one or more of the preceding claims, wherein said gasket (9,90) is made of a platinum silicone rubber compound for food use. 45

10. A household oven (1) comprising a lighting system according to one or more of claims 1 to 9. 50

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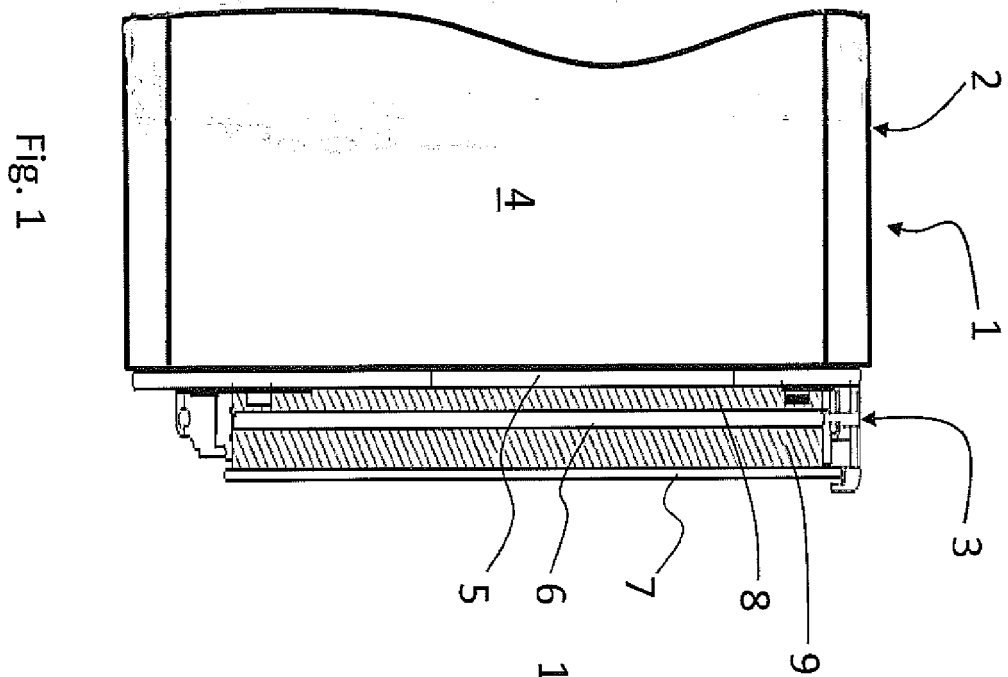


Fig. 1

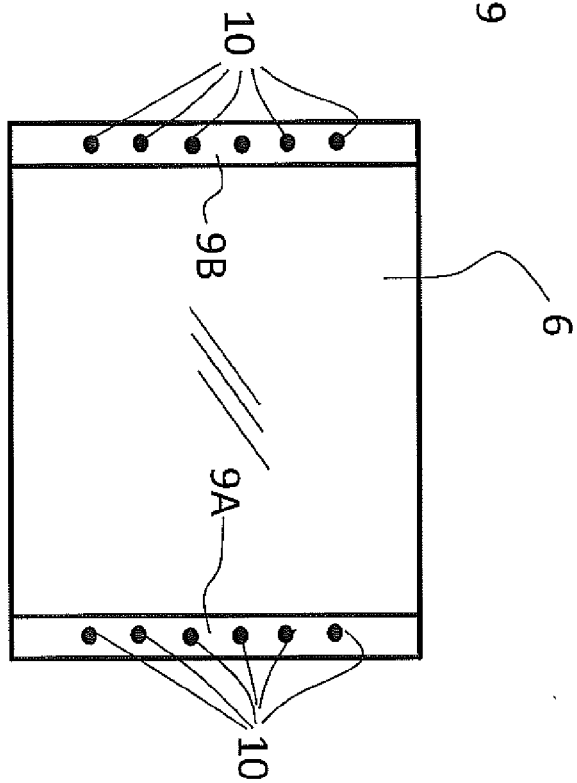
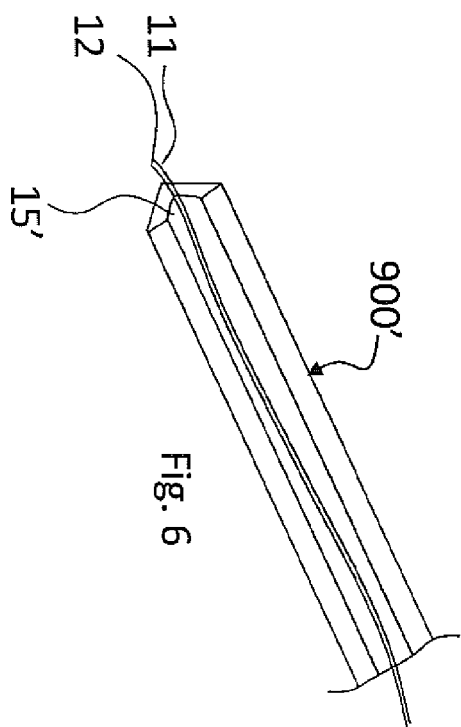
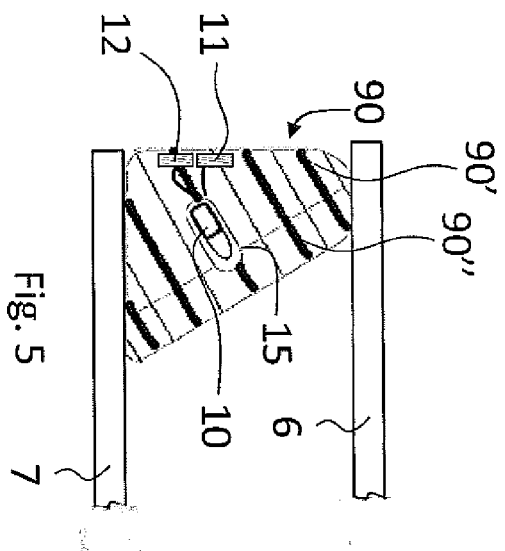
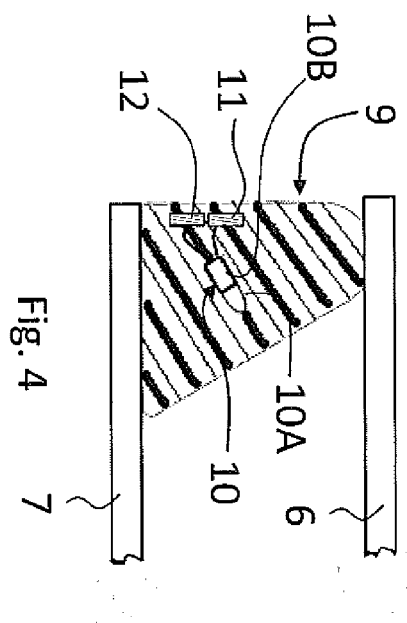
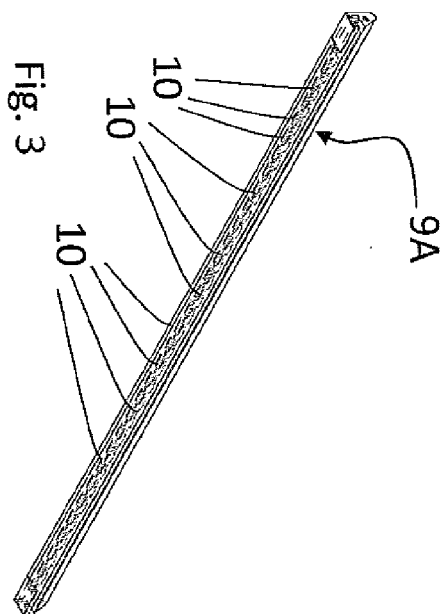


Fig. 2





EUROPEAN SEARCH REPORT

Application Number
EP 10 19 5019

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 995 522 A1 (CANDY SPA [IT]) 26 November 2008 (2008-11-26) * claim 34 * * figure 10 * -----	1-10	INV. F24C15/00 F24C15/02
			TECHNICAL FIELDS SEARCHED (IPC)
			F24C F27B H05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 April 2011	Examiner Adant, Vincent
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 19 5019

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08-04-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1995522	A1	26-11-2008	NONE

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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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