



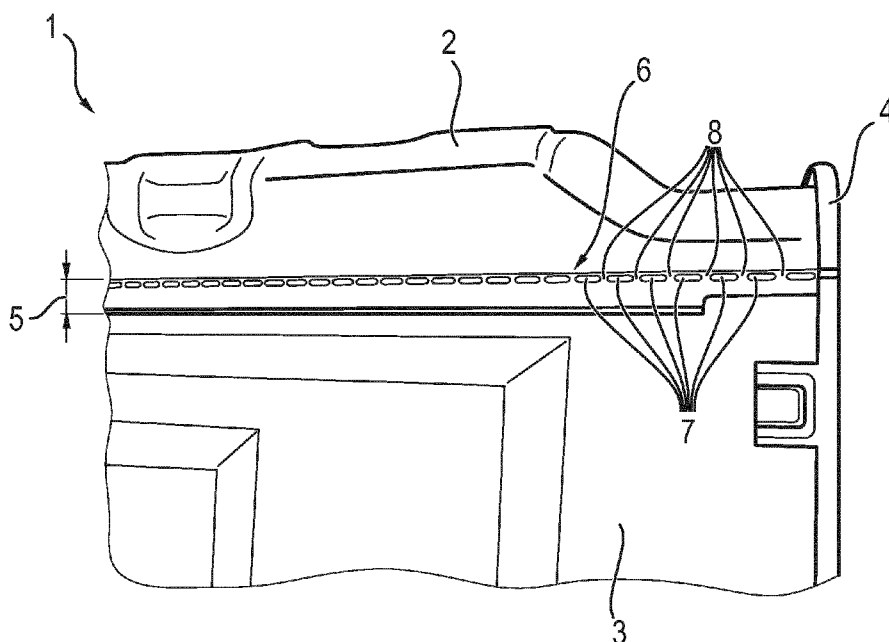
- (51) International Patent Classification:
F24C 15/08 (2006.01)
- (21) International Application Number:
PCT/EP2015/055907
- (22) International Filing Date:
20 March 2015 (20.03.2015)
- (25) Filing Language: English
- (26) Publication Language: English
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: OVEN MUFFLE FOR A DOMESTIC OVEN



(57) Abstract: Oven muffle (1) for a domestic oven, being made of at least two muffle parts (2, 3) which are fixedly connected to each other by a welding connection, wherein said welding connection comprises at least one welding seam (6) that has elongated high energized sections (7) alternating with low energized sections (8).



Published:

— *with international search report (Art. 21(3))*

DescriptionOven muffle for a domestic oven

5 The present invention relates to a oven muffle for a domestic oven.

Known cooking ovens comprise oven muffles made of metal sheets which are welded together. The muffles usually comprise an enamel
10 el coating for hygienic purposes and for protection against corrosive destruction. Due to the progress in the field of laser technology, besides other established welding technologies, laser welding systems are increasingly used for the generation of the necessary welding connections of the oven muffle.

15 The enamel coating of a conventional oven muffle comprises at least a first or basic layer and at least one second layer of enamel which are applied to the oven muffle and fired. In self-cleaning ovens, the second layer can comprise a catalytic enamel
20 which can be a porous enamel to catalyze the reduction of soils in the self-cleaning process.

It is an object of the present invention to provide an oven muffle with reliable welding connections that can be easily pro-
25 duced, wherein number and/or size of quality defects of the enamel coating can be reduced.

It is further an object of the present invention to provide a method for manufacturing an oven muffle that enables to improve
30 the enamel coating of said oven muffle

That object is achieved by an oven muffle being made of at least two muffle parts which are fixedly connected to each other by a welding connection, wherein said welding connection comprises at
35 least one welding seam that has elongated high energized sections alternating with low energized sections.

The inventive embodiment enables the provision of a welding connection that can be easily and reliably enameled. High energized sections shall be understood as sections or regions of the welding seam that have received a relatively high overall energy or high energy density in the welding process in comparison to the low energized sections which are sections of the welding seam that have received lower overall energy or lower energy density than the high energized sections. The high energized sections may alternate regularly with the low energized sections but also a not regular alternation is possible.

In an advantageous embodiment of the invention said muffle parts are in contact with each other within an overlapping section and said welding connection is arranged within said overlapping section.

The inventive solution can be advantageously applied to an overlapping section. The welding seam can be arranged along the complete overlapping section, thus, providing a stable and fix welding connection.

In a further advantageous embodiment of the invention that said welding seam is produced in a laser welding process. Alternating high energized sections and low energized sections can be produced advantageously in a laser welding process. Thus, it is possible to delimit high energized sections and low energized sections spatially and to arrange said sections very precisely.

In a further embodiment of the invention said low energized sections are elongated low energized sections, in particular in that the low energized sections are substantially as long as said high energized sections. In such an arrangement the stability of the welding connection is improved.

In a further advantageous embodiment of the invention said low energized sections are welded, in particular in a laser welding process, by receiving a substantially lower energy density than

the high energized sections, in particular wherein material in the low energized sections is softened and/or melted.

Thus, it is possible to produce a welding connection which is, as a whole, less thermically influenced than a continuous welding connection. The low energized sections are receive less energy, but however, a still stable and reliable welding connection is produced.

In another advantageous embodiment of the invention said low energized sections receive no energy in the welding process, in particular such that no material is melted in the in the low energized sections in the welding process.

Thus, sections of the welding connection are advantageously minimally influenced with a heat load.

In a further advantageous embodiment of the invention said high energized sections have a regular length from 5 mm to 150 mm and/or that the low energized sections have a regular length of from 0,5 mm to 8 mm.

A welding seam with sections according to said dimensions has a particularly high rigidity and is therefore preferred.

In a further advantageous embodiment said oven muffle has an enamel coating which comprises at least one first enamel layer, in particular a basic enamel layer, and at least one second enamel layer, in particular a catalytic enamel layer.

In the enamel process a first layer of a basic enamel is applied to the muffle in order to cover the muffle's welding areas. Subsequently, the basic enamel is melted at a high temperature, e.g. at 800°C. In a further subsequent step, a second layer of a catalytic enamel is applied onto the first layer of enamel. In a further subsequent step the catalytic enamel is heated again to about the same temperature to form the catalytic enamel layer.

The applicant has observed that defects are be generated in the enamel process in the region of the welding connection. The defects seem to result from the appearance of bubbles on the enamel surface as a result of the enamel process. It was surprisingly observed by the applicant, that said defects are reduced in the region of the welding connections, when the welding connections which have to be enameled are formed according to the invention.

The object of the invention is also achieved by a method for manufacturing an oven muffle comprising at least one step of welding at least two muffle parts to form an oven muffle, wherein a welding tool applies energy to an overlapping section of said muffle parts in such way, that high energized sections and low energized sections are formed alternately in said overlapping section by alternating the energy output of said welding tool and/or alternating the motion speed of said welding tool and/or alternating the distance between welding tool and overlapping section.

According to the inventive method, an oven muffle is created that can be advantageously enameled in the region of a welding connection. High energized sections and low energized sections can be precisely formed by varying process parameters regularly or not regularly.

In a further advantageous embodiment of the invention the following steps are subsequently provided to the at least one welding step:

- applying at least one basic enamel layer to at least a part of said oven muffle;
- firing said at least one basic enamel layer;
- applying at least one second enamel layer onto said basic enamel layer;
- firing said at least second enamel layer;

The applicant has observed that defects are generated in the enamel process in the region of the welding connection. The defects seem to result from the appearance of bubbles on the enamel surface as a result of the enamel process. It was surprisingly observed by the applicant, that said defects are reduced in the region of the welding connections, when the welding connections which have to be enameled are formed according to the invention.

Due to modifications of transformations in the material of the welding connection, e.g. transformation of the crystal lattice or dissolution of substances out of the metallic welded parts, together with the heat in second fire step, i.e. the fire step for firing the catalytic enamel layer, the first layer and/or the second layer emit gas which generates bubbles within the finished enamel coating. It is assumed, that the effect of the bubble generation is dependent on the welding process and the fire steps of the enamel process.

In a further advantageous embodiment of the invention the following steps subsequent to the at least one welding step:

- applying at least one basic enamel layer to at least a part of said oven muffle;
- applying at least one second enamel layer onto said basic enamel layer;
- firing said at least one basic enamel layer and said at least one second enamel layer in one single firing step.

Also in embodiment with only one firing step, the emission of gas can be reduced by the specific welding step, resulting in a reduction of bubbles in or on the final enamel surface.

The present invention will be described in further detail with reference to the drawing in which

FIG illustrates a view of a top part of an oven muffle embody-
5 ying the present invention;

FIG illustrates an oven muffle 1 adapted to be installed in a cooking oven or the like and delimiting a cooking chamber of said oven. Conventional oven muffles comprise several metal
10 sheet parts, such as a top part 2 and an intermediate or wrapper part 3 which are welded together to form an oven muffle 1. Further parts may be a bottom part or a rear part which also can be welded to a respective part of the oven muffle 1. The oven muffle 1 has a front opening (not shown) which is surrounded by a
15 front flange 4.

In the intended connection region, top part 2 and wrapper part 3 comprise edge sections which overlap each other, forming an overlapping section 5. In this overlapping section 5, a welding
20 seam extends from a rear section to a front section of the oven muffle 1. The welding seam 6 is formed as a discontinuous welding seam. This means that in the welding process in which the welding seam 6 is produced, the energy of the welding tool is varied or alternated. Due to this variation or alternation of
25 the welding energy, the welding seam 6 comprises high energized sections 7 and low energized sections 8. The oven muffle 1 is shown from the exterior, however, the appearance of the welding seam 6 is equal on the interior side.

30 The welding process in this case is a laser welding process. Thus, the welding process can be carried out by guiding the laser beam along the overlapping section 5 with a predetermined motion speed, wherein the laser is operated in a pulsed mode. Thus, during one pulse duration one high energized section 7 is
35 generated and during the pause between two pulses one low energized section 8 is generated.

It is possible, to operate the laser between two pulses with lower power than during the two pulses or, alternatively, it is possible to operate without power between the two pulses. Operating with lower power or without power results in a lower energy density in or on the workpiece in the low energized section 6 compared to a high energized section 7. Further it is possible to vary other process parameters of the laser tool such as to vary the motion speed of the laser tool relative to the workpiece or to vary the distance between laser tool and workpiece to enlarge or to reduce the energized area or to vary the energy focus of the laser beam.

After welding the muffle parts together, the oven muffle 1 is coated with enamel in an enamel process. The coating may consist of at least two layers, including a basic layer and at least one second layer applied on the basic layer. For enabling the oven muffle 1 to be part of a self-cleaning oven, at least one second enamel layer may be a catalytic enamel, e.g. offered under the trade name PE PERC CL Black 2C2C XE3211BA by the company FERRO FRANCE.

List of reference numerals

- 1 oven muffle
- 2 top part
- 3 wrapper part
- 4 front flange
- 5 overlapping section
- 6 welding seam
- 7 high energized section
- 8 low energized section

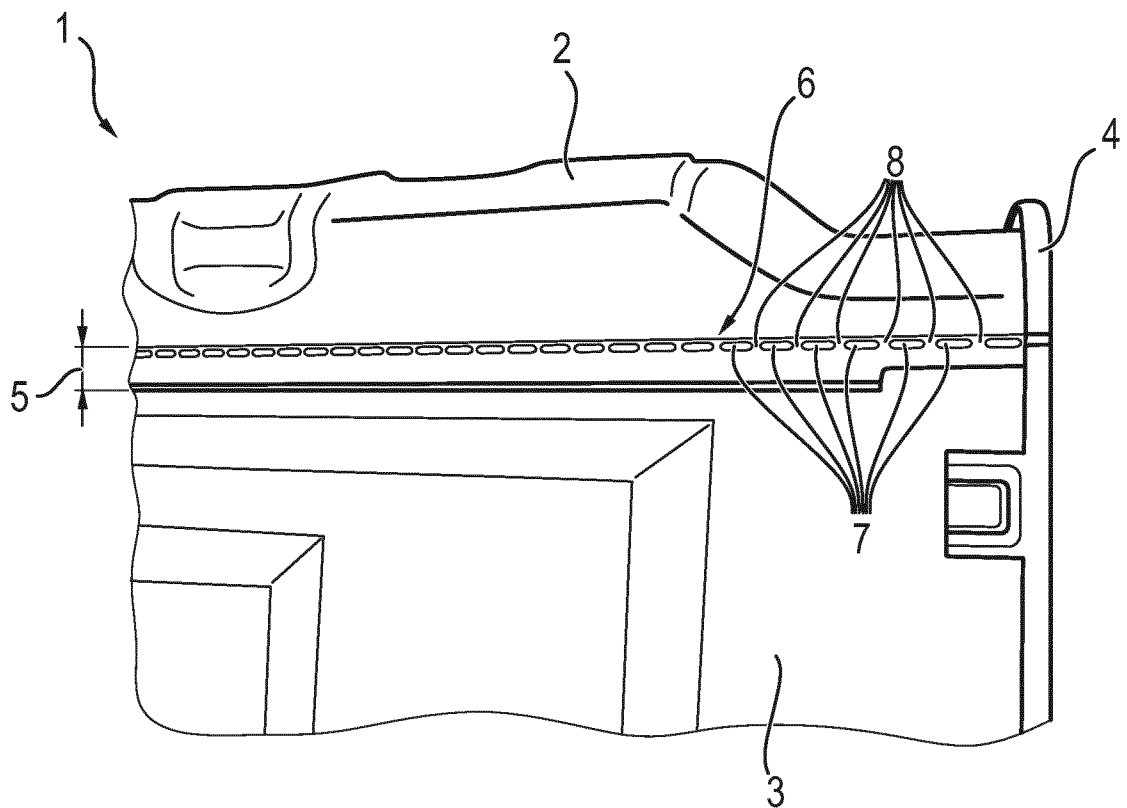
Claims

1. Oven muffle (1) for a domestic oven, being made of at least two muffle parts (2, 3) which are fixedly connected to each other by a welding connection, wherein said welding connection comprises at least one welding seam (6) that has elongated high energized sections (7) alternating with low energized sections (8).
2. Oven muffle (1) according to claim 1, characterized in that said muffle parts (2, 3) are in contact with each other within an overlapping section (5) and said welding connection is arranged within said overlapping section (5).
3. Oven muffle (1) according to one of the preceding claims, characterized in that said welding seam (6) is produced in a laser welding process.
4. Oven muffle (1) according to one of the preceding claims, characterized in that said low energized sections (8) are elongated low energized sections (8), in particular in that the low energized sections (8) are substantially as long as said high energized sections (7).
5. Oven muffle (1) according to one of the preceding claims, characterized in that said low energized sections (8) are welded, in particular in a laser welding process, by receiving a substantially lower energy density than the high energized sections (7), in particular wherein material in the low energized sections (8) is softened and/or melted.
6. Oven muffle (1) according to one of the claims 1 to 4, characterized in that said low energized sections (8) receive no energy in the welding process, in particular such that no material is melted in the in the low energized sections (8) in the welding process.

7. Oven muffle (1) according to one of the preceding claims,
characterized in that the high energized sections (7) have a
regular length from 5 mm to 150 mm and/or that the low ener-
gized sections (8) have a regular length of from 0,5 mm to 8
mm.
8. Oven muffle (1) according to one of the preceding claims,
characterized in that said oven muffle (1) has an enamel
coating which comprises at least one first enamel layer, in
particular a basic enamel layer, and at least one second
enamel layer, in particular a catalytic enamel layer.
9. Method for manufacturing an oven muffle (1) comprising at
least one step of welding at least two muffle parts (2, 3) to
form an oven muffle (1), wherein a welding tool applies ener-
gy to an overlapping section (5) of said muffle parts (2, 3)
in such way, that high energized sections (7) and low ener-
gized sections (8) are formed alternately in said overlapping
section (5) by alternating the energy output of said welding
tool and/or alternating the motion speed of said welding tool
and/or alternating the distance between welding tool and
overlapping section (5).
10. Method according to claim 9, characterized in the following
steps subsequent to the at least one welding step:
- applying at least one basic enamel layer to at least
a part of said oven muffle (1);
 - firing said at least one basic enamel layer;
 - applying at least one second enamel layer onto said
basic enamel layer (1);
 - firing said at least second enamel layer;
11. Method according to claim 10, characterized in the following
steps subsequent to the at least one welding step:
- applying at least one basic enamel layer to at least
a part of said oven muffle (1);

- applying at least one second enamel layer onto said basic enamel layer (1);
- firing said at least one basic enamel layer and said at least one second enamel layer in one single firing step.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/055907

A. CLASSIFICATION OF SUBJECT MATTER
INV. F24C15/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24C B23K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

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Y	abstract; figures 1-3	1-8,10, 11
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A	abstract; figure 1 paragraph [0018]	1-8,10, 11
X	----- EP 1 655 544 A2 (UNOX SPA [IT]) 10 May 2006 (2006-05-10)	9
A	paragraphs [0006] - [0008]; figures 1,2	1-8,10, 11
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Further documents are listed in the continuation of Box C.



See patent family annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

14 October 2015

Date of mailing of the international search report

26/10/2015

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/055907

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/055907

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