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(54) **Method for manufacturing a welded grate for cooktops, grate manufactured in accordance with said method, and cooking household appliance comprising such a grate**

(57) The present invention relates to a method for manufacturing a welded grate (1) for cooktops, wherein the grate comprises at least one frame (2) from which at least two bars extend, thus forming a first and a second concurrent arms (3,5,6,3',5',6',5",50,50',60,60') having a common intersection area (10,10'), and wherein the arms (3,5,6,3',5',6',3",5",50,50',60,60') are arranged at the same height relative to the frame (2), the method comprising the step of welding one end portion of the first arm (5,6,5',6',5",50,50') to the second arm (3,3",60,60') in the intersection area (10,10'). The present invention also relates to a grate manufactured in accordance with said method and to a cooking household appliance, in particular a gas cooktop or a gas cooker, provided with such a grate.

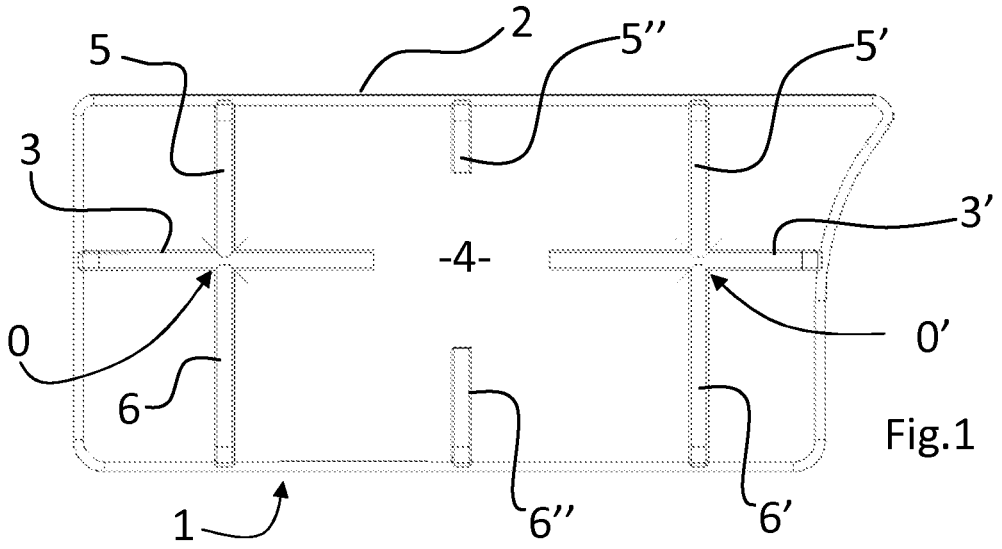

Fig.1

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Description

[0001] The present invention relates to a method for manufacturing a welded grate for cooktops, a grate manufactured in accordance with said method, and a cooking household appliance comprising such a grate.

[0002] Cooktop grates, which are used as support bases for pans, comprise a frame, typically having a rectangular or square shape, from which one or more arms extend inwards in both the longitudinal and transversal directions, thus forming the pan support regions: the arms may terminate at a certain distance from each another, thereby leaving a central area empty, or else they may intersect.

[0003] Such grates are generally manufactured in two ways: by casting or by welding.

[0004] The former are typically made of cast iron and are installed on high-quality cooktops, since they are stronger and more expensive: these grates are typically manufactured as a monolithic cast iron piece which is cast into a mould having the desired shape.

[0005] The latter, often referred to as "flat-wire grates", on the contrary are typically made of a weldable metal material, such as steel or the like, and are installed on low-end cooktops because they imply lower production costs, since they are made out of metal bars welded together to form a grate.

[0006] These two grate types are so different from each other in terms of construction, materials, finishing and costs that they actually represent two different non-interchangeable alternatives.

[0007] The present invention specifically refers to the field of welded grates.

[0008] In these grates, the regions including the points of intersection between two concurrent arms suffer from a few problems: as aforementioned, and also as shown in Italian patent application PN2005A000089 in the name of COSMA S.p.A., the intersections between the longitudinal arms and the transversal arms are obtained simply by overlapping the two bars forming the arms one onto the other and welding them together.

[0009] As can easily be imagined, this solution, though simple, does not allow all the branches afferent to the intersection point to be arranged at the same height.

[0010] Furthermore, welding overlapped bars often involves weld shrink problems such that cavities are frequently formed, leading to poor finishing even for a low-cost grate; additionally, when using the grate on a cooktop, such cavities represent potential points of dirt accumulation.

[0011] Moreover, if when in use the bar intersection area is over one of the cooktop burners, the two bars will undergo different thermal expansion (due to the fact that they are placed at a different height above a heat source), which may cause the grate to warp or the above-mentioned cavities to grow larger.

[0012] Aiming at finding a remedy to this problem, in some solutions available on the market the bars extend from one side to the other side of the frame, and in an intermediate position between the opposite bar ends a notch is made by chip removal machining, e.g. by milling; the bars are then overlapped and thus remain at the same height, thereby providing a level support for pans.

[0013] However, this solution has a few drawbacks: in fact, due to normal machining tolerances, and in order to avoid an interference condition which would make the assembly step difficult, the actual notch is made larger than the size of the bar which it is to accommodate, resulting in cavities (as wide as a few millimeters) remaining open in the bar intersection area.

[0014] Furthermore, the chip removal operation for creating the notch is typically quite costly, and in this solution it has to be carried out on both bars in order to be able to arrange them at the same height relative to the frame.

[0015] In addition, according to the case, welded grates are sometimes subjected to an enamelling process: in such a case, the cavities near the bar intersection point are so large that they cannot be coated or filled by the enamel, which instead penetrates into them, with the consequence that such cavities remain visible even on enamelled grates, resulting in the same problems already described (poor finishing and potential dirt accumulation).

[0016] The present invention aims at providing a method for manufacturing a welded grate for cooktops, as well as a grate manufactured in accordance with said method, which can overcome such drawbacks.

[0017] The object of the present invention consists of a method for manufacturing a welded grate for cooktops according to claim 1 appended hereto and a welded grate for cooktops according to claim 10.

[0018] The present invention is based upon the idea of providing a method for manufacturing a welded grate for cooktops, of the type comprising a frame from which at least two bars extend, thus forming a first and a second concurrent arms having a common intersection area, wherein the arms are arranged at the same height relative to the frame, and wherein one end portion of the first arm is welded to the second arm in the intersection area.

[0019] It is thus possible to manufacture in an economical way a welded grate on which pans can be laid safely and which shows no cavities in the bar intersection points, thanks to the fact that an end portion of an arm concurs to the bar intersection area and is welded therein.

[0020] Further objects of the present invention consist of a grate manufactured in accordance with said method and a cooking household appliance, in particular a gas cooktop or a gas cooker, comprising such a grate.

[0021] Further features and advantages of the present invention will become more 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 plan view of a grate according to the

present invention;

Fig. 2 shows different cross-sections of the bars of the grate of Fig. 1;

Fig. 3 is a sectional view of a part of the grate of Fig. 1;

Fig. 4 is a plan view of a detail of the intersection area of the grate of Fig. 1 in the unassembled condition;

Figs. 5, 6, 7 and 8 show four consecutive moments of a step of the process for manufacturing the grate of Fig. 1;

Fig. 9 shows a detail of the intersection area of a variant of the grate of Fig. 1;

Fig. 10 shows the detail of Fig. 9 according to a further variant.

[0022] Fig. 1 shows a grate 1 according to the present invention: it comprises a frame 2 from which longitudinal arms 3, 3' and transversal arms 5, 6, 5', 6', 5", 6" extend perpendicularly to one another.

[0023] As can be seen, the longitudinal arms 3, 3' are coupled to the transversal arms 5, 6 and 5', 6', respectively, thus defining two intersection areas 10 and 10', whereas in the central portion of the grate 1 the two transversal arms 5" and 6" are connected neither to each other nor to any longitudinal arm, thus defining a supportless area 4.

[0024] The underlying gas burners may be located in the intersection area and/or in the supportless area.

[0025] Of course, it should be pointed out right away that the number of intersection areas 10, 10', supportless areas 4, longitudinal arms 3, 3' and transversal arms 5, 6, 5', 6', 5", 6", as well as the arrangement thereof on the grate 1 and the shape of the frame 2, may be varied at will without however departing from the teachings and protection scope of the present invention.

[0026] The frame 2 and the arms 3,3',5,5',5",6,6',6" are made from a bar of weldable metal material, such as iron, steel, stainless steel or the like, having a solid cross-section and any shape, e.g. square A, round B, rectangular C, rectangular with bevelled edges D, as shown in Fig. 2, although more in general shapes other than those shown in Fig. 2 may also be used, e.g. polygonal or oval or elliptic.

[0027] Preferably, for the reasons described below with reference to bar machining, the bars employed have cross-sections with one dimension greater than the other, e.g. rectangular with or without bevelled edges, like the cross-sections C and D shown in Fig. 2, and are arranged in a manner such that the prevailing dimension is horizontal, i.e. parallel to the plane that contains the frame 2.

[0028] For example, it has been observed that sufficient mechanical strength together with good workability can be attained when the width of the bars ranges from 8 to 12 mm, in particular approx. 10 mm, and when their thickness ranges from 4 to 6 mm, in particular approx. 5 mm.

[0029] The frame 2 is manufactured by bending and welding a single bar or by welding together multiple bars to obtain the closed shape illustrated herein.

[0030] As can be seen in Fig. 3, the longitudinal arm 3 consists of a bar bent in the manner of an "L" and coupled at its end 3B to the frame 2, while the other end 3A extends parallel to the plane that contains the frame 2 and is placed at the same height as the arm 6 relative to the frame 2, so that pans can be laid flat thereon.

[0031] As far as the transversal arms are concerned, they are manufactured in the same way as the arm 3 described above.

[0032] For the purpose of understanding the teachings of the present invention, reference will only be made hereafter to the intersection area 10 in which the transversal arms 5 and 6 are coupled to the longitudinal arm 3, since the intersection area 10' and more in general any intersection areas possibly provided will be constructed in the same manner.

[0033] To this end, reference will now be made to Fig. 4, which illustrates that area in detail: as can be seen, the longitudinal arm 3 has two concave, substantially V-shaped, coupling profiles 35 and 36 formed on its body, with which the two end portions of both transversal arms 5 and 6 are matched at the same height, the latter having each a convex coupling profile 51 and 61 complementary to the shape of the concave coupling profiles 35 and 36, thus creating the intersection point 10.

[0034] It must be pointed out that this arrangement, unlike the prior art, prevents the problem of a possible interference condition, and the coupling profiles have such dimensions that no cavities can be generated in the bar intersection area.

[0035] In the intersection point 10 between the transversal arms 5 and 6 and the longitudinal arm 3, it can be observed that all concurrent arms 3, 5, 6 are complanate with one another and, according to the invention, they are mutually coupled by means of a weld made at the coupling interface between the arms 3 and 5 and the arms 3 and 6.

[0036] In general, the welding may be autogenous (welding in the strict sense of the word) or heterogeneous (brazing or braze welding): autogenous welding may be of the electrode, submerged-arc or resistance type, as will be described more in detail further on with reference to Figs. 5 to 8; heterogeneous welding may consist of a brazing or braze welding process: brazing is preferably a strong brazing using alloys having a high content of silver, brass or the like as a weld material, whereas braze welding uses brass or bronze or the like as a weld material, which melt at a higher temperature than the weld materials used in strong brazing.

[0037] As far as heterogeneous welding is concerned, it can only be used if the joint has sufficient mechanical characteristics and if the weld material in use melts at higher temperatures than those which will normally be found when using the grate.

[0038] As concerns the concave coupling profiles 35 and 36 and the convex coupling profiles 51 and 61, they may be created in different ways, e.g. by mechanical chip

removal machining; it is however preferable to create such profiles through a simple shearing operation.

[0039] In this respect, it should be pointed out that the shearing operation carried out for creating the coupling profiles 35,36,51,61 is facilitated by the fact that the bars having a rectangular cross-section (with or without bevelled edges, e.g. like the cross-sections C and D in Fig. 2) are arranged with the greater dimension horizontal.

[0040] Shearing offers the advantage that it is an extremely economical process and, unlike chip removal machining (e.g. milling), which is notoriously more costly and complex, it does not affect too much the cost of the grate.

[0041] In order to simplify the bar shearing operations and to obtain optimum welding results, the edges of the coupling profiles 35,36,51,61 are so conceived as to include a portion inclined by about 45° relative to the corresponding bar on which they are made.

[0042] For this purpose, it can in fact be noticed that the edge end of the bars 5 and 6 that abuts on the weld area includes a section which is parallel to the bar 3 to which said bars will be welded, said edge end being joined to the body of the respective bar 5 and 6 by two sections inclined by 45°, obtained by shearing.

[0043] Likewise, the coupling profiles 35 and 36 have complementary shapes so conceived that the central area of the bar 3 on which they are obtained has a width of approx. 4 mm., thus avoiding to weaken the grate.

[0044] The different steps of the method, as far as welding is concerned, are shown in sequence in Figs. 5 to 8: in this regard, it must be pointed out that the type of welding shown is autogenous resistance welding, more precisely of the projection type.

[0045] To this end, as shown in Fig. 5, the coupling profiles 51 and 61 are provided each with a projection 52 and 62 in one piece with the bar that forms the arm 5 or 6, which projection is created during the shearing step for generating the coupling profile 51 and 61 by suitably shaping the bar itself and is intended for supplying at least some of the material used for the weld bead.

[0046] Referring to Fig. 6, there is shown that the arm 5 is approached to the arm 3 until the projection 52 comes in contact with the latter; a force in the approach direction and an electric potential difference are then applied to both arms 3 and 5 which, by Joule effect, cause the projection 52 and some of the surrounding material of the arms 3 and 5 to melt, thus welding them together in the prearranged position of the two arms 3 and 5.

[0047] The same process is employed for welding the arm 6 to the arm 3, as shown in Fig. 7, so as to form the intersection point 10 shown in Fig. 8, wherein all the arms 3, 5 and 6 are complanate and welded to one another.

[0048] By using this projection-type resistance welding technique it is possible to manufacture at low cost a grate 1 as the one described above, which has no cavities in the intersection area 10, 10', or anyway only has cavities so small that they will not give rise to any of those problems suffered by the prior art; this is mainly due to two factors: firstly, the fact that at least one of the arms concurrent to the intersection point is butt welded (i.e. welded at one end) allows to reduce the machining tolerances normally expected for the notch along the bars of the welded grates according to the prior art; secondly, the force applied when approaching the two arms during the welding operation reduces even further any cavities which may form.

[0049] Moreover, if the grate 1 thus manufactured is subsequently subjected to a painting or enamelling process, the dimensions of any cavities which may form are such that the paint or enamel layer will obstruct them completely, thereby eliminating the problem of dirt accumulating therein.

[0050] A further advantage of the grate 1 thus manufactured is that in the intersection area all concurrent arms 3, 5 and 6 lie in the same plane and therefore, when the grate 1 is installed on the cooktop in a manner such that the intersection area is located over one of the cooktop burners, all concurrent arms 3, 5 and 6 are placed at the same height relative to the fire, hence undergoing the same thermal expansion and leading to the advantage of preventing any deformation of the arms 3, 5 and 6, which may jeopardize the complanation of the pan support points or cause the grate to warp.

[0051] Referring now to Figs. 9 and 10, there is shown a variant of the grate according to the present invention: in this solution, the intersection point is obtained by welding together four arms 50, 50', 60, 60', all consisting of weldable metal bars just like the arms 3, 5 and 6 previously described.

[0052] As can be seen, in this variant each concurrent arm has a respective convex coupling profile 510, 510', 610, 610', so that, when the arms are welded together, an intersection area is created similarly to the previous solution.

[0053] As far as welding is concerned, in this case as well a projection-type resistance welding process may be used with the same advantages previously discussed: to this end, there may be a projection on each arm or, alternatively as shown in Fig. 10, two arms 50, 50' may have each two projections 520, 620 and 520', 620' to be welded to two matching arms 60 and 60' lacking such projections.

[0054] When the chosen welding process is heterogeneous, another variation regarding the projections 52,62,520,620,520' and 620' is worth mentioning: in such a case, the projections 52,62,520,620,520' and 620' will not be made of the same material as the bars, but of weld material, which melts at a lower temperature than the bar material.

[0055] In this latter case, it must be pointed out that, due to the approaching force exerted during the welding process, the weld material will tend to be distributed along the entire arm interface, thus reducing the risk of cavity formation even further.

[0056] Of course, although in the example provided herein two transversal arms 5 and 6 and one longitudinal

arm 3 are afferent to the intersection area 10, it is nonetheless conceivable that, in general, only one arm (5 or 6) is afferent thereto, even at angles other than those shown herein, e.g. in order to create grates having different shapes or intersection areas wherein the arms are not perpendicular or parallel to one another.

[0057] For example, intersection points may be created by coupling one arm to another single arm, so as to create intersection points from which two or three arms extend, or, alternatively, more than three arms may be used, e.g. five, six or more arms coupled to one another.

[0058] As an alternative, it is also conceivable that the arms afferent to the intersection area extend in different directions neither perpendicular nor parallel to one another, so as to create grates wherein the intersection areas have any symmetry or shape.

[0059] In all of these cases, the man skilled in the art may conceive specific coupling profiles depending on the particular geometry chosen, without however departing from the scope and teachings of the present invention.

Claims

1. Method for manufacturing a welded grate (1) for cooktops, wherein the grate comprises at least one frame (2) from which at least two bars extend, thus forming a first and a second concurrent arms (3,5,6,3',5',6',5",50,50',60,60') having a common intersection area (10,10'), and wherein the arms (3,5,6,3',5',6',3",5",50,50',60,60') are arranged at the same height relative to the frame (2),
characterized in that
the method comprises the step of welding one end portion of the first arm (5,6,5',6',5",50,50') to the second arm (3,3",60,60') in the intersection area (10,10').

2. Method according to claim 1, wherein a first coupling profile (51,61,510,510') is created beforehand on the end portion of the first arm (5,6,5',6',5",50,50') and a second coupling profile (35,36,610,610') is created beforehand on the body of the second arm (3,3", 60,60').

3. Method according to claim 2, wherein the coupling profiles (35,36,51,61,510,510',610,610') are generated by shearing.

4. Method according to claim 1, 2 or 3, wherein the bars forming the arms (3,5,6,3',5',6',3",5",50,50',60,60') have a cross-section extending with one dimension greater than the other, and are arranged in a manner such that the greater dimension is parallel to the plane that contains the frame (2).

5. Method according to any of the preceding claims, wherein the arms (3,5,6,3',5',6',3",5",50,50',60,60') are made from weldable metal bars, and the arms (3,5,6,3',5',6',3",5",50,50',60,60') are welded in the intersection area (10,10') by means of a projection-type autogenous resistance welding (52,62,520,620,520',620').

6. Method according to claim 5, wherein at least one of the coupling profiles (51,61,510,510') has a projection (52,62,520,620,520',620') in one piece with the bar that forms the corresponding arm (5,6,50,50').

7. Method according to any of the preceding claims, wherein at least one of the coupling profiles (51,61,510,610,510',610') is convex.

8. Method according to any of claims 2 to 7, wherein the first (51,61) and second (35,36) profiles have complementary shapes.

9. Method according to any of the preceding claims, wherein each intersection area (10,10') is obtained by means of three bars (3,5,6) extending from the frame (2), one (3) of said bars being provided with at least two concave coupling profiles (35,36) matching the end portions of the remaining two bars (5,6), which are aligned with each other and are provided with at least respective convex coupling profiles (51,61).

10. Welded grate (1) for cooktops, **characterized in that**
it is manufactured in accordance with the method of one or more of the present claims.

11. Cooking household appliance, in particular a gas cooktop or a gas cooker comprising at least one gas burner,
characterized in that
it comprises a grate according to claim 10.

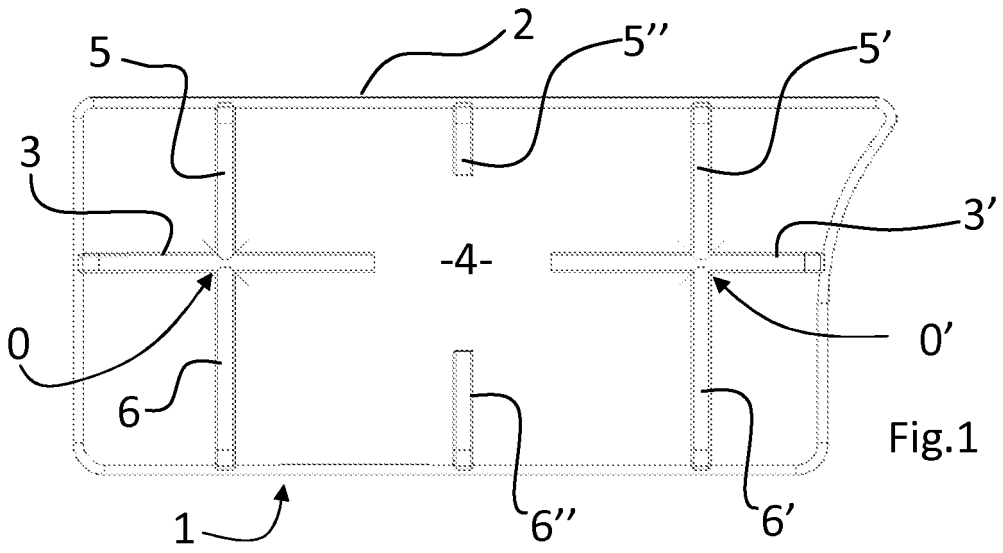

Fig.1

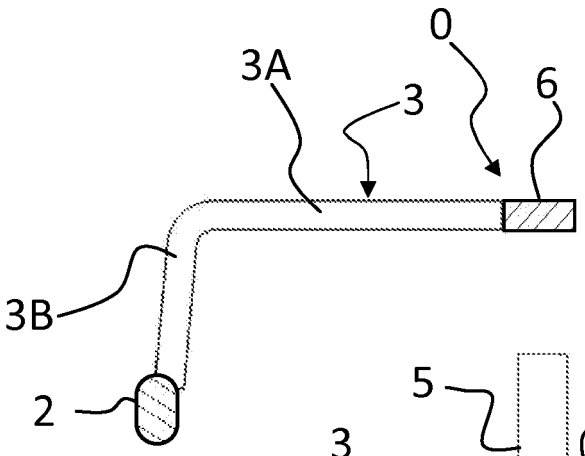

Fig.3

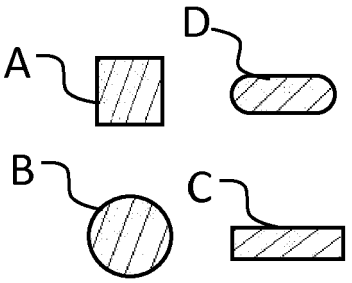

Fig. 2

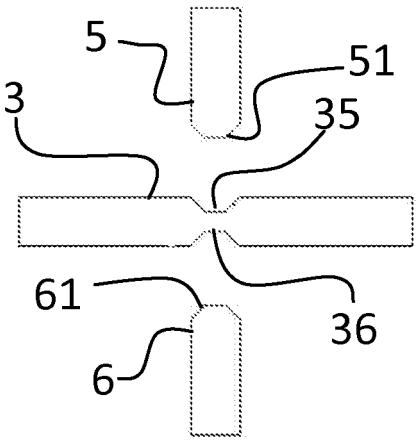

Fig.4

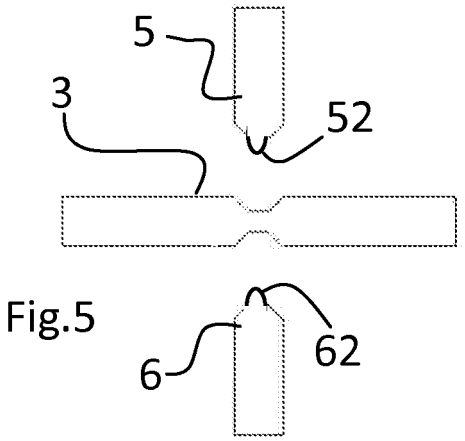

Fig.5

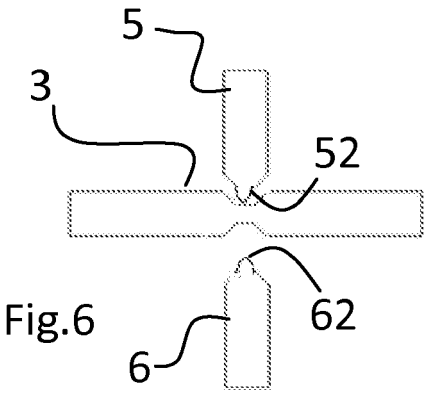

Fig.6

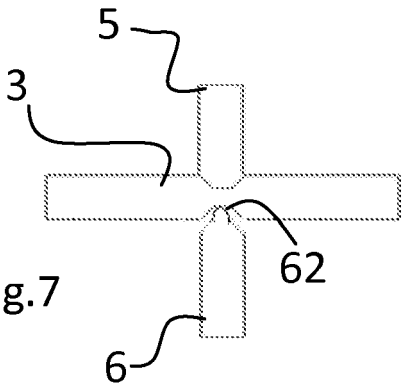

Fig.7

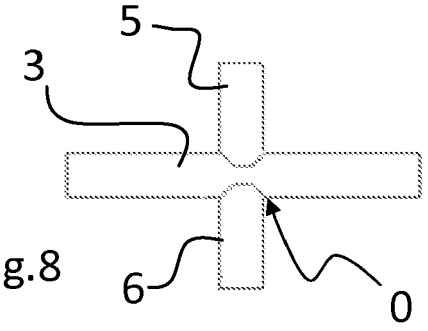

Fig.8

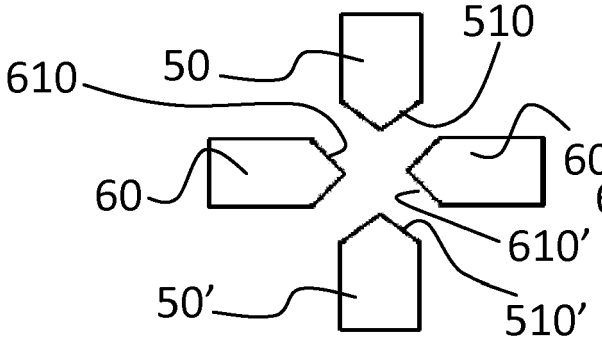

Fig.9

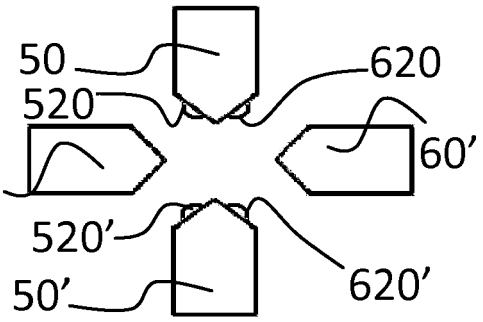

Fig.10

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 8838

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 Y	US D 493 065 S1 (CASWELL RUSSELL E [US] ET AL) 20 July 2004 (2004-07-20) * figures 3-4 * -----	1,3,4, 9-11 2,5-8	INV. F24C15/10
Y	US 2 594 215 A (MARC RESEK) 22 April 1952 (1952-04-22) * column 2, lines 26-29 * * column 5, line 55 - column 3, line 9 * -----	5,6	
Y	EP 1 909 036 A2 (GRANDI ANGELO CUCINE SPA [IT]) 9 April 2008 (2008-04-09) * figures 2-8 * -----	2,7,8	

TECHNICAL FIELDS SEARCHED (IPC)

F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 April 2010	Adant, Vincent

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 15 8838

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29-04-2010

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EPO FORM P0459

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

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