



(11) **EP 4 091 482 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
23.11.2022 Bulletin 2022/47

(51) International Patent Classification (IPC):
A24F 40/70^(2020.01) H05B 3/20^(2006.01)
H05B 3/26^(2006.01) A24F 40/46^(2020.01)

(21) Application number: **20914321.3**

(52) Cooperative Patent Classification (CPC):
A24F 40/46; A24F 40/70; H05B 3/20; H05B 3/26

(22) Date of filing: **14.01.2020**

(86) International application number:
PCT/JP2020/000852

(87) International publication number:
WO 2021/144836 (22.07.2021 Gazette 2021/29)

(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
Designated Validation States:
KH MA MD TN

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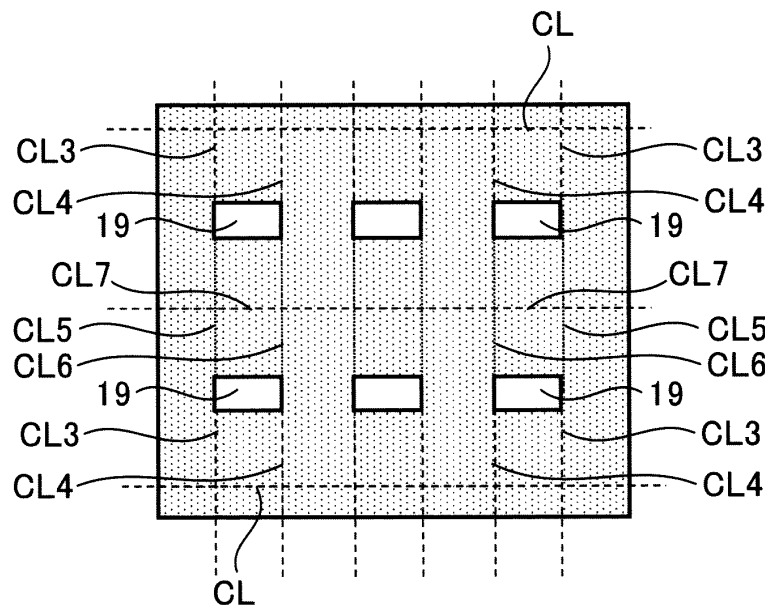
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(54) **METHOD FOR MANUFACTURING HEATER FOR HEATING FLAVOR SOURCE**

(57) Provided is a method for manufacturing a heater for heating a flavor source, in which a heat generating resistor layer is formed on a main surface, a rear surface, and one side surface. The method includes the steps of

forming a heat generating resistor layer by plating on a surface of a plate-like base material and forming an unplated region in the plate-like base material on which the heat generating resistor layer is formed.

Fig. 4C



Description

a heater for heating a flavor source by a simpler method.

TECHNICAL FIELD

BRIEF DESCRIPTION OF DRAWINGS

[0001] The invention relates to a method for manufacturing a heater for heating a flavor source.

5 **[0007]**

BACKGROUND ART

[0002] A heater that has been known as a heater for heating a flavor source is made by arranging specific metal, such as molybdenum and tungsten, on pre-sintered ceramic as a heat generating resistor layer precursor and then forming a heat generating resistor on a ceramic base material during sintering. A heater which is provided with a heat generating resistor layer by direct lithography on a base material using plating technology has also been known (Patent Literatures 1 and 2, for example).

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Fig. 1A is a perspective view showing one example of a heater for heating a flavor source which is manufactured by a manufacturing method according to an embodiment of the invention.

Fig. 1B is a perspective view showing another example of the heater for heating a flavor source which is manufactured by the manufacturing method according to the embodiment of the invention.

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Fig. 2A is a schematic perspective view that explains a first example of a method for manufacturing the heater shown in Fig. 1A.

Fig. 2B is a schematic perspective view that explains the first example of the method for manufacturing the heater shown in Fig. 1A.

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Fig. 2C is a schematic perspective view that explains the first example of the method for manufacturing the heater shown in Fig. 1A.

Fig. 2D is a schematic perspective view that explains the first example of the method for manufacturing the heater shown in Fig. 1A.

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Fig. 3A is a schematic perspective view that explains a second example of the method for manufacturing the heater shown in Fig. 1A.

Fig. 3B is a schematic perspective view that explains the second example of the method for manufacturing the heater shown in Fig. 1A.

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Fig. 3C is a schematic perspective view that explains the second example of the method for manufacturing the heater shown in Fig. 1A.

Fig. 3D is a schematic perspective view that explains the second example of the method for manufacturing the heater shown in Fig. 1A.

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Fig. 4A is a perspective view that explains a third example of the method for manufacturing the heater shown in Fig. 1A.

Fig. 4B is a perspective view that explains the third example of the method for manufacturing the heater shown in Fig. 1A.

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Fig. 4C is a perspective view that explains the third example of the method for manufacturing the heater shown in Fig. 1A.

Fig. 4D is a perspective view that explains the third example of the method for manufacturing the heater shown in Fig. 1A.

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Fig. 5 is a schematic view that explains an example of the method for manufacturing the heater shown in Fig. 1B.

Fig. 6 is a schematic view showing a shape of a second opening.

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Fig. 7 is a schematic view that explains a fourth example of the heater manufacturing method.

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CITATION LIST

PATENT LITERATURE

[0003]

PTL 1: U.S. Patent Application No. 2018/0296777

PTL 2: U.S. Patent Application No. 2019/0090544

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0004] A method for providing a heat generating resistor layer precursor on pre-sintered ceramic is limited in kinds of metal materials that can be used and is limited in freedom of heater designing. Using the methods disclosed in Patent Literatures 1 and 2 increases the freedom of heater designing, but the methods are complicated. In this light, an issue of the invention is to provide a method for manufacturing a heater for heating a flavor source by a simpler method.

SOLUTION TO PROBLEM

[0005] According to one mode, there is provided a method for manufacturing a heater for heating a flavor source in which a heat generating resistor layer is formed on a main surface, a rear surface, and one side surface. The method includes the steps of forming the heat generating resistor layer on a surface of a plate-like base material by plating, and forming an unplated region on the plate-like base material on which the heat generating resistor layer is formed.

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ADVANTAGEOUS EFFECTS OF INVENTION

[0006] The invention makes it possible to manufacture

DESCRIPTION OF EMBODIMENTS

[0008] Embodiments of the invention will be explained with reference to the attached drawings. Similar or corresponding constituent elements in the figures explained below are provided with similar reference signs, and overlapping explanation will be omitted. Fig. 1A is a perspective view showing one example of a heater for heating a flavor source which is manufactured by a manufacturing method according to an embodiment of the invention. Fig. 1B is a perspective view showing another example of the heater for heating a flavor source which is manufactured by the manufacturing method according to the embodiment of the invention. A heater 10 for heating a flavor source (hereinafter, referred to simply as "heater") is a heater for heating a flavor source without burning. The flavor source is material of tobacco or the like which can generate a flavor. The heater 10 is inserted in the flavor source and therefore preferably has a substantially plate-like shape as a whole as shown in Figs. 1A and 1B. The heater 10 may have a bar-like or columnar shape.

[0009] The heater 10 includes a main surface 10a, a rear surface 10b that is an opposite surface from the main surface 10a, and a side surface 10c connecting the main surface 10a and the rear surface 10b. In the present specification, the main surface 10a and the rear surface 10b are surfaces having largest area of the heater 10. According to an example shown in Figs. 1A and 1B, the heater 10 includes a heat generating resistor layer 15 formed on the main surface 10a and the rear surface 10b. The heat generating resistor is material, such as metal, which generates heat when energized. The heat generating resistor may be made, for example, of tungsten, copper or the like. The heat generating resistor layer 15 preferably has a thickness ranging from 10 μm to 30 μm , both inclusive.

[0010] The heat generating resistor layer 15 is formed on part of the side surface 10c. In other words, the side surface 10c includes an unplated region 7 where the heat generating resistor layer 15 is not formed. The heater 10 may include a pair of electrodes 21, one of which is connected to the main surface 10a and the other to the rear surface 10b. The pair of electrodes 21, the main surface 10a, the side surface 10c including the heat generating resistor layer 15, and the rear surface 10b thus form a pathway, through which electric current flows. In order to elongate a pathway for electric current that flows in the heat generating resistor layer 15, the electrodes 21 are preferably formed at a farthest possible position in the main surface 10a and the rear surface 10b from the side surface 10c on which the heat generating resistor layer 15 is formed.

[0011] The heater 10, for example, may be inserted in the flavor source in such a manner that the side surface 10c on which the heat generating resistor layer 15 is formed is located at a distal end. As shown in Fig. 1A, the distal end viewed from the main surface 10a of the

heater 10 has a linear shape. In Fig. 1B, the distal end viewed from the main surface 10a of the heater 10 has a convex shape with an acute angle. The distal end viewed from the main surface 10a of the heater 10 is not limited to the foregoing shapes and may have a curved convex shape.

[0012] According to one mode, the heater 10 preferably has a thickness ranging from 0.1 mm to 5.0 mm, both inclusive, and more preferably from 0.3 mm to 1.0 mm, both inclusive. According to one mode, the heater 10 preferably has a width ranging from 1 mm to 50 mm, both inclusive, and more preferably from 3.0 mm to 7.0 mm, both inclusive. According to one mode, the heater 10 preferably has a length ranging from 3 mm to 100 mm, both inclusive, and more preferably from 10 mm to 30 mm, both inclusive. In the present specification, the thickness of the heater 10 refers to length between the main surface 10a and the rear surface 10b. The length of the heater 10 refers to length in a direction where the heater 10 is inserted into the flavor source, and the width of the heater 10 refers to a direction orthogonal to the direction where the heater 10 is inserted into the flavor source.

[0013] In another mode, the heater 10 may be a rod-like (bar-like) heater having a round cross-section which is formed by chamfering a tangent line between the main surface 10a of the heater 10 and the side surface 10c in which the unplated region 7 is formed.

[0014] A method for manufacturing the heater 10 shown in Figs. 1A and 1B will be now explained. Figs. 2A to 2D are schematic perspective views that explain a first example of the method for manufacturing the heater 10 shown in Fig. 1A. First, as shown Fig. 2A, a plate-like base material 1 is prepared, which is material for the heater 10. According to the example shown in the figures, the plate-like base material 1 is a rectangular plate. The plate-like base material 1 includes a main surface 1a, a rear surface 1b, and a side surface 1c connecting the main surface 1a and the rear surface 1b. The plate-like base material 1 can be made of a publicly-known insulating material. Such materials include, for example, heat resistant polymer, such as engineering plastic and heat-curable resin, and ceramic. Size of the plate-like base material 1 is determined by the shape of the heater 10 that is obtained at the end.

[0015] As shown in Fig. 2B, the heat generating resistor layer 15 is formed on a surface of the plate-like base material 1 by plating. The heat generating resistor layer 15 may be formed, for example, by a publicly-known plating method, such as an electrolytic plating method and an electroless plating method. However, it is preferable that the heat generating resistor layer 15 be formed by the electroless plating method. According to the present embodiment, plating is applied to the surface of the plate-like base material 1. From a perspective of workability, it is preferable to apply plating to the main surface 1a, the rear surface 1b, and at least part of the side surface 1c. It is more preferable to apply plating to the entire of the main, rear, and side surfaces 1a, 1b, and 1c. Fig. 2B

shows the plate-like base material 1 in which plating is applied to the entire of the main, rear, and side surfaces 1a, 1b, and 1c. If the heat generating resistor layer 15 is formed by the electroless plating method, the entire surface (namely the main surface 1a, the rear surface 1b, and the side surface 1c) of the plate-like base material 1 can be plated with the heat generating resistor layer 15 by immersing the entire plate-like base material 1 in plating solution containing metal, with which the heat generating resistor layer 15 is made.

[0016] The unplated region 7 is then formed in the plate-like base material 1 on which the heat generating resistor layer 15 is formed. Specifically, the heat generating resistor layer 15 formed on the side surface 1c is removed from the plate-like base material 1 with part left on the side surface 1c. For example, as shown in Fig. 2C, the side surface 1c at three sides of the plate-like base material 1 is removed by cutting along cut lines CL while maintaining part of the side surface 1c. The unplated region 7 is thus formed on the plate-like base material 1. A publicly-known cutting machine may be used to cut the plate-like base material 1. The publicly-known cutting machine may be a cutter, such as a diamond cutter, a press-cutting machine or the like. Instead of removing the heat generating resistor layer 15 in the above-described manner, the heat generating resistor layer 15 on the side surface 1c may be removed with part left on the side surface 1c by masking a region of the plate-like base material 1 on which the heat generating resistor layer 15 is to be maintained, and etching the heat generating resistor layer 15 on the other region of the side surface 1c of the plate-like base material 1. The heat generating resistor layer 15 on the side surface 1c may also be removed with part left on the side surface 1c by cutting the heat generating resistor layer 15 on the side surface 1c of the plate-like base material 1. It is preferable from a standpoint of simplification of the manufacturing process to cut the plate-like base material 1 along the cut lines CL as shown in Fig. 2C and remove the plate-like base material 1 including the side surface 1c.

[0017] If the process explained above with reference to Figs. 2A to 2C is carried out, the heater 10 is obtained, which includes the heat generating resistor layer 15 extending from the main surface 10a through the side surface 10c (left-side surface on Fig. 2D) to the rear surface 10b as shown in Fig. 2D. The heater 10 includes the side surface 10c comprising three side surfaces 10c which are unplated regions 7, so that a short circuit is prevented from occurring at energization of the main surface 10a and the rear surface 10b. The heat generating resistor layer 15 may be provided on the entire or part of the main, rear, and side surfaces 1a, 1b, and 1c of the plate-like base material 1.

[0018] Figs. 3A to 3D are schematic perspective views that explain a second example of the method for manufacturing the heater 10 shown in Fig. 1A. First, as shown in Fig. 3A, a plate-like base material 1 similar to the plate-like base material 1 in Fig. 2A is prepared. As shown in

Fig. 3B, similarly to Fig. 2B, plating is applied to the entire of the main, rear, and side surfaces 1a, 1b, and 1c of the plate-like base material 1. As explained above with reference to Fig. 2B, plating is applied to the main surface 1a, the rear surface 1b, and at least part of the side surface 1c.

[0019] A first opening 17 is formed in the plate-like base material 1 on which the heat generating resistor layer 15 is formed as shown in Fig. 3C. The first opening 17 may be formed, for example, by cutting the plate-like base material 1. The unplated regions 7 are accordingly formed in an opening side surface 17a that defines the first opening 17. Subsequently, the plate-like base material 1 is cut along a first cut line CL1 and a second cut line CL2 which extend from the first opening 17 to the side surface 1c. The second cut line CL2 preferably does not intersect with the first cut line CL1. The cutting of the plate-like base material 1 along the first cut line CL1 and the second cut line CL2 forms the unplated regions 7 in the plate-like base material 1. Consequently, as shown in Fig. 3D, the heat generating resistor layer 15 is formed, which extends from the main surface 10a through the side surface 10c (left-side surface on Fig. 3D) to the rear surface 10b. The heater 10 is then obtained in which the three side surfaces 10c are the unplated regions 7.

[0020] The plate-like base material 1 may be cut along a first cut line CL1' and a second cut line CL2' which extend from the first opening 17 to another side surface 1c. The second cut line CL2' preferably does not intersect with the first cut line CL1'. Another heater 10 is then obtained from the plate-like base material 1.

[0021] The first cut line CL1 and the first cut line CL1' preferably extend in the same straight line. This makes it possible to cut the plate-like base material 1 along the first cut line CL1 and the first cut line CL1' without difficulty in a single cutting process. If the plate-like base material 1 is cut along two other cut lines extending from the first opening 17 to another side surface, another heater 10 is obtained.

[0022] Figs. 4A to 4D are schematic views that explain a third example of the method of manufacturing the heater 10 shown in Fig. 1A. First, as shown in Fig. 4A, a plate-like base material 1 is prepared, which is material for the heater 10. The plate-like base material 1 is a rectangular plate as a whole and includes at least one second opening 19. In the example shown in the figure, the plate-like base material 1 includes six second openings 19. Two of the second openings 19 are arranged in a vertical direction in the figure, and three of the second openings 19 are arranged in a horizontal direction in the figure. The plate-like base material 1 includes a main surface 1a, a rear surface, not shown, and a side surface 1c connecting the main surface 1a and the rear surface 1b.

[0023] The plate-like base material 1 may be prepared by any method. For example, a plate-like member may be subjected to publicly-known processing, such as cutting machining to form second openings 19, to thereby fabricate the plate-like base material 1. The plate-like

base material 1 also may be fabricated by filling a mold for molding a plate-like member having an opening portion with material such as thermosetting resin and hardening the material. A base material portion and the second openings 19 are thus formed at one time.

[0024] Next, as shown in Fig. 4B, a heat generating resistor layer 15 is formed on a surface of the plate-like base material 1 by plating. The heat generating resistor layer 15 may be formed by a publicly-known plating method, such as an electrolytic plating method and an electroless plating method. It is preferable, however, that the heat generating resistor layer 15 be formed by the electroless plating method.

[0025] The heat generating resistor layer 15 is formed at least on a main surface 1a, a rear surface 1b, and opening side surfaces of the second openings 19. The heat generating resistor layer 15 does not have to be formed in a side surface 1c. According to the present embodiment, the heat generating resistor layer 15 is formed by plating on the main surface 1a, the rear surface 1b, the side surface 1c, and the opening side surfaces of the second openings 19. If the heat generating resistor layer 15 is formed by the electroless plating method, the entire surface (namely the main surface 1a, the rear surface 1b, the side surface 1c, and the opening side surfaces of the second openings 19) of the plate-like base material 1 can be plated with the heat generating resistor layer 15 by immersing the entire plate-like base material 1 in plating solution containing metal, with which the heat generating resistor layer 15 is made.

[0026] An unplated region 7 of the heater 10 is formed by extracting portions of the plate-like base material 1 which are located between the respective second openings 19 on one hand and the side surface 1c on the other from the plate-like base material 1 on which the heat generating resistor layer 15 is formed. To be specific, as shown in Fig. 4C, the plate-like base material 1 is cut along third cut lines CL3 extending from the respective second openings 19 toward the side surface 1c and fourth cut lines CL4 extending from the respective second openings 19 toward the side surface 1c. The portions between the respective second openings 19 on one hand and the side surface 1c on the other can be thus extracted from the plate-like base material 1. Specifically, as shown in Fig. 4C, the third cut lines CL3 or the fourth cut lines CL4 preferably extend in a linear manner toward the side surface 1c opposite to the opening side surfaces of the second openings 19 which corresponds to the side surface 10c of the heater 10 which includes the heat generating resistor layer 15. The fourth cut lines CL4 preferably do not intersect with the third cut lines CL3. As shown in Fig. 4C, the third cut lines CL3 and the fourth cut lines CL4 are preferably straight lines and parallel with each other. Instead of being straight lines, the third cut lines CL3 and the fourth cut lines CL4 may be curved lines, zigzag lines or other lines in freely selected shapes. In the example shown in Fig. 4C, the third cut lines CL3 and the fourth cut lines CL4 reach the side surface 1c of the plate-like

base material 1. However, the third cut lines CL3 and the fourth cut lines CL4 may reach the cut lines CL. In the present specification, cutting directions along the cut lines may be freely decided.

[0027] If the heat generating resistor layer 15 is not formed on the side surface 1c of the plate-like base material 1, the portion between the second opening 19 and the side surface 1c which is extracted from the plate-like base material 1 includes unplated regions 7 in the side surface 1c and a cutting area along the third cut line CL3 and the fourth cut line CL4 and further includes the heat generating resistor layer 15 in a surface corresponding to the opening side surface of the second opening 19. In this case, therefore, the portion between the second opening 19 and the side surface 1c which is extracted from the plate-like base material 1 may be used as the heater 10. For example, if the side surface 1c is masked before the plate-like base material 1 is subjected to electroless plating, the heat generating resistor layer 15 is not formed on the side surface 1c of the plate-like base material 1, and the unplated region 7 is provided only to the side surface 1c.

[0028] If the heat generating resistor layer 15 is formed on the side surface 1c of the plate-like base material 1 as in the present embodiment, the heat generating resistor layer 15 formed on the side surface 1c of the plate-like base material 1 or the heat generating resistor layer 15 formed on the opening side surface of the second opening 19 is removed. In the example shown in Fig. 4C, the plate-like base material 1 is cut along the cut line CL that is orthogonal to the third cut line CL3 and the fourth cut line CL4 and removed including the side surface 1c. The unplated regions 7 are thus formed in the plate-like base material 1. Accordingly, the portion between the second opening 19 and the side surface 1c of the plate-like base material 1 which is extracted from the plate-like base material 1 includes a surface corresponding to the side surface 1c or the opening side surface of the second opening 19 and further includes unplated regions 7 in surfaces cut along the third cut line CL3 and the fourth cut line CL4. The heat generating resistor layer 15 on the side surface 1c may be removed by etching the heat generating resistor layer 15 on the side surface 1c of the plate-like base material 1 or cutting the heat generating resistor layer 15 on the side surface 1c of the plate-like base material 1.

[0029] With regard to the plate-like base material 1 shown in Fig. 4C, if a portion between a pair of second openings 19 of the plate-like base material 1 is divided in a direction where the pair of second openings 19 are arranged, the heater 10 can be extracted. Specifically, the plate-like base material 1 is cut along fifth cut lines CL5, sixth cut lines CL6, and seventh cut lines CL7 shown in Fig. 4C. Each of the fifth cut lines CL5 extends between a corresponding one of the second openings 19 and a corresponding other one of the second openings 19. Each of the sixth cut lines CL6 extends between a corresponding one of the second openings 19 and a corre-

sponding other one of the second openings 19 so as not to intersect with the fifth cut lines CL5. Each of the seventh cut lines CL7 extends between a corresponding one of the fifth cut lines CL5 and a corresponding one of the sixth cut lines CL6. This makes it possible to extract two heaters 10 and form unplated regions 7 at the same time.

[0030] The above-explained process manufactures twelve heaters 10 shown in Fig. 4D from portions between the respective second openings 19 and the side surface 1c and portions between the pair of second openings 19 and forms unplated regions 7 at the same time.

[0031] In the example shown in Fig. 4C, the third cut lines CL3 and the fourth cut lines CL4 are preferably straight lines. The fifth cut lines CL5 and the sixth cut lines CL6 are preferably straight lines. The third cut lines CL3 and the fifth cut lines CL5 preferably extend in the same straight line. This makes it possible to cut the plate-like base material 1 from the third cut lines CL3 through to the fifth cut lines CL5 without difficulty in a single cutting process. As shown in Fig. 4C, it is preferable that the fourth cut lines CL4 and the sixth cut lines CL6 extend in a straight line. This makes it possible to cut the plate-like base material 1 from the fourth cut lines CL4 through to the sixth cut lines CL6 without difficulty in a single cutting process.

[0032] When the third cut lines CL3 and the fifth cut lines CL5 extend in the same straight line, and the fourth cut lines CL4 and the sixth cut lines CL6 extend in the same straight line, it is preferable that the third cut lines CL3 and the fifth cut lines CL5 extend substantially parallel with the fourth cut lines CL4 and the sixth cut lines CL6 as shown in Fig. 4C. This makes it possible to uniform width of the heater 10 manufactured from the portion between the second opening 19 and the side surface 1c and width of the heater 10 manufactured from the portion between the second openings 19.

[0033] In the example shown in Fig. 4C, a plurality of pairs of second openings 19 vertically arranged in the figure are adjacently located in the horizontal direction in the figure. As shown in Fig. 4C, the seventh cut line CL7 dividing the portion between one of the pairs of second openings 19 and the seventh cut line CL7 dividing the portion of the plate-like base material 1 which is located between the pair of second openings 19 and another pair of second openings 19 arranged in the horizontal direction in the figure preferably extend in the same straight line. This makes it possible to divide the portion between two adjacent pairs of second openings 19 in a single cutting process when the plurality of pairs of second openings 19 are adjacently located as shown in Fig. 4C.

[0034] The seventh cut line CL7 preferably extends between a center of the fifth cut line CL5 and a center of the sixth cut line CL6. This makes it possible to uniform lengths of two heaters 10 extracted from the respective portions between the pairs of second openings 19 when the fifth cut line CL5 and the sixth cut line CL6 are straight lines.

[0035] In the example shown in Fig. 4C, the heater 10

is manufactured from the portion of the plate-like base material 1 which is located between the pair of second openings 19 along the fifth cut line CL5, the sixth cut line CL6, and the seventh cut line CL7. Instead of manufacturing the heater 10 in the above-described manner, the heater 10 may be manufactured by cutting the portion of the plate-like base material 1 which is located between the pair of second openings 19 along freely selected cut lines. For example, the fifth cut line CL5 and the sixth cut line CL6 may intersect with each other to extend between one of the second openings 19 and another one of the second openings 19. In such a case, a portion of the plate-like base material 1 which is zoned by the fifth cut line CL5, the sixth cut line CL6, and the second opening 19 is extracted as the heater 10 without providing the seventh cut line CL7.

[0036] In the examples shown in Figs. 4A to 4D, the second openings 19 each have a rectangular shape. However, the shape of the second opening 19 is not limited. The second opening 19 may be of any shape, such as a rounded rectangle, a circle, and an ellipse. Fig. 5 is a schematic view that explains an example of the method for manufacturing the heater 10 shown in Fig. 1B. As shown in Fig. 5, the second opening 19 has a shape of a hexagon that is obtained by connecting short sides of two trapezoids. The plate-like base material 1 shown in Fig. 5 may be cut along the third cut lines CL3, the fourth cut lines CL4, the fifth cut lines CL5, the sixth cut lines CL6, and the seventh cut lines CL7 as explained above with reference to Fig. 4C. This makes it possible to obtain twelve heaters 10 in a convex shape with an acute angle as shown in Fig. 2. As shown in Fig. 6, for example, the second opening 19 may have a shape obtained by rounding two obtuse angles of a shape of the second opening 19 in Fig. 5.

[0037] Fig. 7 is a schematic view that explains a fourth example of the method of manufacturing the heater 10. In the example shown in Fig. 7, the plate-like base material 1 includes a plurality of second openings 19. As shown in the figure, the second openings 19 have shapes including a rectangle, an ellipse, and a hexagon obtained by connecting short sides of two trapezoids. The plate-like base material 1 shown in Fig. 7 may have the same structure except for the number and shape of the second openings 19 and size of the plate-like base material 1. In the example shown in Fig. 7, the plate-like base material 1 may be cut along eighth cut lines CL8 and ninth cut lines CL9 as well as the third cut lines CL3, the fourth cut lines CL4, the fifth cut lines CL5, the sixth cut lines CL6, and the seventh cut lines CL7.

[0038] Each of the eighth cut line CL8 extends between a corresponding one of the second openings 19 and a corresponding other one of the second openings 19 so as not to intersect with the fifth cut lines CL5 and the sixth cut lines CL6. A portion between a pair of second openings 19 can be divided by cutting the plate-like base material 1 along the eighth cut line CL8. Any cut line extending between one of the second openings 19 and the other

of the second openings 19 may be added.

[0039] The ninth cut lines CL9 are different cut lines from the third cut lines CL3 and the fourth cut lines CL4. The ninth cut lines CL9 extend from the second openings 19 toward the side surface 1c. The ninth cut lines CL9 preferably do not intersect with the third cut lines CL3 and the fourth cut lines CL4. The heater 10 obtained from a portion between the second opening 19 and the side surface 1c can be divided by cutting the plate-like base material 1 along the ninth cut lines CL9. Any cut line extending from the second opening 19 toward the side surface 1c may be added.

[0040] According to the manufacturing method explained above, the heater 10 can be obtained, in which the heat generating resistor layer 15 is provided in part of the main surface 10a, the rear surface 10b, and the side surface 10c. An electrode 21 may be formed on each of the main surface 10a and the rear surface 10b of the heater 10. Specifically, it is preferable that the electrodes 21 be formed at a farthest possible position in the main surface 10a and the rear surface 10b from the side surface 10c on which the heat generating resistor layer 15 is formed. The electrodes 21 may be made with a publicly-known material, such as a metal sheet.

[0041] In the heater 10 manufactured by the manufacturing method explained above, the heat generating resistor layer 15 does not have to be provided to the entire of the main surface 10a or the rear surface 10b. The heat generating resistor layer 15 therefore may be partially removed from the main surface 10a or the rear surface 10b. In this case, a resistance value may be increased by elongating a cable run distance by applying the patterning to the heat generating resistor layer 15 in such a manner that a cable run of the main surface 10a or the rear surface 10b which extends between the side surface 10c on which the heat generating resistor layer 15 is formed and the opposite side surface 10c is curved.

[0042] The embodiments of the invention have been explained. The invention is not limited to the embodiments and may be modified in various ways in the range of the technical ideas described in the claims, description, and drawing. Any shape and material that are not directly mentioned in the description and drawings are in the range of technical idea of the invention as long as they provide the operation and advantageous effects of the invention.

[0043] Some modes disclosed in the present application will be discussed below.

[0044] A first mode provides a method for manufacturing a heater for heating a flavor source in which a heat generating resistor layer is formed on a main surface, a rear surface, and one side surface. The method includes the steps of forming the heat generating resistor layer on a surface of a plate-like base material by plating, and forming an unplated region on the plate-like base material on which the heat generating resistor layer is formed.

[0045] In a second mode according to the first mode, the step of forming the heat generating resistor layer in-

cludes forming the heat generating resistor layer on a main surface, a rear surface, and a side surface of the plate-like base material.

[0046] In a third mode according to the second mode, the step of forming the unplated region includes removing the heat generating resistor layer formed on the side surface from the plate-like base material with part left on the side surface.

[0047] In a fourth mode according to the second or third mode, the step of forming the unplated region includes forming a first opening in the plate-like base material on which the heat generating resistor layer is formed, and cutting the plate-like base material along a first cut line extending between the first opening and the side surface and a second cut line that extends between the first opening and the side surface and does not intersect with the first cut line.

[0048] In a fifth mode according to the first or second mode, the plate-like base material includes a second opening, and the step of forming the heat generating resistor layer includes forming the heat generating resistor layer at least on the main surface, the rear surface, and an opening side surface of the plate-like base material which defines the second opening.

[0049] In a sixth mode according to the fifth mode, the step of forming the unplated region includes extracting from the plate-like base material a portion between the second opening and a side surface of the plate-like base material.

[0050] In a seventh mode according to the sixth mode, the step of forming the unplated region includes cutting the plate-like base material along a third cut line extending from the second opening toward the side surface of the plate-like base material and a fourth cut line extending from the second opening toward the side surface.

[0051] In an eighth mode according to any one of the fifth to seventh modes referring to the second mode, the step of forming the unplated region includes removing the heat generating resistor layer formed on the side surface of the plate-like base material or the heat generating resistor layer formed on the opening side surface.

[0052] In a ninth mode according to any one of the fifth to eighth modes, the plate-like base material includes the second opening comprising a pair of second openings, and the step of forming the unplated region includes dividing a portion of the plate-like base material which is located between the pair of second openings in a direction where the pair of second openings are arranged.

[0053] In a 10th mode according to the ninth mode, the step of forming the unplated region includes cutting the plate-like base material along a fifth cut line extending between one of the second openings and the other of the second openings, a sixth cut line that extends between one of the second openings and the other of the second openings and does not intersect with the fifth cut line, and a seventh cut line that extends between the fifth cut line and the sixth cut line and divides a portion of the plate-like base material which is located between the pair

of second openings.

[0054] In an 11th mode according to the tenth mode, the fifth cut line and the sixth cut line are straight lines extending between one of the second openings and the other of the second openings.

[0055] In a 12th mode according to the 10th or 11th mode, the seventh cut line is a straight line extending between a center of the fifth cut line and a center of the sixth cut line.

[0056] In a 13th mode according to any one of the 10th to 12th modes referring to the seventh mode, the third cut line and the fifth cut line extend in the same straight line, and the fourth cut line and the sixth cut line extend in the same straight line.

[0057] In a 14th mode according to the 13th mode, the third cut line and the fifth cut line are substantially parallel to the fourth cut line and the sixth cut line.

[0058] In a 15th mode according to any one of the 10th to 14th modes, the step of forming the unplated region includes cutting the plate-like base material along an eighth cut line extending between one of the second openings and the other of the second openings, and the eighth cut line does not intersect with the fifth cut line and the sixth cut line.

[0059] In a 16th mode according to any one of the 10th to 15th modes, the plate-like base material includes another pair of second openings adjacent to the pair of second openings, and the seventh cut line dividing the portion of the plate-like base material which is located between the pair of second openings and the seventh cut line dividing a portion of the plate-like base material which is located between the another pair of second openings extend in the same straight line.

[0060] In a 17th mode according to any one of the first to 16th modes, the method for manufacturing a heater for heating a flavor source includes the step of forming an electrode on each of the main surface and the rear surface of the heater for heating the flavor source.

REFERENCE SIGN LIST

[0061]

- 1: Plate-like base material
- 7: Unplated region
- 10: Heater
- 10a: Main surface
- 10b: Rear surface
- 10c: Side surface
- 15: Heat generating resistor layer
- 17: First opening

- 17a: Opening side surface
- 19: Second opening
- 5 21: Electrode
- CL1: First cut line
- CL1': First cut line
- 10 CL2: Second cut line
- CL2': Second cut line
- 15 CL3: Third cut line
- CL4: Fourth cut line
- CL5: Fifth cut line
- 20 CL6: Sixth cut line
- CL7: Seventh cut line
- 25 CL8: Eighth cut line

Claims

- 30 **1.** A method for manufacturing a heater for heating a flavor source in which a heat generating resistor layer is formed on a main surface, a rear surface, and one side surface, comprising the steps of:
 - 35 forming the heat generating resistor layer on a surface of a plate-like base material by plating, and
 - forming an unplated region on the plate-like base material on which the heat generating resistor layer is formed.
- 40 **2.** The method for manufacturing a heater for heating a flavor source according to Claim 1, wherein the step of forming the heat generating resistor layer includes forming the heat generating resistor layer on a main surface, a rear surface, and a side surface of the plate-like base material.
- 45 **3.** The method for manufacturing a heater for heating a flavor source according to Claim 2, wherein the step of forming the unplated region includes removing the heat generating resistor layer formed on the side surface from the plate-like base material with part left on the side surface.
- 50 **4.** The method for manufacturing a heater for heating a flavor source according to Claim 2 or 3, wherein the step of forming the unplated region in-
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cludes:

- forming a first opening in the plate-like base material on which the heat generating resistor layer is formed, and
cutting the plate-like base material along a first cut line extending between the first opening and the side surface and a second cut line that extends between the first opening and the side surface and does not intersect with the first cut line.
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- of second openings are arranged.
10. The method for manufacturing a heater for heating a flavor source according to Claim 9, wherein the step of forming the unplated region includes cutting the plate-like base material along a fifth cut line extending between one of the second openings and the other of the second openings, a sixth cut line that extends between one of the second openings and the other of the second openings and does not intersect with the fifth cut line, and a seventh cut line that extends between the fifth cut line and the sixth cut line and divides a portion of the plate-like base material which is located between the pair of second openings.
11. The method for manufacturing a heater for heating a flavor source according to Claim 10, wherein the fifth cut line and the sixth cut line are straight lines extending between one of the second openings and the other of the second openings.
12. The method for manufacturing a heater for heating a flavor source according to Claim 10 or 11, wherein the seventh cut line is a straight line extending between a center of the fifth cut line and a center of the sixth cut line.
13. The method for manufacturing a heater for heating a flavor source according to any one of Claims 10 to 12 referring to Claim 7,
wherein the third cut line and the fifth cut line extend in the same straight line, and
wherein the fourth cut line and the sixth cut line extend in the same straight line.
14. The method for manufacturing a heater for heating a flavor source according to Claim 13, wherein the third cut line and the fifth cut line are substantially parallel to the fourth cut line and the sixth cut line.
15. The method for manufacturing a heater for heating a flavor source according to any one of Claims 10 to 14,
wherein the step of forming the unplated region includes cutting the plate-like base material along an eighth cut line extending between one of the second openings and the other of the second openings, and
wherein the eighth cut line does not intersect with the fifth cut line and the sixth cut line.
16. The method for manufacturing a heater for heating a flavor source according to any one of Claims 10 to 15,
5. The method for manufacturing a heater for heating a flavor source according to Claim 1 or 2,
wherein the plate-like base material includes a second opening, and
wherein the step of forming the heat generating resistor layer includes forming the heat generating resistor layer at least on the main surface, the rear surface, and an opening side surface of the plate-like base material which defines the second opening.
6. The method for manufacturing a heater for heating a flavor source according to Claim 5,
wherein the step of forming the unplated region includes extracting from the plate-like base material a portion between the second opening and a side surface of the plate-like base material.
7. The method for manufacturing a heater for heating a flavor source according to Claim 6,
wherein the step of forming the unplated region includes cutting the plate-like base material along a third cut line extending from the second opening toward the side surface of the plate-like base material and a fourth cut line extending from the second opening toward the side surface.
8. The method for manufacturing a heater for heating a flavor source according to any one of Claims 5 to 7 referring to Claim 2,
wherein the step of forming the unplated region includes removing the heat generating resistor layer formed on the side surface of the plate-like base material or the heat generating resistor layer formed on the opening side surface.
9. The method for manufacturing a heater for heating a flavor source according to any one of Claims 5 to 8,
wherein the plate-like base material includes the second opening comprising a pair of second openings, and
wherein the step of forming the unplated region includes dividing a portion of the plate-like base material which is located between the pair of second openings in a direction where the pair

wherein the plate-like base material includes another pair of second openings adjacent to the pair of second openings, and
wherein the seventh cut line dividing the portion of the plate-like base material which is located between the pair of second openings and the seventh cut line dividing a portion of the plate-like base material which is located between the another pair of second openings extend in the same straight line.

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- 17. The method for manufacturing a heater for heating a flavor source according to any one of Claims 1 to 16, comprising the step of forming an electrode on each of the main surface and the rear surface of the heater for heating a flavor source.

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Fig. 1A

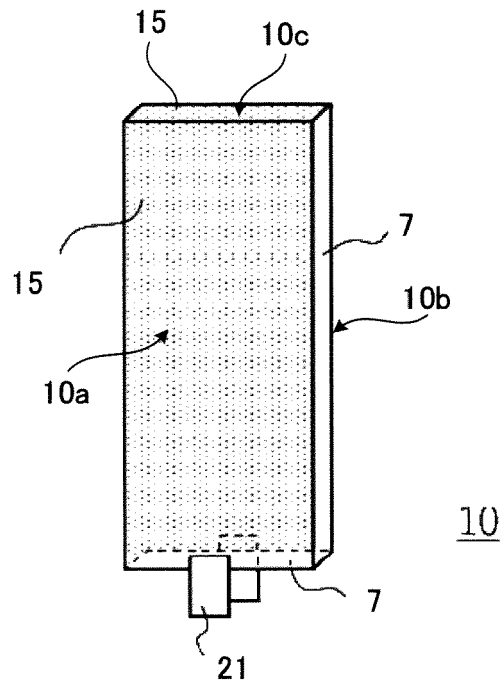


Fig. 1B

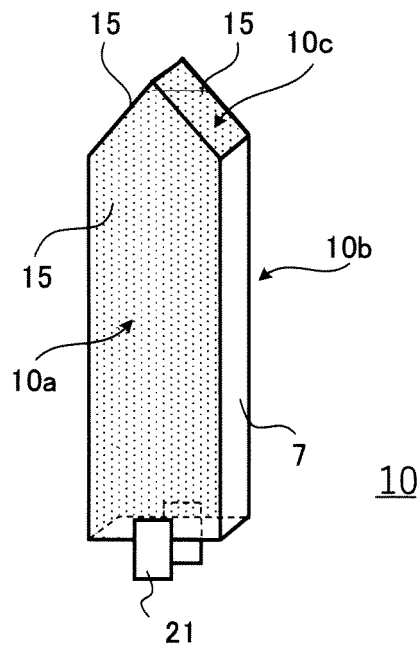


Fig. 2A

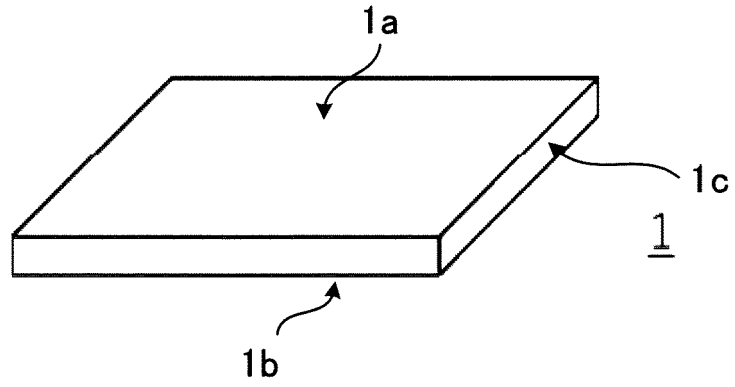


Fig. 2B

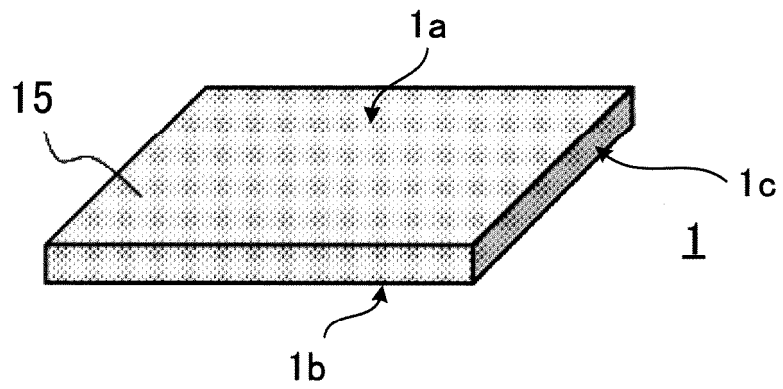


Fig. 2C

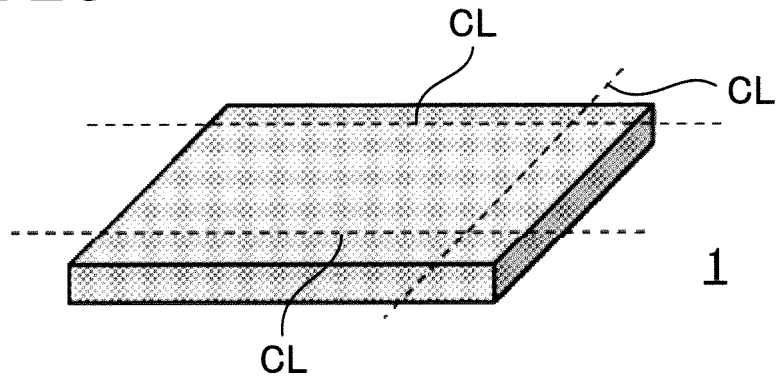


Fig. 2D

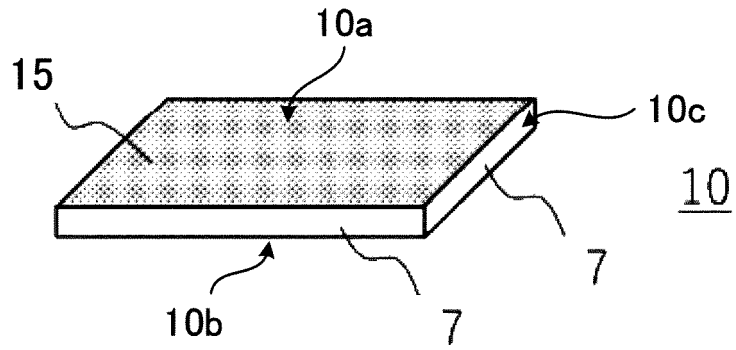


Fig. 3A

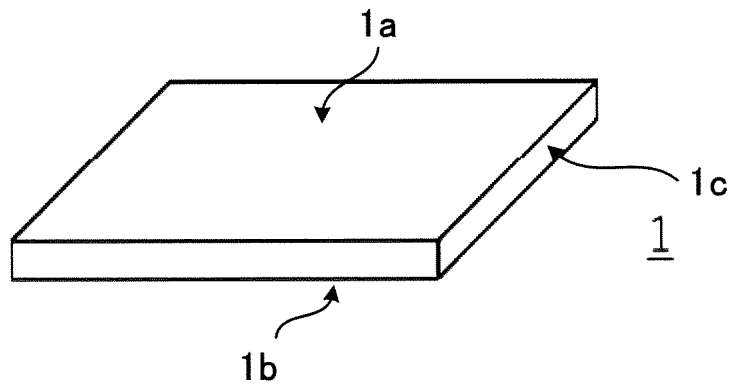


Fig. 3B

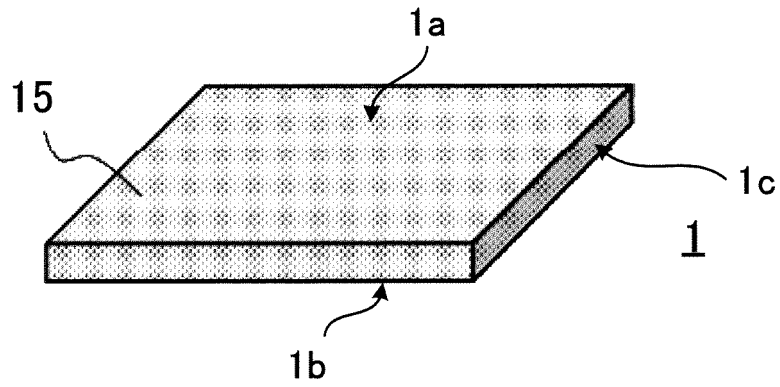


Fig. 3C

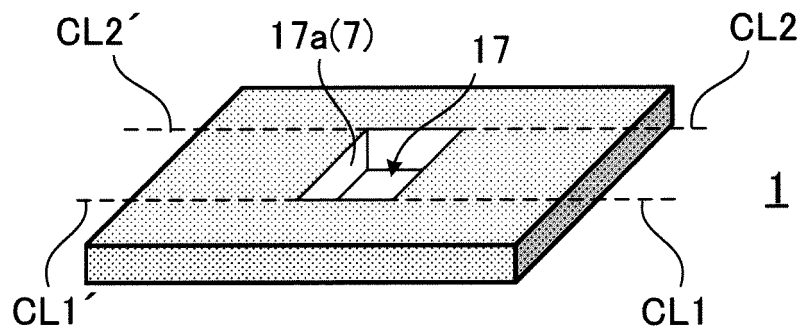


Fig. 3D

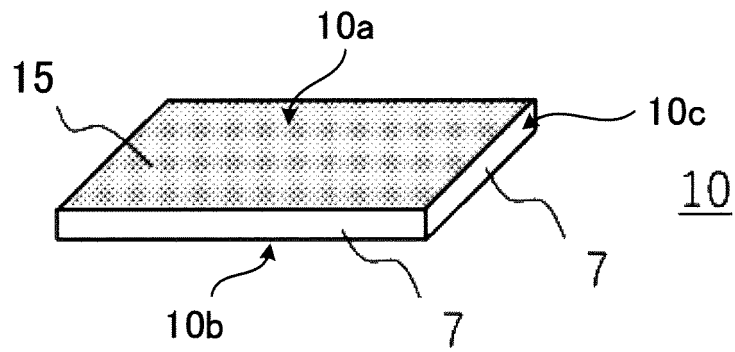


Fig. 4A

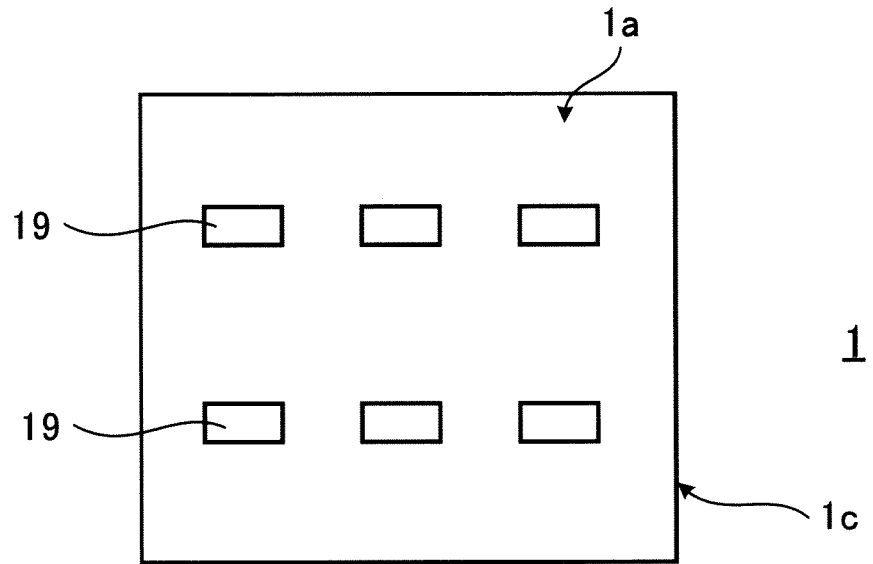


Fig. 4B

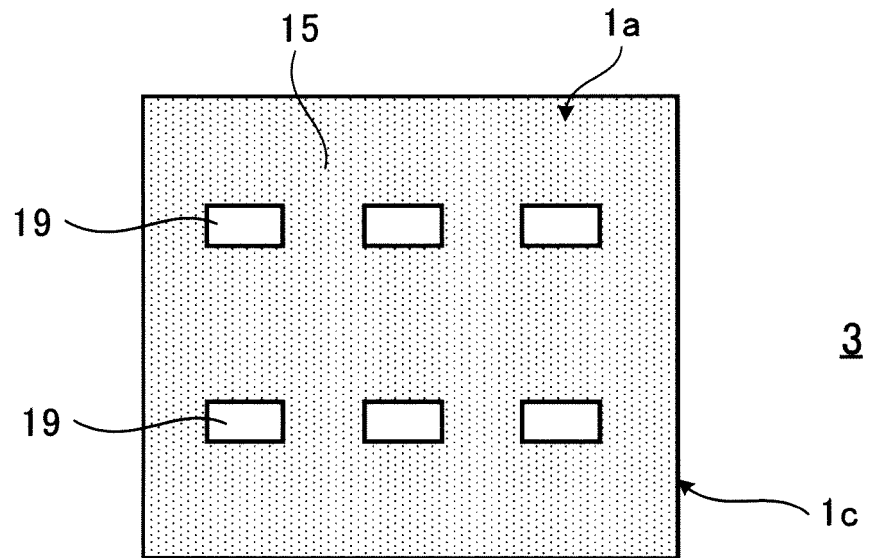


Fig. 4C

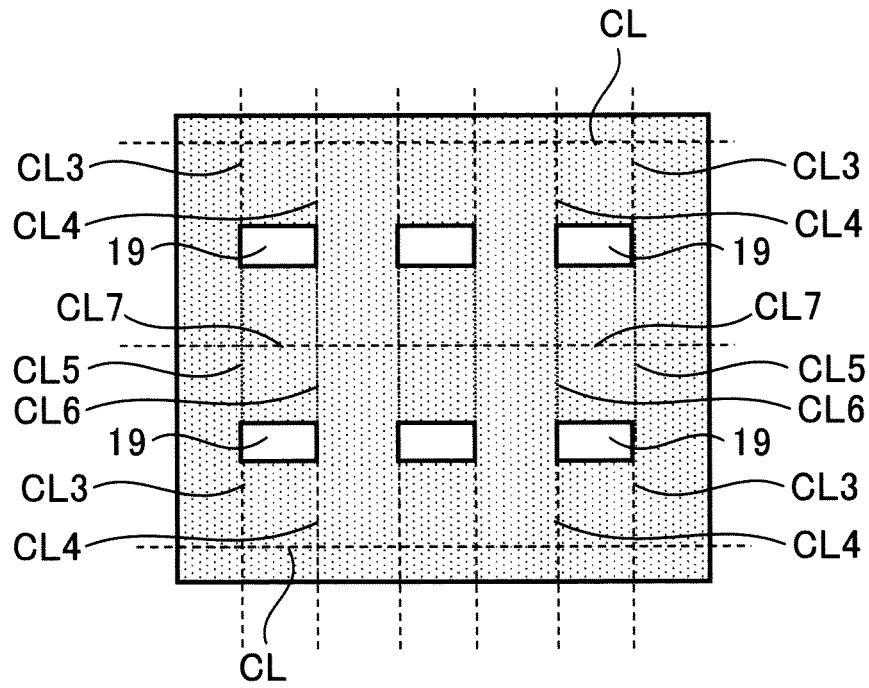


Fig. 4D

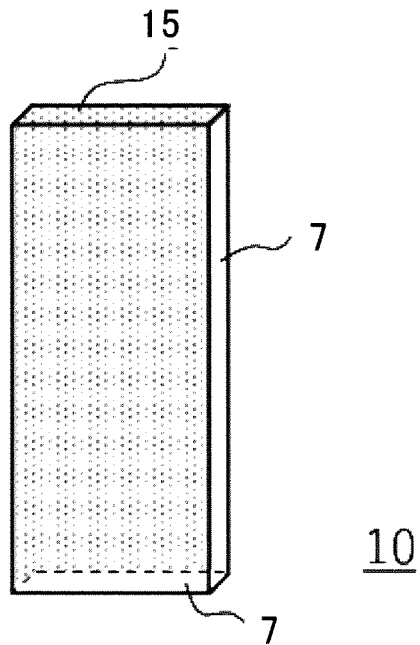
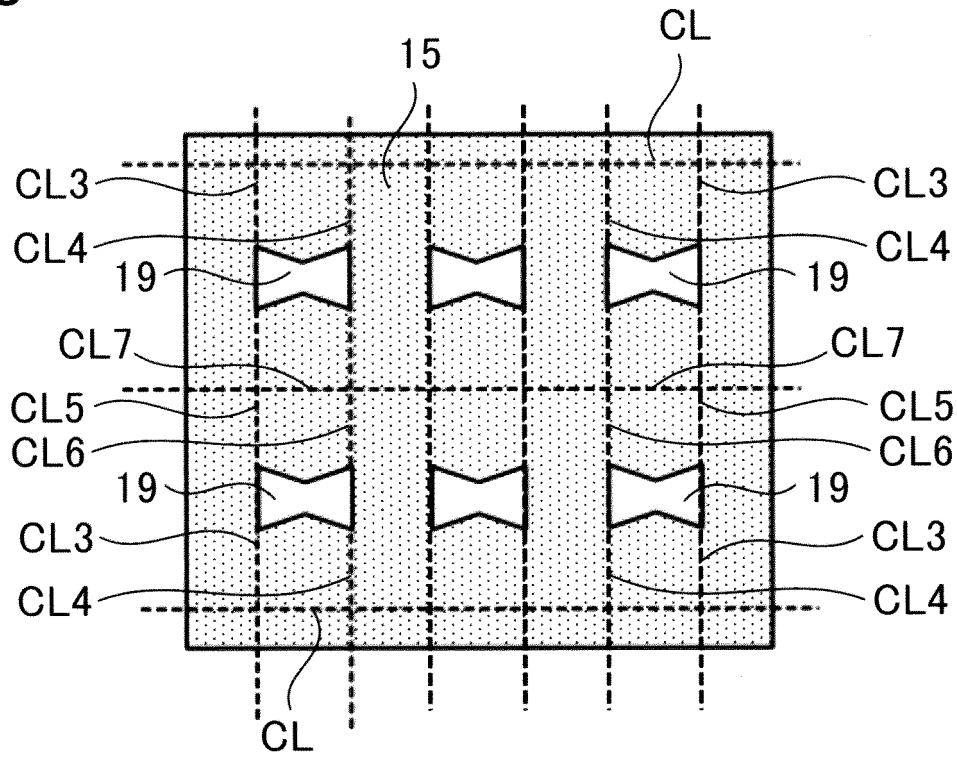


Fig. 5



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Fig. 6

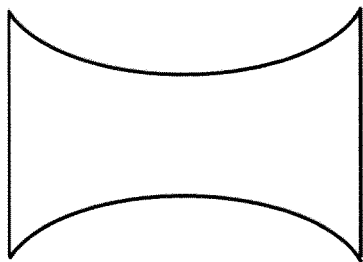
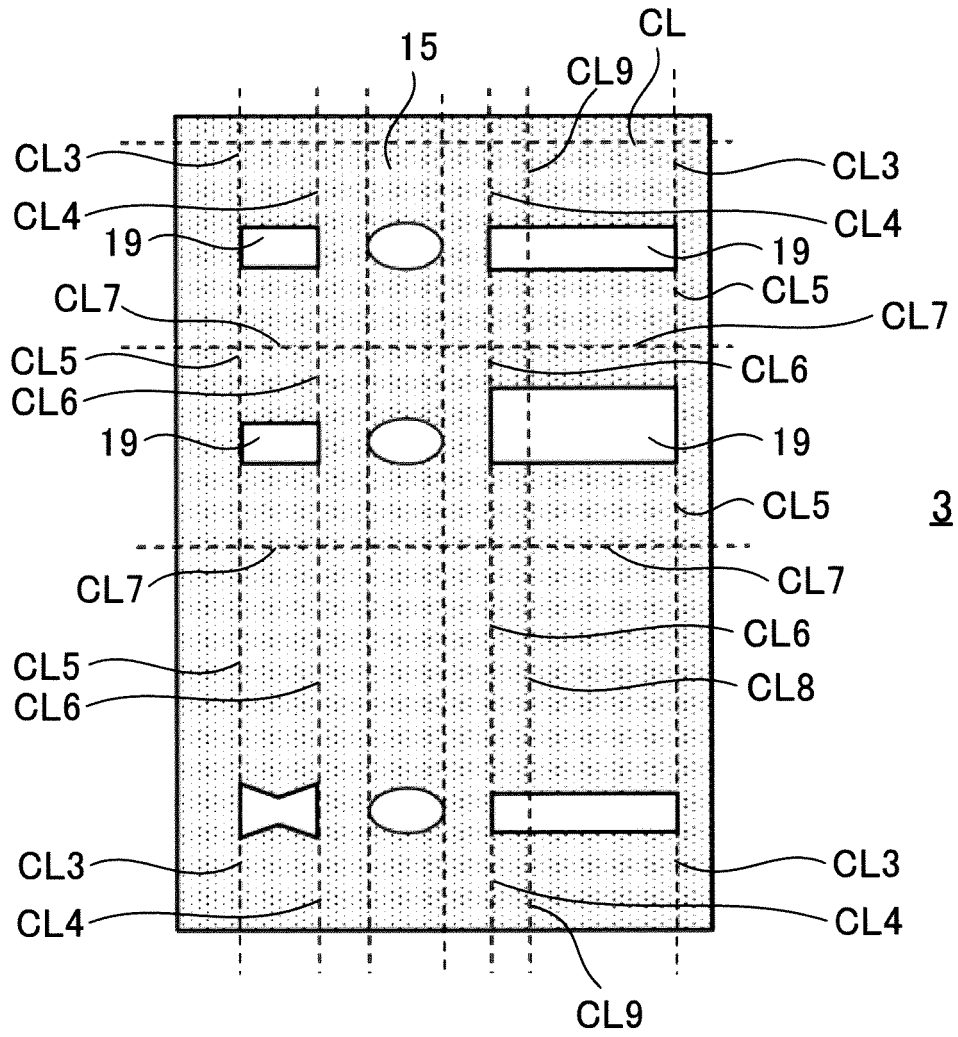


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/000852

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. A24F40/70 (2020.01) i, H05B3/20 (2006.01) i, H05B3/26 (2006.01) i, A24F40/46 (2020.01) i FI: A24F47/00, H05B3/26, H05B3/20 301 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) Int. Cl. A24F40/00-40/95, H05B3/00-3/86, A61M15/06		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2020 Registered utility model specifications of Japan 1996-2020 Published registered utility model applications of Japan 1994-2020		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2015-508287 A (PHILIP MORRIS PRODUCTS S.A.) 19 March 2015, paragraphs [0064], [0065], fig. 2	1-3, 17 4-16
Y A	CN 109413781 A (SHENZHEN SUNLORD ELECTRONICS) 01 March 2019, paragraphs [0019]-[0032], fig. 1-3	1-3, 17 4-16
Y A	JP 59-169090 A (HITACHI NETSU KIGU KK) 22 September 1984, page 1, lower right column, line 1 to page 2, upper left column, line 18, fig. 2, 3	1-3, 17 4-16
A	CN 107920394 A (KIMREE TECH CO., LTD.) 17 April 2018, paragraphs [0030]-[0045], fig. 1-3	1-17
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		<input checked="" type="checkbox"/> See patent family annex.
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "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 04.03.2020		Date of mailing of the international search report 17.03.2020
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan		Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/000852

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 109984385 A (O NET AUTOMATION TECH SHENZHEN LTD.) 09 July 2019, paragraphs [0058]-[0078], fig. 2, 3	1-17

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Information on patent family members

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CN 107920394 A	17.04.2018	(Family: none)	
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