(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 394 248 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**03.07.2024 Bulletin 2024/27**

(21) Application number: **22383288.2**

(22) Date of filing: **26.12.2022**

(51) International Patent Classification (IPC):
***F23D 14/66*** *(2006.01)* ***F23L 15/00*** *(2006.01)*
***F23L 15/04*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
**F23D 14/66; F23L 15/00; F23L 15/04;**
F23M 2900/13003

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA**
Designated Validation States:
**KH MA MD TN**

(71) Applicant: **ORKLI, S. COOP.**
**20240 Ordizia (Gipuzkoa) (ES)**

(72) Inventors:
- **UNANUE IMAZ, Andoni**
  **20213 IDIAZABAL (ES)**
- **HERZOG DELGADO, Juan Francisco**
  **20210 LAZKAO (ES)**
- **PEREZ GARMENDIA, Jose Luis**
  **20240 ORDIZIA (ES)**

(74) Representative: **Igartua, Ismael**
**Galbaian S. Coop.**
**Garaia Parke Teknologikoa**
**Goiru Kalea 1**
**20500 Arrasate-Mondragón (ES)**

(54) **DEVICE FOR GENERATING ENERGY FROM THE COMBUSTION GASES GENERATED IN A COOKING APPLIANCE BURNER**

(57) Device for generating energy from the residual heat of combustion gases generated in a burner (2) of a gas cooking appliance (1), comprising a thermoelectric generator module (10; 20; 30; 40; 50) at least partially surrounding the gas burner (2). The thermoelectric generator module (10) delimits a passage area (A) for the combustion gases, the thermoelectric generator module (10) comprising a plurality of thermoelectric couples (10) electrically connected to one another forming a thermopile in the passage area (A) such that the combustion gases heat the plurality of thermoelectric couples upon going through the passage area (A), generating electrical energy, further generating in the passage area (A) a secondary air stream towards the burner (2) preheated by the thermoelectric generator module (10).

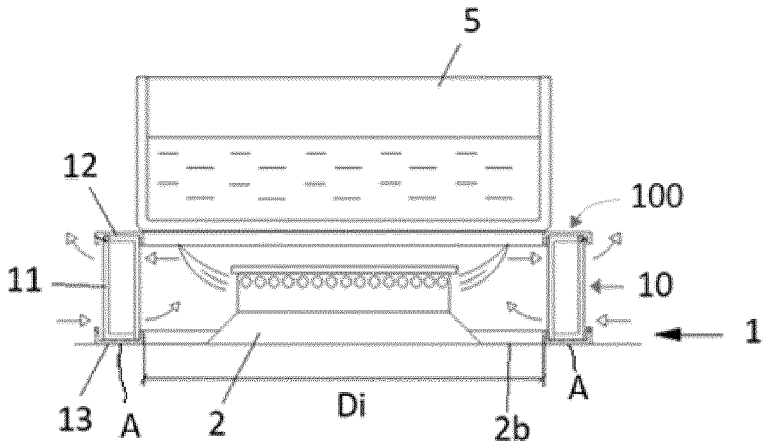


FIG. 1

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## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a device for generating energy from the residual heat of the combustion gases generated in a cooking appliance burner.

### PRIOR ART

**[0002]** Gas cooking appliances comprising devices for trying to improve the performance efficiency of the burner are known.

**[0003]** CN 106287834 A1 discloses a hollow device arranged concentric to the burner and comprising a hot side, a cold side concentric to the hot side, and thermoelectric generating foil disposed between the two and electrically connected to a booster module connected in turn to a battery. When the burner is in operation, the hot side absorbs the residual heat radiated from the burner, the foil absorbing said heat and radiating heat towards the outside through the cold side. The electricity generated is stored in the battery through the booster module.

**[0004]** US 2006/0172245 A1 and US 2006/0016446 A1 disclose burners including thermoelectric modules installed inside the burner configured to generate electricity from the combustion gases, and heat sinks. The thermoelectric module comprises a hot side in contact with the head of the burner and a cold side in contact with the heat sink. It can comprise a thermal insulation inserted between the thermoelectric module and the head of the burner to control the temperature of the hot side. The thermoelectric module is arranged connected to a DC/DC converter, capable of powering electric devices, batteries, etc.

**[0005]** EP 2711627 A2 discloses a burner comprising a thermogenerator device comprising a hot part, a cold part arranged in a vertical support, and a thermogenerator connected to a controller which controls an LED. The thermogenerator is arranged in thermal contact with the hot part and with the cold part. Said thermogenerator activates the LED when the temperature of the pot exceeds the 60°C.

**[0006]** Lastly, CN 105186927 A describes a support for pots which uses the residual heat from combustion to generate electricity, the support comprising a lower base, a heat conductive cylinder, an upper insulating cover, a lower insulating cover, a thermogenerator module, and a heat exchanger, with the exchanger, the conductive cylinder, and the thermogenerator module being arranged concentric to one another, fixed between the insulating covers. The heat exchanger is arranged on the outside of the thermogenerator module and includes a cold water duct, such that said duct is in contact with the cold part of the thermogenerator module in order to extract more heat from said cold part and enable a better performance of the support. The thermogenerator module comprises an N-type thermoelectric element, a P-type thermoelectric element, and a deflector.

### DISCLOSURE OF THE INVENTION

**[0007]** The object of the invention is to provide a device for generating energy from the residual heat of the combustion gases generated in a gas appliance burner as defined in the claims.

**[0008]** The device for generating energy comprises a thermoelectric generator module at least partially surrounding the gas burner and delimiting a passage area for the combustion gases. The thermoelectric generator module comprises a plurality of thermoelectric couples electrically connected to one another forming a thermopile in the passage area such that the combustion gases heat the plurality of thermoelectric couples upon going through the passage area, preheating by means of the thermoelectric couples, in said passage area, an incoming secondary air stream towards the burner such that, while generating electrical energy usable for other uses, the performance of the gas burner is increased.

**[0009]** The device for generating energy that is obtained allows the performance of the gas burner to be improved on one hand, because it enables introducing heated secondary air towards the burner, and on the other hand, because it generates electrical energy as the combustion gases go through the passage area which could be used to power loads of the cooking appliance and/or to notify the user as to aspects affecting the performance of the combustion system. Furthermore, the device for generating energy does not interfere with combustion and has little load loss, considerably increasing the performance of the system.

**[0010]** These and other advantages and features of the invention will become apparent in view of the figures and detailed description of the invention.

### DESCRIPTION OF THE DRAWINGS

**[0011]**

Figure 1 shows a sectioned view of a gas cooking appliance comprising a first embodiment of a device for generating energy according to the invention.

Figure 2 shows a perspective view of the device for generating energy shown in Figure 1.

Figure 3 shows a sectioned partial view of the device for generating energy shown in Figure 1, wherein the connections of a plurality of thermoelectric couples are shown.

Figure 4 shows a sectioned view of the gas cooking appliance comprising a second embodiment of the device for generating energy according to the invention.

Figure 5 shows a perspective view of a third embodiment of the device for generating energy according to the invention.

Figure 6 shows a sectioned partial view of the device for generating energy shown in Figure 5, wherein the connections of a plurality of thermoelectric couples are shown.

Figure 7 shows a perspective view of a gas cooking appliance comprising a fourth embodiment of a device for generating energy according to the invention.

Figure 8 shows a partial perspective view of the device for generating energy shown in Figure 7.

Figure 9 shows a sectioned partial view of the device for generating energy shown in Figure 7.

Figure 10 shows a detail view of electrical connections between the thermocouples of the energy device shown in Figure 7.

Figure 11 shows a detail view of other electrical connections between the thermocouples of the energy device shown in Figure 7.

Figure 12 shows a detail view of other electrical connections between the thermocouples of the energy device shown in Figure 7.

## DETAILED DISCLOSURE OF THE INVENTION

**[0012]** Figure 1 shows a gas cooking appliance 1 comprising at least one burner 2 and a first embodiment of a device for generating energy according to the invention suitable for generating energy from the residual heat of the combustion gases generated in the burner 2. The device for generating energy 100 comprises a thermoelectric generator module 10 surrounding the perimeter of the burner 2 and delimiting a passage area A of the combustion gases towards the outside. The thermoelectric generator module 10 comprises a plurality of thermoelectric couples 11 electrically connected to one another forming a thermopile in the passage area A, such that the combustion gases heat the plurality of thermoelectric couples 11 upon going through the passage area A towards the outside, heating in said passage area A an incoming secondary air stream towards the burner 2 by means of the thermoelectric couples 11. That is, the thermoelectric generator module 10 generates electrical energy as the combustion gases heat the plurality of thermoelectric couples 11, and it further enables the provision of preheated secondary air to the burner 2, which improve its performance.

**[0013]** The secondary air for combustion enters through the lower part or through the intermediate part of the thermoelectric generator module 10 collaborating in the generation of a thermal gradient between the upper (heated) part and the lower (cooled) part of each thermoelectric couple 11 without the need for any forced air system. Furthermore, a base 2b of the burner 2 where the thermoelectric generator module 10 is supported allows the thermal gradient to increase when it acts as a cooling unit.

**[0014]** Figure 4 shows a gas home appliance 1' similar to the one in Figure 1 comprising a second embodiment of the device for generating energy 110 according to the invention. In addition to comprising a thermoelectric generator module 10 having the features of the generator module described in the first embodiment of Figures 1 to 3, the device for generating energy 110 comprises a heat exchanger module 60 externally surrounding the thermoelectric generator module 10, the heat exchanger module 60 being configured to exchange heat between the combustion gases that have previously gone through the thermoelectric generator module and the secondary air that will subsequently go through the thermoelectric generator module 10. The heat exchanger 60 further increases the performance of the burner 2.

**[0015]** The heat exchanger module 60 is preferably an air/air exchanger comprising inlet channels 61 for the secondary air and other outlet channels 62 for the hot air coming from the combustion gases that have previously gone through the thermoelectric generator module 10 causing the exchange of heat between both. The outlet channels 62 absorb the heat from the gas passing through same, transferring said heat to the inlet channels 61 for secondary air, so the secondary air cooperating in the combustion enters being hotter, therefore boosting the performance of the burner 2. Furthermore, the upper part of the device for generating energy 110 will emit heat in the form of thermal radiation, whereby heating the utensil 5 placed on the burner 2.

**[0016]** Preferably, the heat exchanger module 60 is not supported directly on the base of the burner 2 for the purpose of even further optimizing the effect of the exchanger, thermally separating it from the base 2b so that it does not cool down through the latter. In this case, the device for generating energy 60 is supported directly on the base 2b of the burner 2 through the thermoelectric generator module 10.

**[0017]** The device for generating energy 110 can be configured to maximize one of the two effects (heat exchanger or thermoelectric effect) or to balance out both effects based on the application.

**[0018]** In any of the embodiments shown in Figures 1 to 4, the device for generating energy 100; 110 delimits a closed contour. Preferably, the plurality of thermoelectric couples 11 are homogeneously distributed surrounding the burner 2.

**[0019]** In the embodiments shown in Figures 1 to 4, each thermoelectric couple 11 comprises two metal rods 11a and 11b made of different materials connected to one another, each rod 11a and 11b having an L-shaped geometry through which both rods 11a and 11b are con-

nected to one another and to the corresponding rod 11a of the next thermoelectric couple 11.

**[0020]** Preferably, one of the rods 11a is made of a nickel-chromium alloy and the other rod 11b is made of constantan. In another embodiment not shown in the figures, each thermoelectric couple 11 comprises two metal bands instead of rods, with the rest of the features defined for the rods being valid for the bands.

**[0021]** Furthermore, each thermoelectric generator module 10 comprises an upper base 12 and a lower base 13 supporting the thermoelectric couples 11, with each thermoelectric couple 11 being arranged between both bases 12 and 13, in particular substantially orthogonal to both bases 12 and 13. Each thermoelectric couple 11 goes through both bases 12 and 13, with the electrical connections between the thermoelectric couples 11 being housed in a respective recess 12a and 13a of each base 12 and 13. A cap 12b and 13b covers said connections. The bases 12 and 13 are metal, preferably made of anodized aluminum so as to electrically insulate the thermoelectric couples 11.

**[0022]** In the embodiments shown in Figures 1 to 4, the thermoelectric generator module 10 is supported in the base 2b through the lower support 13. Moreover, the upper base 12 can comprise radial grooves not shown in the figures, configured to partially house a grill (not shown) of the gas cooking appliance 1.

**[0023]** In another embodiment of the invention, shown in Figures 5 and 6, the device for generating energy 120 comprises a thermoelectric generator module 20 without a heat exchanger module. The thermoelectric generator module 20 differs from the thermoelectric generator module 10 of the embodiment shown in Figures 1 to 3, in which the two rods 21a and 21b of each thermoelectric couple 21 are diagonally connected. Furthermore, the rods 21a and 21b do not go through the upper base 22 and the lower base 23, being housed in recesses 22a and 22b of said bases 22 and 23, preferably being fixed to said bases 22 and 23 through silicone or resin. The remaining features are similar to those described in the first embodiment.

**[0024]** In the embodiments shown in Figures 1 to 6, the thermoelectric generator module 10; 20 comprises stiffeners 15; 25 attaching the upper base 12; 22 with the corresponding lower base 13; 23.

**[0025]** In other embodiments of the invention shown in Figures 7 to 12, the device for generating energy 130; 140; 150 comprises only the thermoelectric generator module 30;40;50 (i.e., it does not include an additional heat exchanger module), differing from the thermoelectric generator module 10 of the first embodiment shown in Figures 1 to 3 by the type of thermoelectric couple. In the embodiments shown in Figures 7 to 10, each thermoelectric couple 31; 51 comprises a metal body 32;52 and a metal rod 35; 55 housed inside the metal body 32; 52, a first end of the rod 35; 55 being connected to the metal body 32; 52 generating a hot junction 34; 54. Preferably, the metal body 32;52 is cylindrical and made of a nickel-chromium alloy and the rod 35; 55 is made of constantan. Furthermore, the corresponding thermoelectric generator module 30; 40; 50 comprises a single support base 33;53 where the metal body 32; 52 is fixed.

**[0026]** In the embodiments shown in Figures 10 and 11, the plurality of thermoelectric couples 31 are fixed to the support base 33 through a threaded attachment 32b, being electrically connected to one another such that a second end 35b of the rod 35 of each thermoelectric couple 31 is connected to the metal body 32 of another thermoelectric couple 31 as shown in Figures 10 and 11. In particular, in the embodiment shown in Figure 10, the second end of the rod 35b is attached by direct contact, without welding, with the thread 32b of the body 32 of the corresponding thermoelectric couple 31. Moreover, in the embodiment shown in Figure 11, the second end of the rod 35b is welded with the body 32 of the corresponding thermoelectric couple 31. In the embodiments shown in Figures 10 and 11, the support base 33 is preferably made of anodized aluminum.

**[0027]** In the embodiment shown in Figure 12, the support base 53 of the thermoelectric generator module 50 is a printed circuit board or PCB. The metal body 52 and the rod 55 are fixed by means of welding to the PCB board 53, such that the thermoelectric couples 51 are supported and connected to one another through the printed circuit on the PCB board 53.

**[0028]** In the embodiments shown in Figures 7 to 12, the thermoelectric couples 31;51 are arranged distributed in the passage area A in a concentric manner, such that the thermoelectric couples 31;51 to be arranged closest to the burner 2 (when the generator device is assembled in the cooking appliance) have a height h1 smaller than the height h2 of the thermoelectric couples 31;51 arranged in a second row, and so on and so forth as shown in Figure 9. The heights h1, h2, h3 of the thermoelectric couples are calculated so that the thermoelectric couples can be heated as much as possible without the flame of the burner touching them. Furthermore, the thermoelectric couples 31;51 are preferably arranged such that there are gaps 58 for the grill 9.

**[0029]** In any of the embodiments shown, the plurality of thermoelectric couples 11; 21; 31; 51 are preferably connected in series. In other embodiments, the plurality of thermoelectric couples 11; 21; 31; 51 can be connected in series.

**[0030]** In any of the embodiments shown, the device for generating energy 100; 110; 120; 130; 140; 150 is detachable with respect to the cooking appliance, i.e., it can be readily removed to be later washed. In other embodiments that are not shown, the device for generating energy can be coupled in a detachable manner to a cooking utensil/pot or fixed to said cooking utensil.

**[0031]** In other embodiments not shown, the device for generating energy can comprise an exchanger module having the features of the exchanger module described in the second embodiment shown in Figure 4 and a thermoelectric generator module 10; 20; 30 and 50 according

to any of the embodiments described throughout the description.

**[0032]** In any of the embodiments shown, the thermoelectric generator module 10; 20; 30; 40 and 50 has an inner diameter Di larger than the outer diameter of the burner 2, said thermoelectric generator module surrounding the burner. The thermoelectric generator module to be used in each burner 2 will depend on the calorific value of the respective burner 2. That is, the inner diameter Di of the thermoelectric generator module 10; 20; 30; 40 and 50 will be adapted to the standard pot suitable for the calorific value of the given burner. If it were larger than the diameter of the standard pot, the residual heat would escape upwardly such that the thermoelectric generator module would lose efficiency.

**[0033]** Preferably, the device for generating energy 100; 110; 120; 130; 140; 150 is substantially annular, i.e., both the thermoelectric generator module 10; 20; 30; 40; 50 and the heat exchanger module 60 have an annular geometry, with a circular inner contour. The outer contour can be circular, rectangular, or have another geometry. Preferably, the device for generating energy 10; 20; 30; 40; 50 has a closed contour. In other embodiments, the device for generating energy has an open contour.

**[0034]** In any of the embodiments, the respective thermoelectric generator module can comprise at least one electrical connector for the electrical connection of the thermopile to a load of the gas appliance 1, where said load can be a battery, other electric circuits of the cooking appliance, wireless communication, a pot detection sensor, a timer, indicator LEDs, etc. In one embodiment, the electrical connector can be connected to a voltage booster before being connected with the load. In other embodiments, the thermoelectric generator module can generate sufficient voltage to power the load directly without the need to use a voltage booster.

**[0035]** In the embodiments shown in Figures 7 to 11, the device for generating energy 130; 140; 150 comprises display means 41 powered by the plurality of thermoelectric couples 31; 51 and configured to show to the user the correct positioning of the pot on the burner 2, the appropriateness of the size of the pot with respect to the burner 2, or the presence of the pot 5. The display means 41 shown in Figures 7 and 8 do not surround the device for generating energy, but rather are arranged at one end of said device for generating energy, although in other embodiments, the display means could surround the device for generating energy. Furthermore, the display means 41 comprise a screen 42 configured to display symbols 43, such that when one of them is not illuminated, it shows the incorrect positioning of the pot with respect to the burner. In the event that none of the symbols lights up, or they light up in a weaker manner, it would indicate that the size of the pot is not the correct size or that there is no pot despite the burner being on.

**[0036]** In one embodiment, the display means can be configured to indicate to the user when energy is being saved, such that as it is switched on, it would show the user that the device for generating energy is operating correctly. Furthermore, the display means can include resistors connected such that the display means could light up at different temperatures. The display means can be arranged in another position with respect to the device for generating energy.

**[0037]** In another embodiment, the display means can be configured to show to the user if the chosen pot is suitable for the corresponding burner 2. In the event that a pot the size of which is not recommended for the corresponding burner 2 is used, the display device would show that information to the user so that said user is aware that the energy efficiency of the system is lower. In the event that the size of the pot is smaller than the inner diameter of the device for generating energy, the combustion gases would escape upwardly, barely contacting the device for generating energy, so the lighting means would not light up or would very dimly light up. In contrast, in the event that the pot is too large and covers at least part of the device for generating energy, the lighting means would show a more intense light than the light corresponding to it during a correct operation of the device given that a higher concentration of heat and, therefore, a higher generation of electric voltage powering the lighting means would be generated, or an LED of another color could light up in order to indicate this anomaly, showing to the user that system efficiency is not optimal.

**[0038]** In another embodiment, the lighting means can be configured to inform the user of the incorrect positioning of the pot with respect to the burner. In the event that the pot is not correctly positioned with respect to the burner, the combustion gases would escape through the area not covered by the pot. In one embodiment, the device for generating energy could include lighting means in each quadrant, such that in the case of an incorrect positioning, at least one of the quadrants would not be lit up.

**[0039]** In another embodiment in which the gas cooking appliance operates with hydrogen gas, the flame generated in combustion would not be visible. In this case, the lighting means can be configured to show if combustion is taking place in the burner when there is a pot on the burner given that, even though the user does not see the flame, the lighting means/display device would remain lit up, indicating to the user the existence of combustion.

**[0040]** In another embodiment, the lighting means can be configured to warn the user that an excessive temperature has been reached in the pot. For example, in the event that there is boiling food with water in the pot. If it gets to the point where all the water has evaporated, the temperature of the pot becomes very hot, with a high risk of burning the food and causing a fire. When this high temperature is reached, the thermoelectric generation module generates a higher electric voltage and the lighting intensity of the lighting means is higher, a different color LED may light up to indicate this anomaly. Furthermore, the thermoelectric generation module would be connected to an audible alarm through the electrical con-

nector, the audible alarm being activated once an electric voltage higher than a predetermined value has been generated.

**[0041]** Lastly, the lighting means may include LEDs or any other known lighting element.

## Claims

1. Device for generating energy from the residual heat of combustion gases generated in a burner (2) of a gas cooking appliance (1), comprising a thermoelectric generator module (10; 20; 30; 40; 50) at least partially surrounding the gas burner (2), **characterized in that** the thermoelectric generator module (10; 20; 30; 40; 50) delimits a passage area (A) for the combustion gases, the thermoelectric generator module (10; 20; 30; 40; 50) comprising a plurality of thermoelectric couples (11; 21; 31; 51) electrically connected to one another forming a thermopile in the passage area (A) such that the combustion gases heat the plurality of thermoelectric couples (11; 21; 31; 51) upon going through the passage area (A) generating electrical energy, preheating by means of the thermoelectric couples (11), in said passage area (A), an incoming secondary air stream towards the burner (2) such that, while generating electrical energy usable for other uses, the performance of the gas burner (2) is increased.

2. Device for generating energy according to the preceding claim, comprising a heat exchanger module (60) externally surrounding the thermoelectric generator module (10), the heat exchanger module (60) being configured to exchange heat between the combustion gases that have previously gone through the thermoelectric generator module (10; 20; 30; 40; 50) and the secondary air that will subsequently go through the thermoelectric generator module (10; 20; 30; 40; 50), increasing the performance of the burner (2).

3. Device for generating energy according to the preceding claim, wherein the thermoelectric generator module (10; 20; 30; 40; 50) delimits a closed contour.

4. Device for generating energy according to any of the preceding claims, wherein the thermoelectric generator module (10; 20) comprises an upper base (12; 22) and a lower base (13; 23) that support the plurality of thermoelectric couples (11;21).

5. Device for generating energy according to the preceding claim, wherein the thermoelectric generator module (10;20) comprises at least one stiffener (15; 25) which attaches the upper base (12; 22) with the lower base (13; 23).

6. Device for generating energy according to any of the preceding claims, wherein each thermoelectric couple (11) comprises two metal rods (11a, 11b) made of different materials connected to one another, each rod (11a, 11b) having an L-shaped geometry, being connected to one another forming the thermoelectric couple (11) and to the corresponding rod (11a, 11b) of the next thermoelectric couple (11).

7. Device for generating energy according to any of claims 1 to 5, wherein each thermoelectric couple (21) comprises two metal rods (21a, 21b) made of different materials connected to one another diagonally.

8. Device for generating energy according to any of claims 1 to 3, wherein each thermoelectric couple (31) comprises a metal body (32) including a thread (32b) at one end through which it is fixed to a support base (33) of the thermoelectric generator module (30;40), and a metal rod (35) housed inside the metal body (32), with a first end of the rod (35) being connected to the metal body (32) generating a hot junction (34), with the plurality of thermoelectric couples (31) being arranged electrically connected to one another such that a second end (35b) of the rod (35) of each thermoelectric couple (31) is connected to the metal body (32) of another thermoelectric couple (31).

9. Device for generating energy according to the preceding claim, wherein the second end of the rod (35b) is attached by direct contact with the thread (32b) of the body (32) of the corresponding thermoelectric couple (31).

10. Device for generating energy according to any of claims 1 to 3, wherein each thermoelectric couple (51) comprises a metal body (52) and a metal rod (55) housed inside the metal body (52), a first end of the rod (55) being connected to the metal body (52) generating a hot junction (54), the thermoelectric generator module (50) comprising a PCB (53) with the plurality of thermoelectric couples (51) being arranged supported and electrically connected to one another through the PCB (53).

11. Device for generating energy according to any of the preceding claims, wherein the thermoelectric generator module includes at least one electrical connector for the electrical connection thereof with at least one load of the gas appliance (1; 1'; 1").

12. Device for generating energy according to any of the preceding claims, comprising display means (41) powered through the thermoelectric generator module (10; 20; 30; 40; 50) and configured to indicate to the user the correct positioning of a pot on the burner

(2), the appropriateness of the size of the pot (5) with respect to the burner (2), the presence or absence of a pot on the thermoelectric generator module (30; 40; 50), the performance of the thermoelectric generator module (30; 40; 50), the residual heat of the thermoelectric generator module (30; 40; 50), and/or a temperature excess reached in the pot arranged on the thermoelectric generator module (30; 40; 50).

**13.** Cooking utensil comprising a device (110; 120; 130; 140; 150) for generating energy according to any of the preceding claims.

**14.** Gas cooking appliance comprising at least one burner (2) and a device (110; 120; 130; 140; 150) for generating energy according to any of claims 1 to 12.

**15.** Cooking appliance according to the preceding claim, wherein the device (110; 120; 130; 140; 150) for generating energy is arranged in a detachable manner with respect to the burner (2).

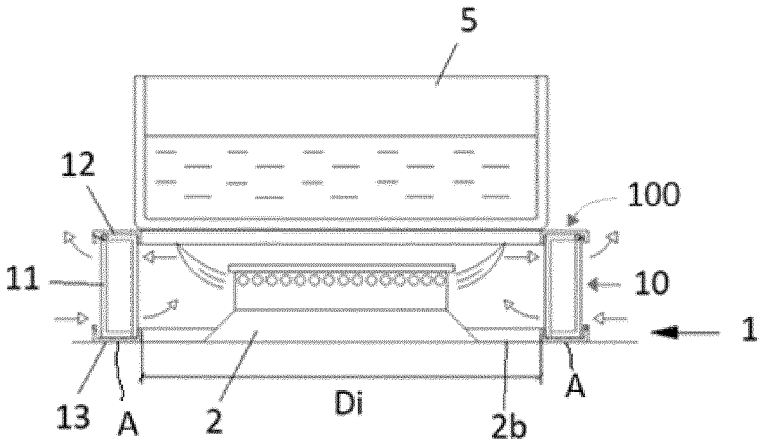


FIG. 1

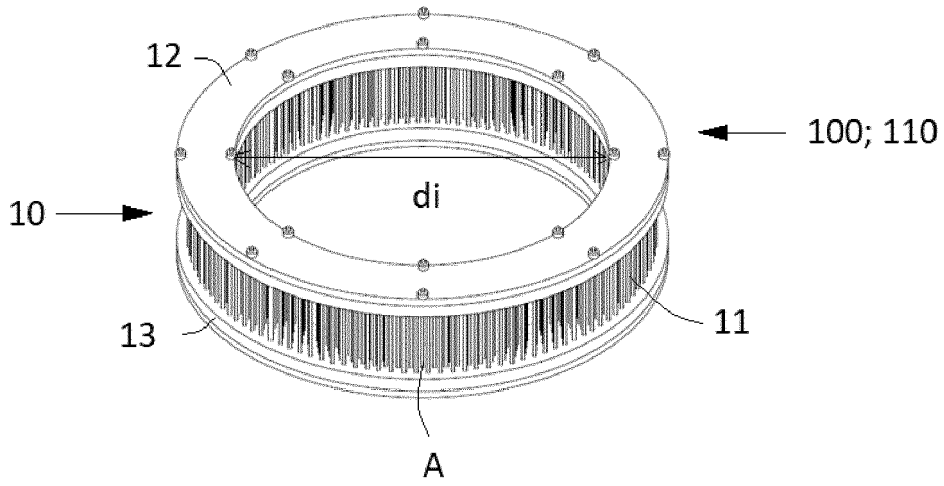


FIG. 2

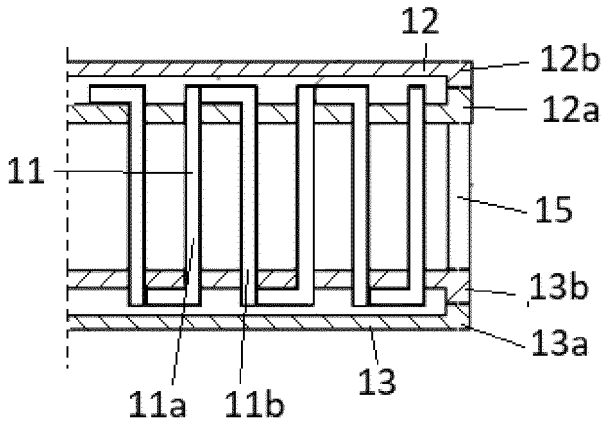
12
12b
12a
11
15
13b
13a
11a
11b
13

FIG. 3

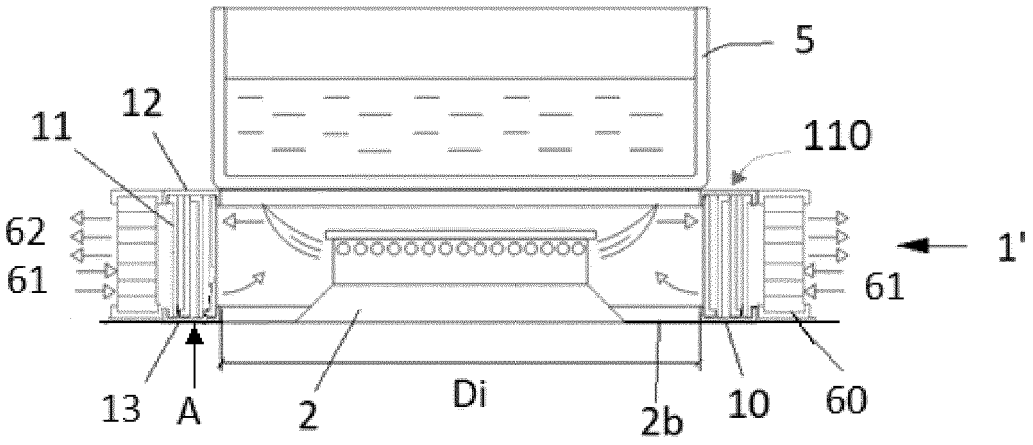
5
11
12
110
62
61
1'
61
13
A
2
Di
2b
10
60

FIG. 4

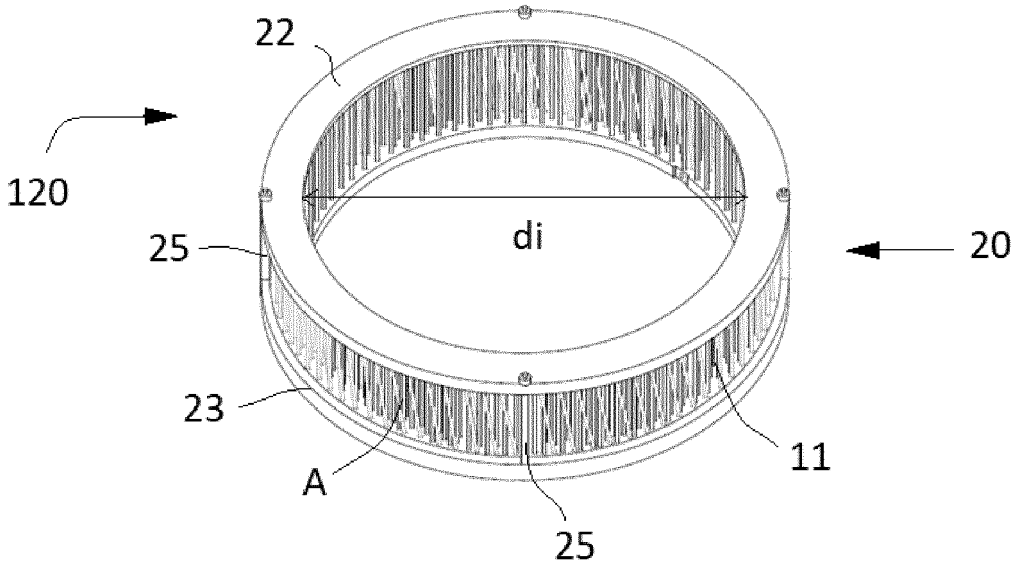


FIG. 5

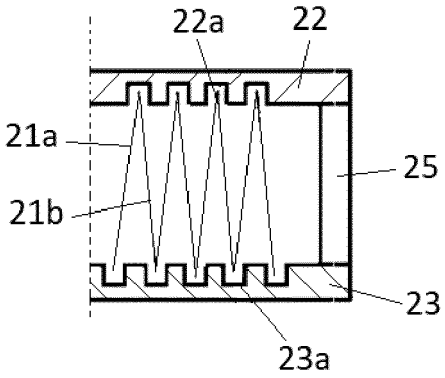


FIG. 6

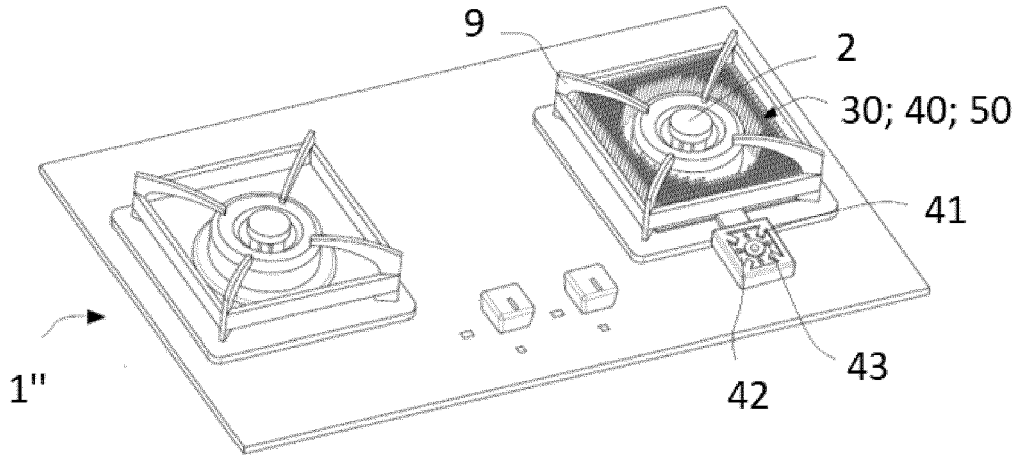


FIG. 7

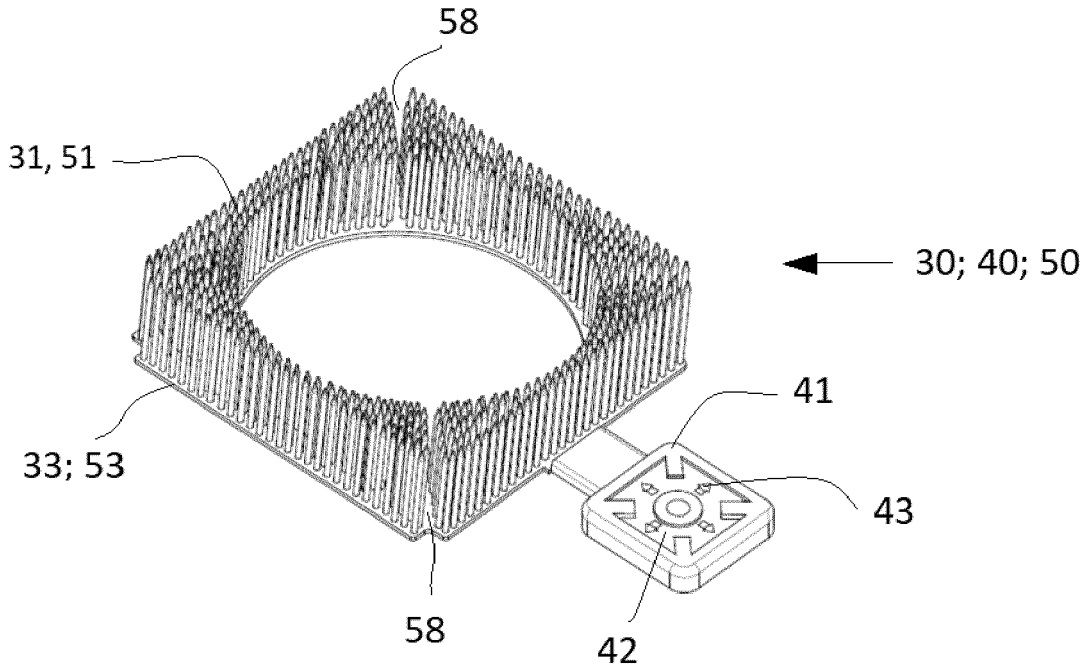


FIG. 8

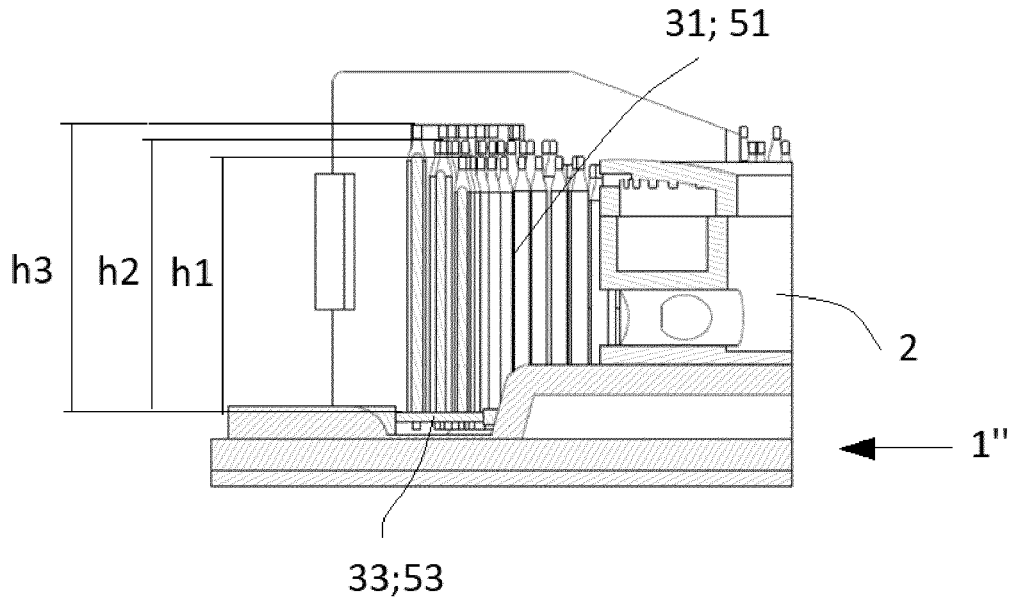


FIG. 9

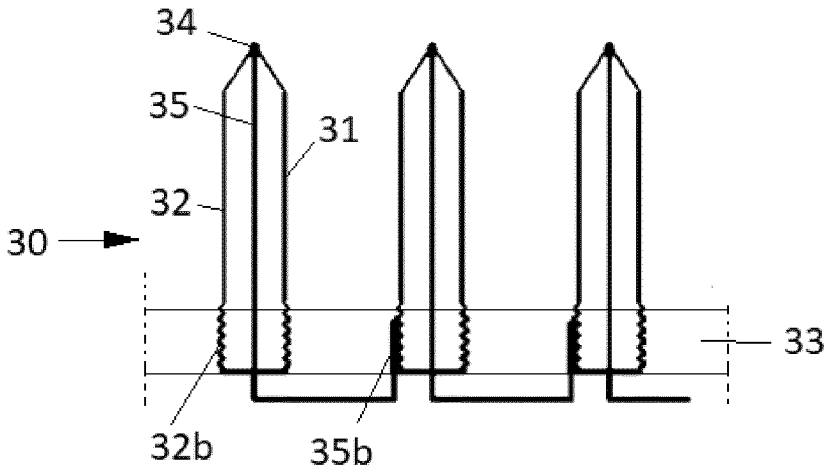


FIG. 10

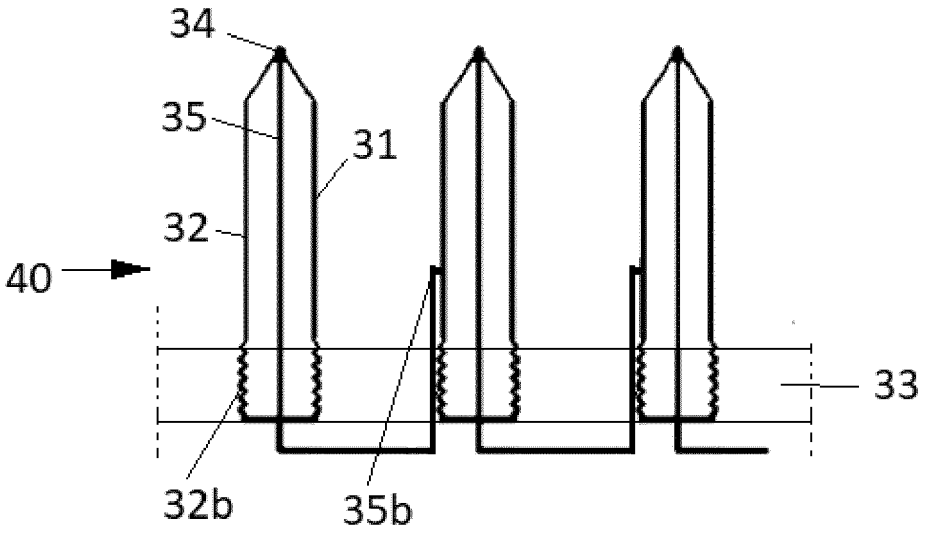


FIG. 11

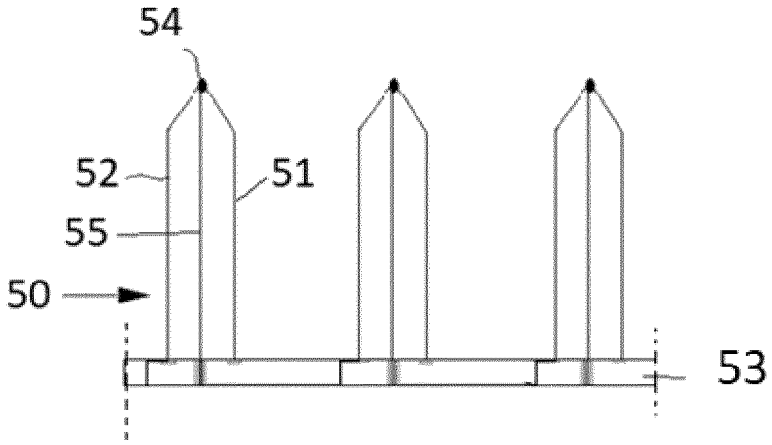


FIG. 12

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# EUROPEAN SEARCH REPORT

Application Number
EP 22 38 3288

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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TECHNICAL FIELDS SEARCHED (IPC)

F23D
F23L
F23M

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 13 June 2023 | Hauck, Gunther |

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13-06-2023

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| CN 205909351 U | 25-01-2017 | NONE | |
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