

(19)



(11)

EP 3 839 352 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
02.07.2025 Bulletin 2025/27

(51) International Patent Classification (IPC):
F24C 3/12 (2006.01) F23N 5/10 (2006.01)

(21) Application number: **19383142.7**

(52) Cooperative Patent Classification (CPC):
F23N 5/102; F24C 3/126

(22) Date of filing: **19.12.2019**

(54) THERMOELECTRIC ASSEMBLY FOR POWERING A PLURALITY OF ELECTROMAGNETIC VALVES OF A COOKING APPLIANCE

THERMOELEKTRISCHE ANORDNUNG ZUR SPEISUNG EINER VIELZAHL VON ELEKTROMAGNETISCHEN VENTILEN EINES KOCHGERÄTES

ENSEMBLE THERMOÉLECTRIQUE POUR ALIMENTER UNE PLURALITÉ DE VANNES ÉLECTROMAGNÉTIQUES D'UN APPAREIL DE CUISSON

(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

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(43) Date of publication of application:
23.06.2021 Bulletin 2021/25

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EP 3 839 352 B1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a thermoelectric assembly for powering a plurality of electromagnetic valves of a cooking appliance, each electromagnetic valve allowing or preventing the passage of gas to a respective burner of the cooking appliance.

PRIOR ART

[0002] Cooking appliances with burners, each of which having associated therewith a thermocouple connected to a respective electromagnetic valve are known in the state of the art, such that when the thermocouple detects the presence of flame in the burner, it generates a thermoelectric current which is capable of keeping the electromagnetic valve energized at a given time, allowing the passage of gas to the corresponding burner.

[0003] EP 0288390 A1 furthermore describes electric circuits in which a MOSFET is arranged between the thermocouple and the electromagnetic valve, said MOSFET acting like a switch, such that depending on pre-established parameters, the MOSFET can open the circuit preventing the passage of current to the electromagnetic valve, and therefore causing the electromagnetic valve to close the passage of gas to the burner regardless of the presence of flame in the corresponding burner.

[0004] Moreover, powering thermoelectric circuits of this type with power supplies including transformers for galvanically isolating said thermoelectric circuits is also known, as described in US 2019/0195507 A1.

[0005] DE 2306544 A1 discloses a switch off control for gas heating points of a cooking appliance connected to AC mains with a switch for an electrical device, the gas heating points being each secured by means of a thermocouple which, when the respective gas heating point is in operation, current is passed through a winding of an electromagnet which keeps the valve open allowing gas to pass through. The control further includes a charging circuit controlled by a rectifying semiconductor circuit with a capacitor. The capacitor is charged via the semiconductor circuit when the switch is opened, briefly energising the winding of the electromagnet against the current direction of the thermocouple by means of this charging. The circuit makes it possible to switch off the gas heating points by means of program switches used for electric heating points.

[0006] US 2019/078781 A1 discloses a control device for gas appliances including a timing function, for example for enabling setting and/or detection of a time interval for supplying gas to a respective burner. The control device comprises a circuit arrangement including a first control module including a switching circuit electrically connected between an electromagnet and a thermoelectric generator of a safety valve of a gas tap, a second control module including a control circuit that comprises a

wireless communication circuit electrically connected to the control circuit and configured for exchange of signals in wireless mode with a remote electronic programming device, a third control module centralizing the functions of timing and driving the switching circuit, and a power supply module including power supply means. The power supply module is designed to be installed in a position remote from the first control module. The second and third control modules are installed in a position remote from the other modules. The first control module which is the one to be associated to the gas tap, may be simplified from the structural standpoint since it is no longer indispensable for it to be mechanically fixed to the body of a corresponding tap.

DISCLOSURE OF THE INVENTION

[0007] The object of the invention is to provide a thermoelectric assembly for powering a plurality of electromagnetic valves of a cooking appliance, each electromagnetic valve being configured for closing the passage of gas to a corresponding burner of the cooking appliance, as defined in the claims.

[0008] The thermoelectric assembly according to the invention comprises a main current circuit associated with a respective electromagnetic valve, the main current circuit comprising a thermocouple configured for detecting flame in the corresponding burner, a cable connected to the thermocouple and configured for electrically connecting said thermocouple with the corresponding electromagnetic valve, and a transistor connected to the cable and configured for de-energizing the electromagnetic valve.

[0009] The main current circuit comprises a connection module comprising a power supply connected to the transistor, input terminals configured for being connected to an external energy source, a rectifier configured for transforming the alternating current of the external energy source into direct current, and a resistive block connected between one of the input terminals and the rectifier and configured for minimizing the current circulating through the power supply to a value that ensures a galvanic isolation.

[0010] A thermoelectric assembly having a main current circuit with a basic and simple power supply is thereby obtained, without having to include a transformer in said power supply for obtaining the required galvanic isolation. The power supply will thus be simpler and more cost-effective, and is therefore integrated in the main current circuit, particularly in the connection module together with the transistor. A main current circuit that is compact, simple, and can be readily connected to the external energy source is thereby obtained.

[0011] These and other advantages and features of the invention will become evident in view of the drawings and detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0012]

Figure 1 shows a wiring diagram of a thermoelectric assembly according to the invention comprising a main current circuit and additional current circuits.

Figure 2 shows a perspective view of the thermo-electric assembly schematically shown in Figure 1.

Figure 3 shows a detailed view of the wiring diagram of a connection module of the main current circuit shown in Figure 1.

Figure 4 shows a detailed view of a connection module of the additional current circuit shown in Figure 1.

DETAILED DISCLOSURE OF THE INVENTION

[0013] Figure 1 shows a thermoelectric assembly 100 according to the invention suitable for powering a plurality of electromagnetic valves 6 and 6' of a cooking appliance (not depicted in the drawings), each electromagnetic valve 6 and 6' being configured for closing the passage of gas to a corresponding burner (not depicted in the drawings) of the cooking appliance.

[0014] The thermoelectric assembly 100 comprises a main current circuit 1 associated with a respective electromagnetic valve 6. The main current circuit 1 comprises a thermocouple 2 configured for detecting flame in the corresponding burner, cables 3 and 4 connected to the thermocouple 2 and configured for electrically connecting said thermocouple 2 with the corresponding electromagnetic valve 6 through a connector 5, a transistor 9 connected to one of the cables 3 and configured for de-energizing the electromagnetic valve 6, and a connection module 20 comprising a power supply 10 connected to the transistor 9.

[0015] The transistor 9 is a field-effect transistor, preferably a MOSFET type transistor. The transistor 9 comprises a port terminal 9a, a drain terminal 9b, and a source terminal 9c, said transistor 9 being connected to the power supply 10 through the port terminal 9a and source terminal 9c. The transistor 9 behaves like a switch. In particular, when it operates in the cut-off region conduction between the source terminal 9c and the drain terminal 9b does not occur, so it operates like an open switch regardless of whether or not the thermocouple 2 detects the presence of flame, and therefore the electromagnetic valve is kept de-energized, preventing the passage of gas to the corresponding burner. When the power supply 10 is connected to the external energy source 8, it powers the transistor 9 which operates like a closed switch, the electromagnetic valve is kept energized as long as the thermocouple 2 detects flame in the burner and a thermoelectric current capable of keeping the electromagnetic

valve energized is generated. The transistor 9 has two connection terminals 27 and 28, each of which is connected to the cable 3 of the thermocouple 2.

[0016] The power supply 10 comprises two input terminals 22 and 23 configured for being connected to the external energy source 8, a rectifier 11 configured for transforming the alternating current of the external energy source 8 into direct current, and a resistive block 14 connected between one of the input terminals 22 and 23 and the rectifier 11, the resistive block 14 being configured for minimizing the current circulating through the power supply 10 to a value equivalent to the galvanic isolation. The resistance of the resistive block 14 is about 2.24 megaohms.

[0017] In the embodiment shown in the drawings, the power supply 10 comprises two resistive blocks 14, each of them connected to the corresponding input terminal 22 and 23. Preferably, each resistive block 14 comprises at least two resistors 14a and 14b arranged such that they are connected in series. The resistance resulting from the two resistive blocks 14 is about 2.24 megaohms.

[0018] The power supply 10 further comprises capacitance filters 12 connected in parallel to one another and in parallel to the rectifier 11, the capacitance filters 12 being configured for filtering or smoothing out ripple, resulting in a direct current whose voltage would virtually not vary over time. The power supply 10 further comprises a diode 13 connected in parallel to the rectifier 11 and to the capacitance filters 12. In a preferred embodiment, the rectifier 11 is a diode bridge.

[0019] Moreover, the first input terminal 22 and the second input terminal 23 of the power supply 10 are configured for being connected with the external energy source 8, providing a form-fitting connection with the external energy source 8. This form-fitting connection is a simple and quick assembly/disassembly connection. In a preferred embodiment, the first input terminal 22 and the second input terminal 23 of the main current circuit 1 are configured for being connected, providing a male-female attachment.

[0020] The connection module 20 of the main current circuit 1, shown in Figure 2, comprises a body 21 inside which there is housed the power supply 10 and the transistor 9, with the input terminals 22 and 23 projecting from the body 21. The body 21 is made of an insulating material and comprises a corresponding cover 26 which closes the housing where the power supply 10 and the transistor 9 are arranged.

[0021] In the embodiment shown in the drawings, the power supply 10 and the transistor 9 are assembled on a PCB (not depicted) housed inside the body 21.

[0022] The power supply 10 comprises an output terminal 24 projecting from the body 21. The input terminals 22 and 23 and the output terminal 24 project towards the outside orthogonal to the cover 26.

[0023] The connection module 20 of the main current circuit 1 may comprise an additional output terminal (not depicted) configured for connecting with a presence

sensor for detecting the presence of utensils associated with the corresponding burner. Said additional output terminal will provide a form-fitting connection with the corresponding presence sensor.

[0024] The main current circuit 1 further comprises a discharge resistor 15 of the transistor, said discharge resistor 15 being connected in parallel to the transistor 9, said discharge resistor 15 assuring the opening of the transistor 9 when said transistor 9 is no longer powered by the power supply 10. The discharge resistor 15 is arranged such that it is housed in the body 21 of the connection module 20. In particular, the discharge resistor 15 is assembled on the PCB together with the transistor 9 and the power supply 10.

[0025] The main current circuit 1 also comprises a safety resistor 16 connected in series with the port 9a of the transistor 9. Said safety resistor 16 limits the current that would go to the main current circuit 1 from the power supply 10 in the event of a short-circuit failure of the transistor 9. The discharge resistor 16 is arranged such that it is housed in the body 21 of the connection module 20. In particular, the discharge resistor 16 is assembled on the PCB together with the transistor 9 and the power supply 10.

[0026] Moreover, an electromechanical switch 25 is arranged between the power supply 10 and the power supply external 8.

[0027] In other embodiments not shown in the drawings, the switch 25 can be connected between the power supply 10 and the transistor 9. In that case, the connection module 20 houses the switch 27 in the body 21. In one embodiment, the switch 27 is assembled on the PCB housed inside the body 21.

[0028] In both cases, when the switch 27 is closed and the power supply 10 is connected to the external energy source 8, the power supply 10 powers the transistor 9 such that the transistor 9 allows current to pass there-through. With the switch 27 closed, if the thermocouple 2 detects the presence of flame, it will generate a thermoelectric current that goes through the transistor 9 keeping the electromagnetic valve 6 such that it allows the passage of gas to the burner. When the thermocouple 2 does not detect any flame, and therefore no longer generate the thermoelectric current required for keeping the electromagnetic valve 6 energized, said electromagnetic valve 6 closes the passage of gas. When the corresponding signal is sent to the switch 27 from a non-depicted control so as to open said switch 27, the transistor 9 is not powered, so it acts like an open switch, not allowing current to go from the thermocouple 2 to the electromagnetic valve 6, the passage of gas is thereby closed. The transistor 9 therefore allows acting on the electromagnetic valve 6 de-energizing it when a previously defined parameter is achieved, said parameter not being the presence of flame in the burner 2.

[0029] The thermoelectric assembly 100 further comprises at least one additional current circuit 1' associated with a respective electromagnetic valve 6', said addi-

tional current circuit 1' being able to be connected to the main current circuit 1. In the embodiment shown in the drawings, the thermoelectric assembly 100 comprises two additional current circuits 1', each of them associated with a respective electromagnetic valve 6'. Regardless of whether the thermoelectric assembly 100 includes one, two, or a plurality of additional current circuits, the features of each additional current circuit are similar and will be described below.

[0030] Each additional current circuit 1' comprises a thermocouple 2' configured for detecting flame in the corresponding burner, cables 3' and 4' connected to the corresponding thermocouple 2' and configured for electrically connecting said thermocouple 2' with the corresponding electromagnetic valve 6' through a connector 5', and a transistor 9' connected to the corresponding cable 3' and configured for de-energizing the electromagnetic valve 6' to which it is connected.

[0031] Each transistor 9' of the respective additional current circuit 1' has the same features and operates in the same manner as the transistor 9 of the main current circuit 1, so what has been described above is applicable to the transistors of the additional current circuits. The features of the thermocouple 2' of each additional current circuit 1' are similar to those of thermocouple 2. Similarly, the features of the cables 3' and 4' for connecting the thermocouple 2' to the electromagnetic valve 6' in the additional current circuit 1' are similar to those of the cables 3 and 4 of the main current circuit 1, so what is described above in relation to these elements for the main current circuit is applicable to the additional current circuits.

[0032] Each additional current circuit 1' comprises a connection module 20' housing the corresponding transistor 9', each connection module 20' comprising an input terminal 22' connected to the corresponding transistor 9'. In particular, the input terminal 22' is connected to the port 9a' of the respective transistor 9'. The connection module 20' of each additional current circuit 1', shown in Figures 2 and 4, comprises an output terminal 24'. Each input terminal 22' of the corresponding additional current circuit 1' is configured for being connected to the output terminal 24 of the connection module 20 of the main current circuit 1 or to the output terminal 24' of another connection module 20' of the additional current circuit 1'.

[0033] In the embodiment shown in the drawings, one of the additional current circuits 1' (hereinafter, first additional current circuit 1') is connected to the main current circuit 1 through respective connection modules 20 and 20'. In particular, the input terminal 22' of the connection module 20' of the first additional current circuit 1' is connected to the output terminal 24 of the main current circuit 1 as shown in Figure 2. Furthermore, both additional current circuits 1' and 1'' are connected to one another through respective connection modules 20'. In particular, the input terminal 22' of the connection module 20' of another additional current circuit 1'' (hereinafter, second additional current circuit 1'') is connected to the

output terminal 24' of the connection module 20' of the first additional current circuit 1'.

[0034] The output terminal 24 of the connection module 20 of the main current circuit 1 and the input terminal 22' of the connection module 20' of an additional current circuit 1' are configured for being connected, providing a form-fitting connection. This form-fitting connection is a simple and quick assembly/disassembly connection. In a preferred embodiment, the output terminal 24 of the connection module 20 of the main current circuit 1 and the input terminal 22' of the connection module 20' of the first additional current circuit 1' are configured for being connected, providing a male-female attachment.

[0035] Moreover, the output terminal 24' of the connection module 20' of the first additional current circuit 1' and the input terminal 22' of the connection module 20' of the second additional current circuit 1' are configured for being connected, providing a form-fitting connection. This form-fitting connection is a simple and quick assembly/disassembly connection. In a preferred embodiment, the output terminal 24' of the connection module 20' of the first additional current circuit 1 and the input terminal 22' of the connection module 20' of the second additional current circuit 1' are configured for being connected, providing a male-female attachment.

[0036] The connection module 20' of each additional current circuit 1' comprises a body 21' inside which there is housed the respective transistor 9', with the input terminal 22' and the respective output terminal 24' projecting towards the outside of the respective body 21'. Each body 21' is made of an insulating material. Each body 21' comprises a corresponding cover 26' which closes the corresponding housing. In the embodiment shown in the drawings, the input terminal 22' and the output terminal 24' of the connection module 20' of the corresponding additional current circuit 1' project towards the outside orthogonal to the cover 26'.

[0037] The connection module 20' of each additional current circuit 1' may comprise an additional output terminal (not depicted) configured for connecting with a presence sensor for detecting the presence of utensils associated with the corresponding burner. Said additional output terminal will provide a form-fitting connection with the corresponding presence sensor.

[0038] Each additional current circuit 1' further comprises a discharge resistor 15' of the transistor 9', said discharge resistor 15' being connected in parallel to the transistor 9' and configured for assuring the opening of the transistor 9' when said transistor 9' is no longer powered by the power supply 10. The discharge resistor 15' is arranged such that it is housed in the body 21' of the connection module 20'. In particular, the discharge resistor 15' is assembled on the PCB together with the transistor 9'.

[0039] Each additional current circuit 1' comprises a safety resistor 16 connected in series with the port 9a' of the transistor 9' and configured for limiting the current that would go to the additional current circuit 1' from the power

supply 10 in the event of a short-circuit failure of the corresponding transistor 9'. The discharge resistor 16' is arranged such that it is housed in the body 21' of the respective connection module 20'. In particular, the discharge resistor 16' is assembled on the PCB together with the respective transistor 9'.

[0040] Each additional current circuit 1' further comprises a diode 13' connected between the discharge resistor 15' and the safety resistor 16, and in parallel to the transistor 9'.

[0041] In the embodiment shown in the drawings, the output terminal 24' of the connection module 20' of the corresponding additional current circuit 1' is connected between the discharge resistor 15' of the additional current circuit 1' and the safety resistor 16' of the respective additional current circuit 1'.

[0042] In other embodiments that are not shown, the thermoelectric assembly may comprise a single additional current circuit or a plurality of additional current circuits that can be connected to one another through respective connection modules, the single additional current circuit or a circuit of the plurality of additional current circuits being arranged such that it is connected to the main current circuit. A thermoelectric assembly in which the circuits associated with the thermocouples can be quickly coupled to one another is thereby obtained, with the power supply being integrated in one of said circuits. A modular solution that can be scaled according to needs and readily detachable from one another is thereby provided. The features of the single additional current circuit or of each of the additional current circuits of the plurality of additional current circuits are those described for the two additional current circuits of the embodiment shown in the drawings.

[0043] The thermoelectric assembly 100 operates in the following manner, when the switch 25 is closed and the main current circuit 1 connected to the external energy source 8, the power supply 10 powers the transistors 9 and 9' of the main current circuit 1 and of the respective additional current circuits 1', said transistors 9 and 9' acting like closed switches allowing the thermoelectric current which is generated in the respective thermocouple 2 and 2' when there is flame in the corresponding burner to energize the respective electromagnetic valve 6 and 6'. When a parameter whereby it is considered necessary to close the passage of gas to one of the burners in particular is detected, the switch 25 opens such that the transistors 9 and 9' of the main current circuit 1 and of the additional current circuits 1' are not powered and act like open switches, the corresponding electromagnetic valve 6 and 6' being de-energized.

Claims

1. Thermoelectric assembly for powering a plurality of electromagnetic valves (6, 6') of a cooking appliance, each electromagnetic valve (6, 6') being con-

- figured for closing the passage of gas to a corresponding burner of the cooking appliance, the thermoelectric assembly (100) comprising a main current circuit (1) associated with a respective electromagnetic valve (6), the main current circuit (1) comprising a thermocouple (2) configured for detecting flame in the corresponding burner, a cable (3) connected to the thermocouple (2) and configured for electrically connecting said thermocouple (2) with the corresponding electromagnetic valve (6), a transistor (9) connected to the cable (3) and configured for de-energizing the electromagnetic valve (6), and a connection module (20) comprising a power supply (10) connected to the transistor (9), the power supply (10) comprising input terminals (22,23) configured for being connected to an external energy source (8), and a rectifier (11) configured for transforming the alternating current of the external energy source (8) into direct current, **characterized in that** the connection module (20) further comprises a resistive block (14) connected between one of the input terminals (22, 23) of the power supply (10) and the rectifier (11), the resistive block (14) being configured for minimizing the current circulating through the power supply (10) to a value that ensures a galvanic isolation that otherwise would have been provided by a transformer.
2. Thermoelectric assembly according to the preceding claim, wherein the resistive block (14) comprises at least two resistors (14a, 14b) arranged such that they are connected in series.
 3. Thermoelectric assembly according to any of the preceding claims, wherein the power supply (10) comprises two resistive blocks (14), each of them connected to the corresponding input terminal (22, 23).
 4. Thermoelectric assembly according to claim 1 or 2, wherein the resistance of the resistive block (14) is about 2.24 megaohms.
 5. Thermoelectric assembly according to claim 3, wherein the resistance of the two resistive blocks (14) is about 2.24 megaohms.
 6. Thermoelectric assembly according to any of the preceding claims, wherein the first input terminal (22) and the second input terminal (23) are configured for being connected, providing a form-fitting connection with the external energy source (8).
 7. Thermoelectric assembly according to any of the preceding claims, wherein the connection module (20) comprises a body (21) inside which there is housed the power supply (10) and the transistor (9), with the input terminals (22, 23) and an output terminal (24) projecting from the body (21).
 8. Thermoelectric assembly according to claim 7, wherein the connection module (20) comprises an additional output terminal configured for connecting with a presence sensor for detecting the presence of utensils associated with the corresponding burner.
 9. Thermoelectric assembly according to claim 7 or 8, comprising an additional current circuit (1') associated with a respective electromagnetic valve (6'), the additional current circuit (1') comprising a thermocouple (2') configured for detecting flame in the corresponding burner, a cable (3') connected to the thermocouple (2') and configured for electrically connecting said thermocouple (2') with the corresponding electromagnetic valve (6'), and a transistor (9') connected to the cable (3') and configured for de-energizing the electromagnetic valve (6') to which it is connected, the additional current circuit (1') comprising a connection module (20') housing the corresponding transistor (9'), said connection module (20') comprising an input terminal (22') connected to the transistor (9') and configured for being connected to the output terminal (24) of the connection module (20) of the main current circuit (1).
 10. Thermoelectric assembly according to the preceding claim, wherein the output terminal (24) of the connection module (20) of the main current circuit (1) and the input terminal (22') of the connection module (20') of the additional current circuit (1') are configured for being connected, providing a form-fitting connection.
 11. Thermoelectric assembly according to claim 9 or 10, comprising a plurality of additional current circuits (1') each of them associated with a respective electromagnetic valve (6'), each additional current circuit (1') being configured for being connected with another additional current circuit (1') through respective connection modules (20') of each additional current circuit (1'), such that the input terminal (22') of the connection module (20') of one of the additional current circuits (1') and the output terminal (24') of the connection module (20') of another additional current circuit (1') are configured for being connected to one another, providing a form-fitting connection.
 12. Thermoelectric assembly according to any of claims 9 to 11, wherein the additional current circuit (1') comprises a discharge resistor (15') of the transistor (9') connected in parallel to the transistor (9') and configured for assuring the opening of the transistor (9') when said transistor (9') is no longer powered by the power supply (10).
 13. Thermoelectric assembly according to any of claims

9 to 12, wherein the additional current circuit (1') comprises a safety resistor (16') connected in series with the port (9c') of the transistor (9') and configured for limiting the current that would go to the additional current circuit (1') from the power supply (10) in the event of a short-circuit failure of the transistor (9').

14. Thermoelectric assembly according to any of the preceding claims, wherein the main current circuit (1) comprises a discharge resistor (15) of the transistor (9) connected in parallel to the transistor (9) and configured for assuring the opening of the transistor (9) when said transistor (9) is no longer powered by the power supply (10).
15. Thermoelectric assembly according to any of the preceding claims, wherein the main current circuit (1) comprises a safety resistor (16) connected in series with the port (9c) of the transistor (9) configured for limiting the current that would go to the main current circuit (1) from the power supply (10) in the event of a short-circuit failure of the transistor (9).

Patentansprüche

1. Thermoelektrische Anordnung zur Speisung einer Vielzahl von elektromagnetischen Ventilen (6, 6') eines Kochgerätes, wobei jedes elektromagnetische Ventil (6, 6') dafür ausgebildet ist, den Durchgang von Gas zu einem entsprechenden Brenner des Kochgerätes zu schließen, wobei die thermoelektrische Anordnung (100) einen Hauptstromkreis (1) umfasst, welcher mit einem jeweiligen elektromagnetischen Ventil (6) assoziiert ist, wobei der Hauptstromkreis (1) ein Thermoelement (2), welches dafür ausgebildet ist, eine Flamme im entsprechenden zu detektieren, ein Kabel (3), welches mit dem Thermoelement (2) verbunden ist und dafür ausgebildet ist, das genannte Thermoelement (2) mit dem entsprechenden elektromagnetischen Ventil (6) elektrisch zu verbinden, einen Transistor (9), welcher mit dem Kabel (3) verbunden ist und dafür ausgebildet ist, das elektromagnetische Ventil (6) auszuschalten, und ein Verbindungsmodul (20), welches eine mit dem Transistor (9) verbundene Spannungsversorgung (10) umfasst, umfasst, wobei die Spannungsversorgung (10) Eingangsklemmen (22, 23), welche dafür ausgebildet sind, mit einer äußeren Energiequelle (8) verbunden zu werden, und einen Gleichrichter (11), welcher dafür ausgebildet ist, den Wechselstrom der äußeren Energiequelle (8) in Gleichstrom umzuwandeln, umfasst, **dadurch gekennzeichnet, dass** das Verbindungsmodul (20) zusätzlich einen Widerstandsblock (14), welcher zwischen einer der Eingangsklemmen (22, 23) der Spannungsversorgung (10) und dem Gleichrichter (11) verbunden ist, umfasst, wobei der Widerstands-

block (14) dafür ausgebildet ist, den Strom, welcher durch die Spannungsversorgung (10) zirkuliert, auf einen Wert zu minimieren, welcher eine galvanische Trennung gewährleistet, welche ansonsten von einem Wandler bereitgestellt worden wäre.

2. Thermoelektrische Anordnung nach dem vorhergehenden Anspruch, wobei der Widerstandsblock (14) mindestens zwei Widerstandskörper (14a, 14b) umfasst, welche so angeordnet sind, dass sie in Serie geschaltet sind.
3. Thermoelektrische Anordnung nach einem der vorhergehenden Ansprüche, wobei die Spannungsversorgung (10) zwei Widerstandsblöcke (14) umfasst, welche jeweils mit der entsprechenden Eingangsklemme (22, 23) verbunden sind.
4. Thermoelektrische Anordnung nach Anspruch 1 oder 2, wobei der Widerstand des Widerstandsblocks (14) ungefähr 2,24 Megaohm ist.
5. Thermoelektrische Anordnung nach Anspruch 3, wobei der Widerstand der beiden Widerstandsblöcke (14) ungefähr 2,24 Megaohm ist.
6. Thermoelektrische Anordnung nach einem der vorhergehenden Ansprüche, wobei die erste Eingangsklemme (22) und die zweite Eingangsklemme (23) dafür ausgebildet sind, verbunden zu werden, unter Bereitstellung einer formschlüssigen Verbindung mit der äußeren Energiequelle (8).
7. Thermoelektrische Anordnung nach einem der vorhergehenden Ansprüche, wobei das Verbindungsmodul (20) einen Körper (21) umfasst, innerhalb welches die Spannungsversorgung (10) und der Transistor (9) aufgenommen sind, mit den Eingangsklemmen (22, 23) und einer Ausgangsklemme (24) aus dem Körper (21) herausragend.
8. Thermoelektrische Anordnung nach Anspruch 7, wobei das Verbindungsmodul (20) eine zusätzliche Ausgangsklemme umfasst, welche dafür ausgebildet ist, sich mit einem Anwesenheitssensor zu verbinden, um die Anwesenheit von mit dem entsprechenden Brenner assoziierten Utensilien zu detektieren.
9. Thermoelektrische Anordnung nach Anspruch 7 oder 8, umfassend einen zusätzlichen Stromkreis (1'), welcher mit einem jeweiligen elektromagnetischen Ventil (6') assoziiert ist, wobei der zusätzliche Stromkreis (1') ein Thermoelement (2'), welches dafür ausgebildet ist, eine Flamme im entsprechenden Brenner zu detektieren, ein Kabel (3'), welches mit dem Thermoelement (2') verbunden ist und dafür ausgebildet ist, das genannte Thermoelement

- (2') mit dem entsprechenden elektromagnetischen Ventil (6') elektrisch zu verbinden, und einen Transistor (9'), welcher mit dem Kabel (3') verbunden ist und dafür ausgebildet ist, das elektromagnetische Ventil (6'), mit welchem es verbunden ist, auszu-
 5 schalten, umfasst, wobei der zusätzliche Stromkreis (1') ein Verbindungsmodul (20') umfasst, welches den entsprechenden Transistor (9') aufnimmt, wobei das genannte Verbindungsmodul (20') eine Ein-
 10 gangsklemme (22') umfasst, welche mit dem Transistor (9') verbunden ist und dafür ausgebildet ist, mit der Ausgangsklemme (24) des Verbindungsmoduls (20) des Hauptstromkreises (1) verbunden zu werden.
10. Thermoelektrische Anordnung nach dem vorhergehenden Anspruch, wobei die Ausgangsklemme (24) des Verbindungsmoduls (20) des Hauptstromkreises (1) und die Eingangsklemme (22') des Verbindungsmoduls (20') des zusätzlichen Stromkreises (1') dafür ausgebildet sind, verbunden zu werden, unter Bereitstellung einer formschlüssigen Verbindung.
11. Thermoelektrische Anordnung nach Anspruch 9 oder 10, umfassend eine Vielzahl von zusätzlichen Stromkreisen (1'), welche jeweils mit einem jeweiligen elektromagnetischen Ventil (6') assoziiert sind, wobei jeder zusätzliche Stromkreis (1') dafür ausgebildet ist, mit einem anderen zusätzlichen Stromkreis (1') über jeweilige Verbindungsmodule (20') jedes zusätzlichen Stromkreises (1') verbunden zu werden, sodass die Eingangsklemme (22') des Verbindungsmoduls (20') eines der zusätzlichen Stromkreises (1') und die Ausgangsklemme (24') des Verbindungsmoduls (20') eines anderen zusätzlichen Stromkreises (1') dafür ausgebildet sind, miteinander verbunden zu werden, unter Bereitstellung einer formschlüssigen Verbindung.
12. Thermoelektrische Anordnung nach einem der Ansprüche 9 bis 11, wobei der zusätzliche Stromkreis (1') einen Entladewiderstandskörper (15') des Transistors (9') umfasst, welcher parallel mit dem Transistor (9') verbunden ist und dafür ausgebildet ist, das Öffnen des Transistors (9') zu gewährleisten, wenn der genannte Transistor (9') nicht mehr von der Spannungsversorgung (10) gespeist wird.
13. Thermoelektrische Anordnung nach einem der Ansprüche 9 bis 12, wobei der zusätzliche Stromkreis (1') einen Sicherheitswiderstandskörper (16') umfasst, welcher in Serie mit dem Anschluss (9c') des Transistors (9') verbunden ist und dafür ausgebildet ist, den Strom zu begrenzen, welcher zum zusätzlichen Stromkreis (1') von der Spannungsversorgung (10) aus im Falle eines Kurzschlussfehlers des Transistors (9') gehen würde.
14. Thermoelektrische Anordnung nach einem der vorhergehenden Ansprüche, wobei der Hauptstromkreis (1) einen Entladewiderstandskörper (15) des Transistors (9) umfasst, welcher parallel mit dem Transistor (9) verbunden ist und dafür ausgebildet ist, das Öffnen des Transistors (9) zu gewährleisten, wenn der genannte Transistor (9) nicht mehr von der Spannungsversorgung (10) gespeist wird.
15. Thermoelektrische Anordnung nach einem der vorhergehenden Ansprüche, wobei der Hauptstromkreis (1) einen Sicherheitswiderstandskörper (16) umfasst, welcher in Serie mit dem Anschluss (9c) des Transistors (9) verbunden ist, welcher dafür ausgebildet ist, den Strom zu begrenzen, welcher zum Hauptstromkreis (1) von der Spannungsversorgung (10) aus im Falle eines Kurzschlussfehlers des Transistors (9) gehen würde.

Revendications

1. Ensemble thermoélectrique pour alimenter une pluralité de vannes électromagnétiques (6, 6') d'un appareil de cuisson, chaque vanne électromagnétique (6, 6') étant configurée pour fermer le passage de gaz vers un brûleur correspondant de l'appareil de cuisson, l'ensemble thermoélectrique (100) comprenant un circuit de courant principal (1) associé avec une vanne électromagnétique (6) respective, le circuit de courant principal (1) comprenant un thermocouple (2) configuré pour détecter une flamme dans le brûleur correspondant, un câble (3) relié au thermocouple (2) et configuré pour relier électriquement ledit thermocouple (2) à la vanne électromagnétique (6) correspondante, un transistor (9) relié au câble (3) et configuré pour désexciter la vanne électromagnétique (6), et un module de connexion (20) comprenant une alimentation en puissance (10) relié au transistor (9), l'alimentation en puissance (10) comprenant des bornes d'entrée (22, 23) configurés pour être reliés à une source d'énergie externe (8), et un redresseur (11) configuré pour transformer le courant alternatif de la source d'énergie externe (8) en courant continu, **caractérisé en ce que** le module de connexion (20) comprend en outre un bloc résistif (14) relié entre l'une des bornes d'entrée (22, 23) de l'alimentation en puissance (10) et le redresseur (11), le bloc résistif (14) étant configuré pour minimiser le courant circulant à travers l'alimentation en puissance (10) jusqu'à une valeur garantissant un isolement galvanique qui aurait autrement été fourni par un transformateur.
2. Ensemble thermoélectrique selon la revendication précédente, dans lequel le bloc résistif (14) comprend au moins deux résistances (14a, 14b)

- disposées de telle sorte qu'elles sont reliées en série.
3. Ensemble thermoélectrique selon l'une quelconque des revendications précédentes, dans lequel l'alimentation en puissance (10) comprend deux bloc résistifs (14), chacun d'eux étant relié à la borne d'entrée (22, 23) correspondante. 5
 4. Ensemble thermoélectrique selon la revendication 1 ou 2, dans lequel la résistance du bloc résistif (14) est d'environ 2,24 mégaohms. 10
 5. Ensemble thermoélectrique selon la revendication 3, dans lequel la résistance des deux bloc résistifs (14) est d'environ 2,24 mégaohms. 15
 6. Ensemble thermoélectrique selon l'une quelconque des revendications précédentes, dans lequel la première borne d'entrée (22) et la deuxième borne d'entrée (23) sont configurées pour être reliées, fournissant une connexion ajustée avec la source d'énergie externe (8). 20
 7. Ensemble thermoélectrique selon l'une quelconque des revendications précédentes, dans lequel le module de connexion (20) comprend un corps (21) à l'intérieur duquel est logée l'alimentation en puissance (10) et le transistor (9), les bornes d'entrée (22, 23) et une borne de sortie (24) faisant saillie du corps (21). 25 30
 8. Ensemble thermoélectrique selon la revendication 7, dans lequel le module de connexion (20) comprend une borne de sortie additionnelle configurée pour être reliée à un capteur de présence pour détecter la présence d'ustensiles associé avec le brûleur correspondant. 35
 9. Ensemble thermoélectrique selon la revendication 7 ou 8, comprenant un circuit de courant additionnel (1') associé avec une vanne électromagnétique (6') respective, le circuit de courant additionnel (1') comprenant un thermocouple (2') configuré pour détecter une flamme dans le brûleur correspondant, un câble (3') relié au thermocouple (2') et configuré pour relier électriquement ledit thermocouple (2') à la vanne électromagnétique (6') correspondante, et un transistor (9') relié au câble (3') et configuré pour désactiver la vanne électromagnétique (6') à laquelle il est relié, le circuit de courant additionnel (1') comprenant un module de connexion (20') logeant le transistor (9') correspondant, ledit module de connexion (20') comprenant une borne d'entrée (22') reliée au transistor (9') et configurée pour être reliée à la borne de sortie (24) du module de connexion (20) du circuit de courant principal (1). 40 45 50 55
 10. Ensemble thermoélectrique selon la revendication précédente, dans lequel la borne de sortie (24) du module de connexion (20) du circuit de courant principal (1) et la borne d'entrée (22') du module de connexion (20') du circuit de courant additionnel (1') sont configurées pour être reliées, fournissant une connexion ajustée.
 11. Ensemble thermoélectrique selon la revendication 9 ou 10, comprenant une pluralité de circuits de courant additionnels (1') chacun d'eux étant associé avec une vanne électromagnétique (6') respective, chaque circuit de courant additionnel (1') étant configuré pour être relié à un autre circuit de courant additionnel (1') à travers des modules de connexion (20') respectifs de chaque circuit de courant additionnel (1'), de telle sorte que la borne d'entrée (22') du module de connexion (20') de l'un des circuits de courant additionnels (1') et la borne de sortie (24') du module de connexion (20') d'un autre circuit de courant additionnel (1') sont configurées pour être reliées l'une à l'autre, fournissant une connexion ajustée.
 12. Ensemble thermoélectrique selon l'une quelconque des revendications 9 à 11, dans lequel le circuit de courant additionnel (1') comprend une résistance de décharge (15') du transistor (9') reliée en parallèle au transistor (9') et configurée pour assurer l'ouverture du transistor (9') lorsque ledit transistor (9') n'est plus alimenté par l'alimentation en puissance (10).
 13. Ensemble thermoélectrique selon l'une quelconque des revendications 9 à 12, dans lequel le circuit de courant additionnel (1') comprend une résistance de sécurité (16') reliée en série au port (9c') du transistor (9') et configurée pour limiter le courant qui passera au circuit de courant additionnel (1') à partir de l'alimentation en puissance (10) en cas d'une défaillance en court-circuit du transistor (9').
 14. Ensemble thermoélectrique selon l'une quelconque des revendications précédentes, dans lequel le circuit de courant principal (1) comprend une résistance de décharge (15) du transistor (9) reliée en parallèle au transistor (9) et configurée pour assurer l'ouverture du transistor (9) lorsque ledit transistor (9) n'est plus alimenté par l'alimentation en puissance (10).
 15. Ensemble thermoélectrique selon l'une quelconque des revendications précédentes, dans lequel le circuit de courant principal (1) comprend une résistance de sécurité (16) reliée en série au port (9c) du transistor (9) configurée pour limiter le courant qui passera au circuit de courant principal (1) à partir de l'alimentation en puissance (10) en cas d'une défaillance en court-circuit du transistor (9).

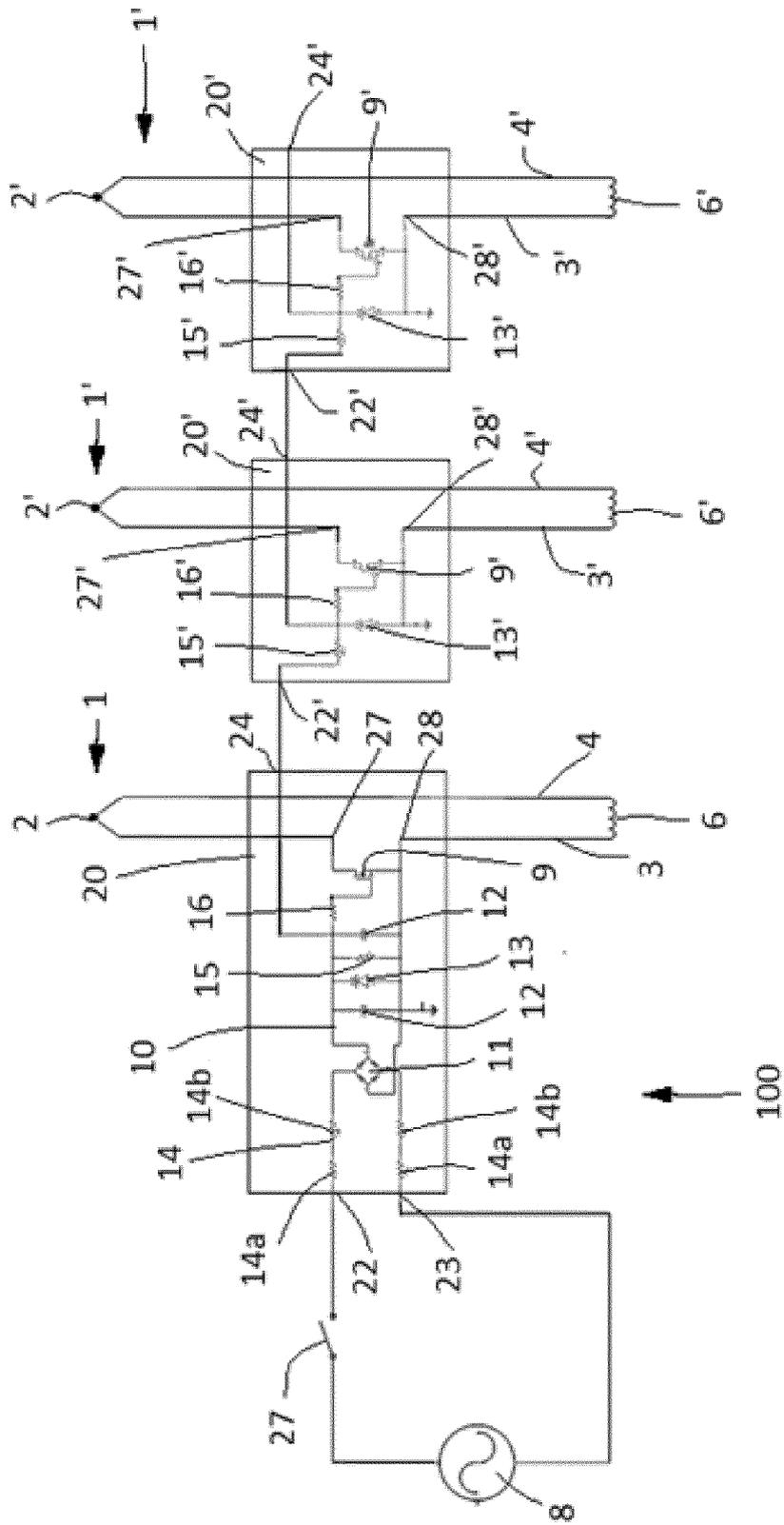


FIG. 1

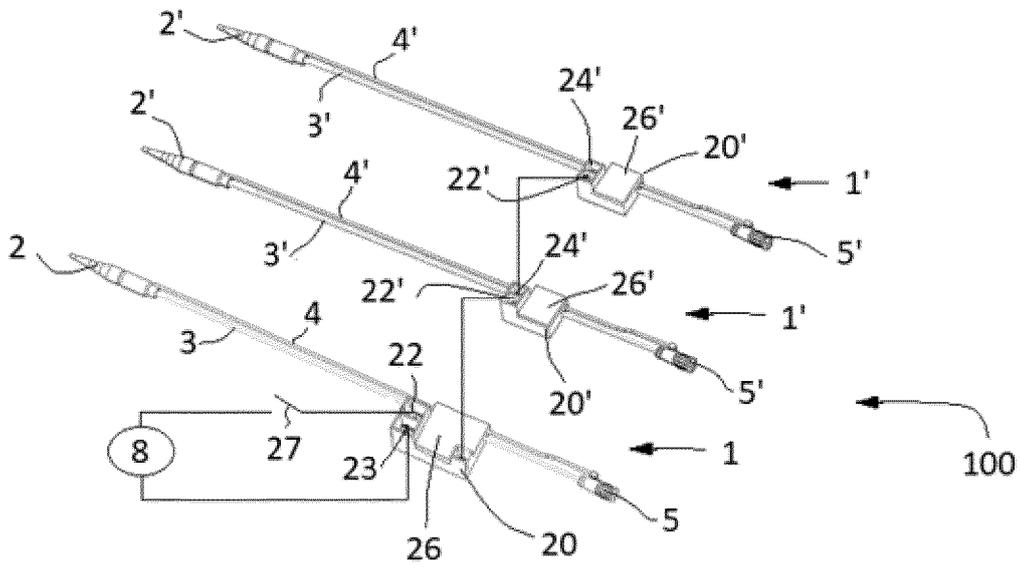


FIG. 2

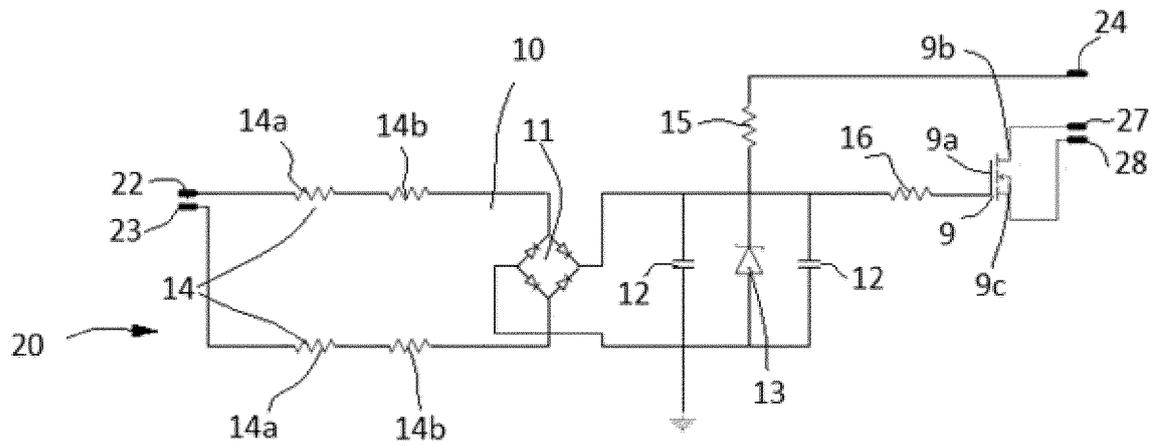


FIG. 3

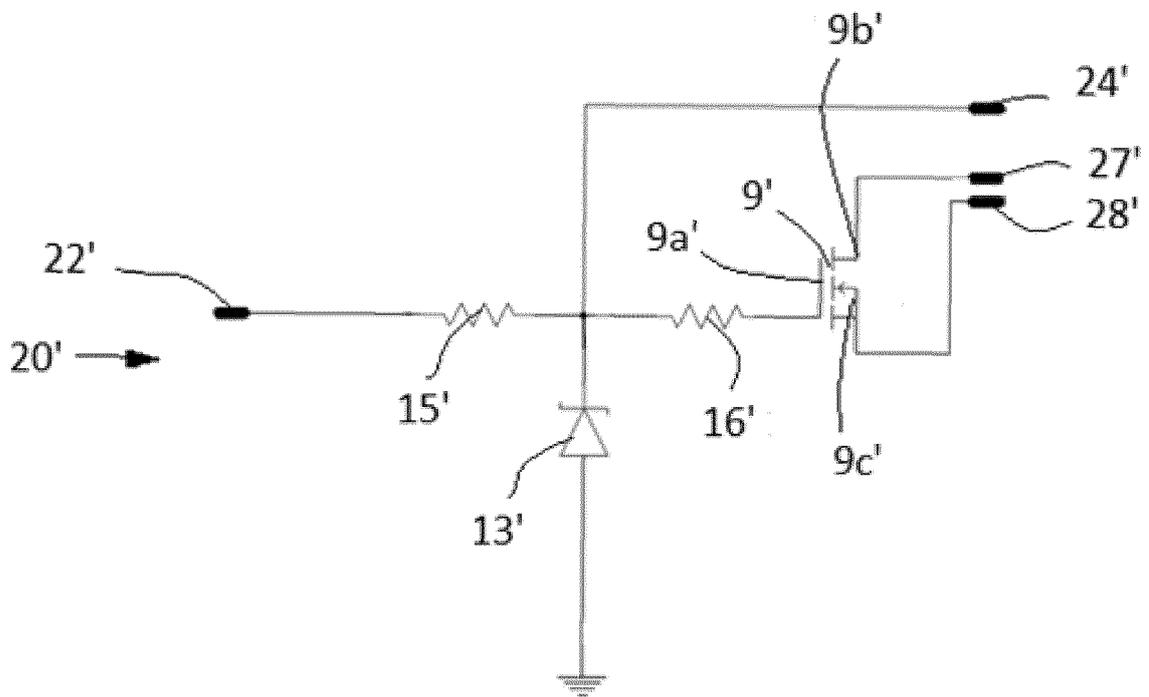


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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