



(12) **EUROPEAN PATENT APPLICATION**

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

(51) Int Cl.:
F24C 3/12 (2006.01) F23N 5/10 (2006.01)

(21) Application number: **19383142.7**

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

(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
KH MA MD TN**

(72) Inventors:
• **ARIZMENDI ZURUTUZA, Mikel**
20240 ORDIZIA (ES)
• **PABLO CURTO, Marcos**
20120 HERNANI (ES)

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

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

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

(57) Thermoelectric assembly for powering a plurality of electromagnetic valves of a cooking appliance, comprising a main current circuit comprising a thermocouple, a cable configured for electrically connecting said thermocouple with the corresponding electromagnetic valve, and a transistor (9) connected to the cable and configured for de-energizing the electromagnetic valve. The main current circuit comprises 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, a rectifier (11), and a resistive block (14) connected between one of the input terminals (22, 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.

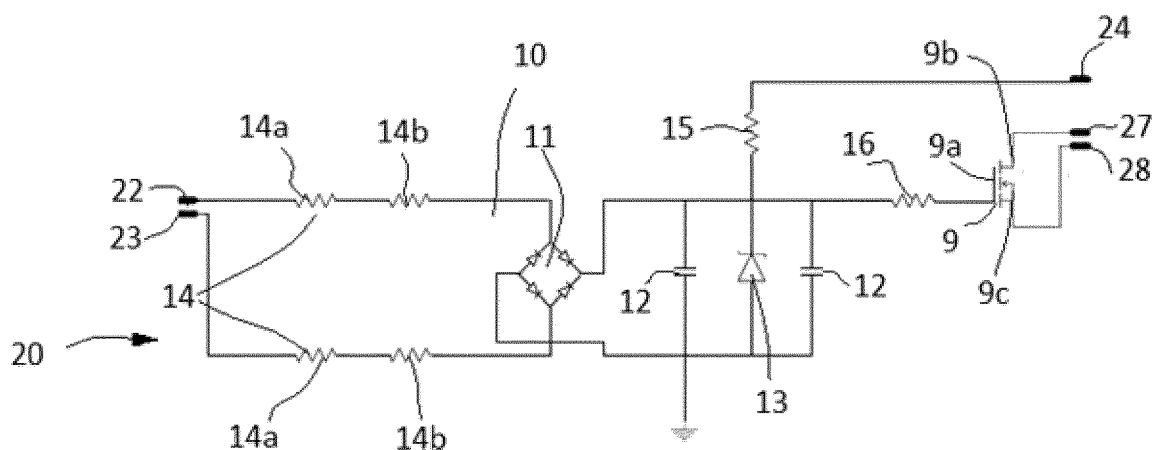


FIG. 3

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.

DISCLOSURE OF THE INVENTION

[0005] 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.

[0006] 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.

[0007] 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 equivalent to the galvanic isolation.

[0008] 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.

[0009] 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

[0010]

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 thermoelectric 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

[0011] 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.

[0012] 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.

[0013] The transistor 9 is a field-effect transistor, pref-

erably 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.

[0014] 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 mohms.

[0015] 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 mohms.

[0016] 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.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] Moreover, an electromechanical switch 25 is arranged between the power supply 10 and the power supply external 8.

[0025] 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.

[0026] 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.

[0027] The thermoelectric assembly 100 further comprises at least one additional current circuit 1' associated with a respective electromagnetic valve 6', said additional 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.

[0028] 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.

[0029] 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.

[0030] 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'.

[0031] 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'.

[0032] 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.

[0033] 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.

[0034] 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'.

[0035] 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.

[0036] 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'.

[0037] 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'.

[0038] 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'.

[0039] 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'.

[0040] 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.

[0041] 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 cur-

rent 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 configured 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), and a transistor (9) connected to the cable (3) and configured for de-energizing the electromagnetic valve (6), **characterized in that** the main current circuit (1) comprises 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), 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, 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.
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 mohms.

5. Thermoelectric assembly according to claim 3, wherein the resistance of the two resistive blocks (14) is about 2.24 mohms.
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).

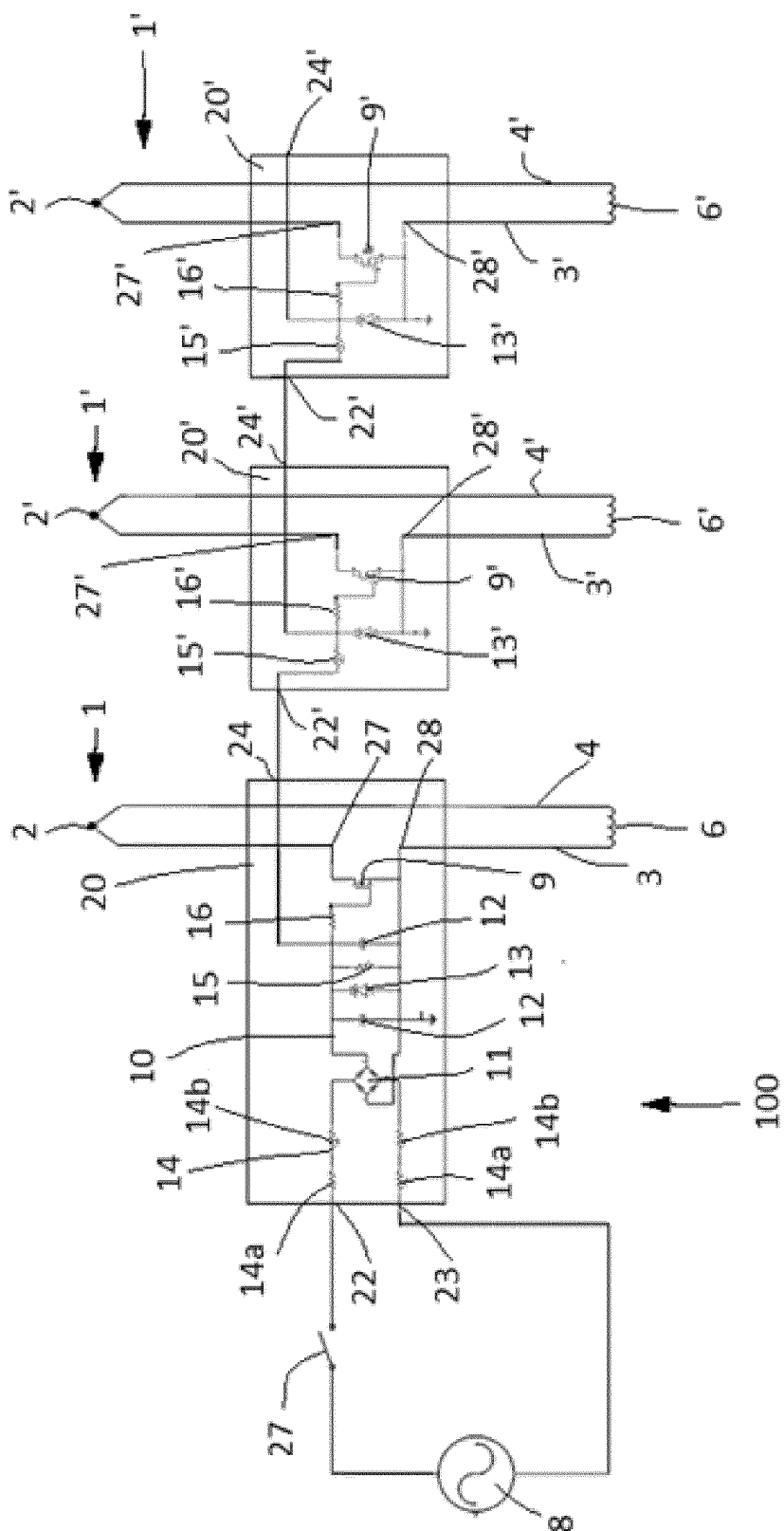


FIG. 1

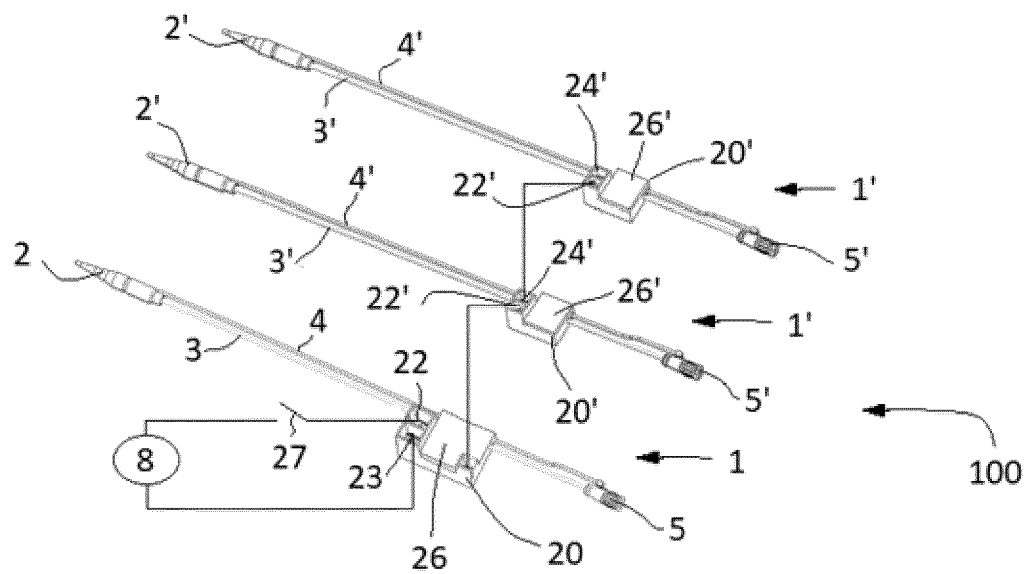


FIG. 2

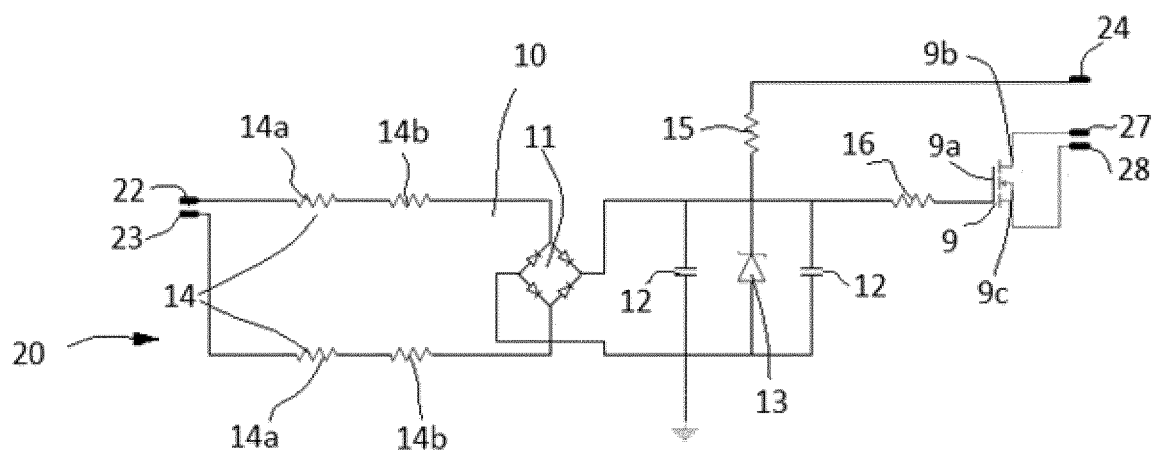


FIG. 3

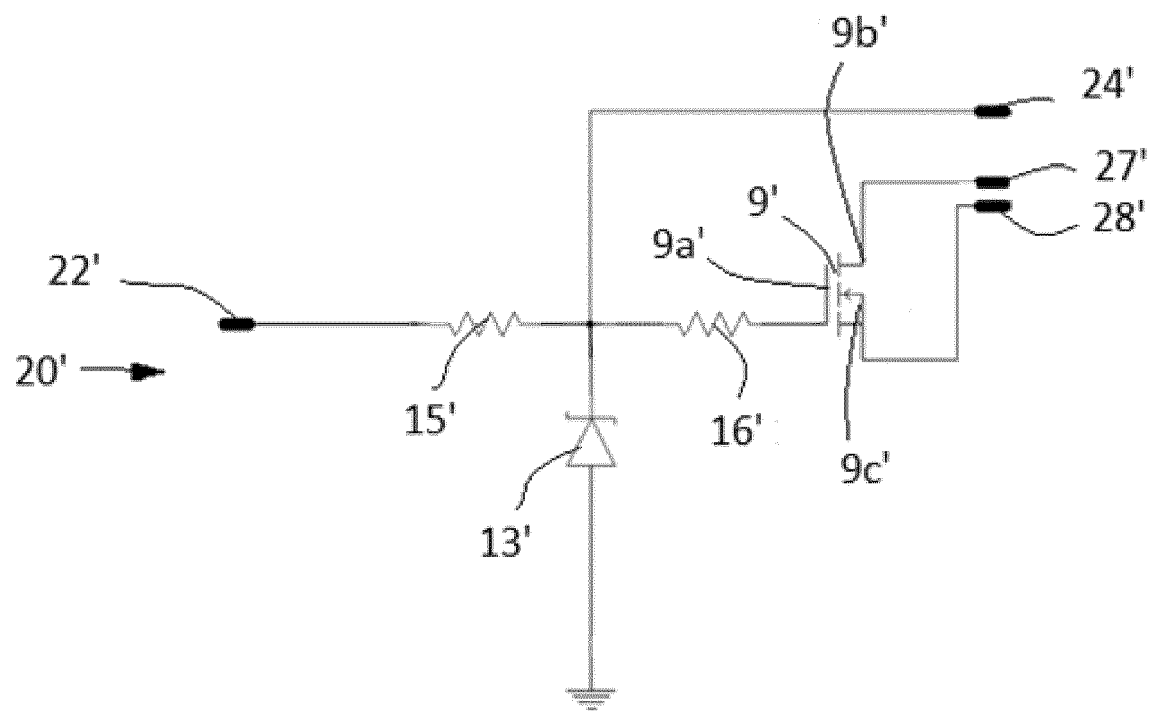


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 19 38 3142

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2019/078781 A1 (MORO MARCO [IT] ET AL) 14 March 2019 (2019-03-14) * paragraphs [0032], [0042], [0048], [0070], [0078], [0112], [0121]; figures 1-18 *	1-15	INV. F24C3/12 F23N5/10
Y	DE 23 06 544 A1 (DIEHL FA) 15 August 1974 (1974-08-15) * page 5, last line, paragraph 1; figure 1 *	1-15	
A	DE 21 23 458 A1 (INDUSTRIE A. ZANUSSI S.P.A [IT]) 23 November 1972 (1972-11-23) * the whole document *	1-15	
A	GB 1 524 056 A (PHILIPS NV) 6 September 1978 (1978-09-06) * the whole document *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F23N F24C H02M
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 June 2020	Examiner Verdoodt, Luk
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 38 3142

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-06-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2019078781 A1	14-03-2019	BR 112017027748 A2	11-09-2018
		CN 108027142 A	11-05-2018
		EP 3325884 A1	30-05-2018
		US 2019078781 A1	14-03-2019
		WO 2017013558 A1	26-01-2017

DE 2306544 A1	15-08-1974	DE 2306544 A1	15-08-1974
		FR 2217636 A1	06-09-1974

DE 2123458 A1	23-11-1972	NONE	

GB 1524056 A	06-09-1978	DE 2552740 A1	10-06-1976
		FR 2292930 A1	25-06-1976
		GB 1524056 A	06-09-1978
		IT 1026546 B	20-10-1978
		JP S5177936 A	06-07-1976

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0288390 A1 [0003]
- US 20190195507 A1 [0004]