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(54) **SAFETY DEVICE ADAPTED FOR GAS BURNERS**

(57) Safety device (1) adapted for gas burners comprising an electromagnetic valve (2) opening or closing the gas supply passage towards at least one burner (6), a thermocouple (3) connected to the electromagnetic valve (2) keeping the electromagnetic valve (2) open as long as it detects the presence of a flame in the burner (6), and thermoelectric means (4) connected to the electromagnetic valve (2) which are activated depending on the temperature reached in a vessel (7) arranged on the burner (6). The safety device (1) comprises a switch (5) connected to the thermoelectric means (4) and to the electromagnetic valve (2), allowing current to flow towards the electromagnetic valve (2) in the direction opposite the current generated by the thermocouple (3) once a specific difference in potential has been reached in said switch (5).

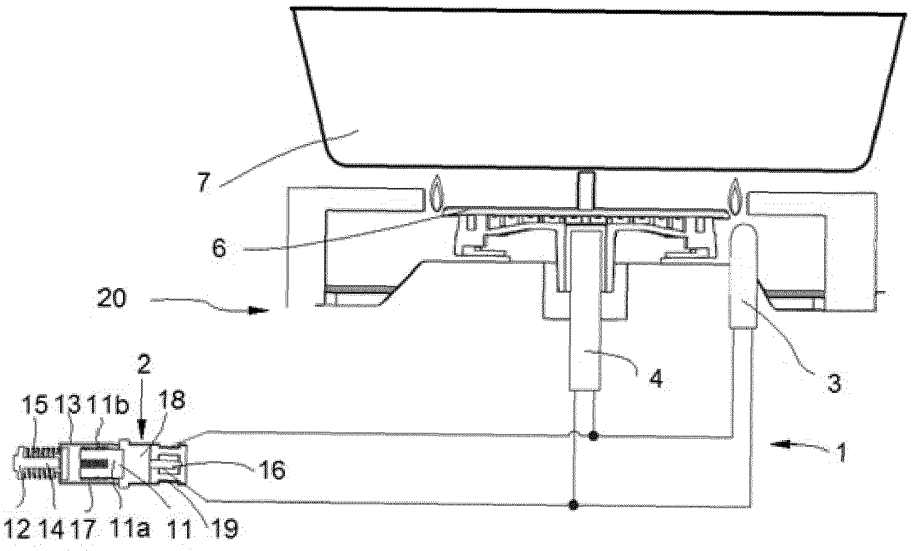

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a safety device adapted for gas burners and a cooking appliance comprising at least one burner and the safety device.

PRIOR ART

[0002] Some gas cooking appliances are known to comprise safety means to prevent a cooking utensil arranged on a gas burner comprised in the cooking appliance from overheating, thereby preventing said cooking utensil from being burned, and/or safety means preventing the gas supply passage towards the burner when a thermocouple does not detect the presence of flame in the burner.

[0003] WO 2014152957 A1 discloses a safety system for gas cooking appliances comprising a manual control connected to a valve opening or closing the gas supply passage to the burner, a sensor arranged proximally to the burner, a second sensor arranged proximally to the manual control for detecting the temperature of an area proximal to the manual control, and a controller connected to the valve which closes said valve when the characterization of the flame obtained through values of the sensor proximal to the burner is equal to predetermined values stored in the controller and the second sensor does not detect the temperature of the user's hand around the manual control. The intention is to prevent the cooking appliance from continuing to operate when the user is not present.

[0004] KR2013032674A discloses a safety device for preventing a cooking utensil from overheating, comprising a thermocouple, a multiprocessor unit and an overheat prevention unit. A terminal of the thermocouple is connected to the multiprocessor unit. The overheat prevention unit comprises a receiving member which receives oil therein, a first electrode connected to an end of the thermocouple and a second electrode which is connected to the multiprocessor unit.

[0005] Finally, US2006/0166154 A1 discloses a device to prevent a cooking utensil arranged on a gas burner from overheating due to an excessively long, unintentional use, comprising a thermocouple, an electromagnetic valve generating a magnetic force due to the electromotive force of the thermocouple keeping the gas supply passage towards the burner open as long as said thermocouple detects the presence of flame, and a timer switch which is arranged between a terminal of the thermocouple and a terminal of the electromagnetic valve. The timer switch disconnects the connection between the thermocouple and the electromagnetic valve when a predetermined time is exceeded. Therefore, even though the thermocouple detects a flame in the burner, if a predefined burner operating time is reached, the timer switch cuts off the power supply to the electromagnetic valve such that gas supply passage towards the burner is closed.

DISCLOSURE OF THE INVENTION

[0006] The object of the invention is to provide a safety device adapted for gas burners and a cooking appliance comprising the safety device, as defined in the claims.

[0007] The safety device according to the invention comprises an electromagnetic valve opening or closing the gas supply passage towards at least one burner, a thermocouple connected to the electromagnetic valve keeping the electromagnetic valve open as long as it detects the presence of flame in the burner, and thermoelectric means connected to the electromagnetic valve which are activated depending on the temperature reached in a vessel arranged on the burner.

[0008] The safety device further comprises a switch connected to thermoelectric means and to the electromagnetic valve, allowing the passage of current towards the electromagnetic valve in the direction opposite the current generated by the thermocouple once a specific difference in potential has been reached in said switch.

[0009] A safety device which does not require an external power supply once the burner is operating is thereby obtained. This safety device is an autonomous, simple, economical and optimized device.

[0010] These and other advantages and features of the invention will become evident in view of the drawings and the detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0011]

Figure 1 shows a sectional schematic view of a burner of a gas cooking appliance comprising a safety device according to the invention.

Figure 2 is a diagram of the electrical circuit of the safety device shown in Figure 1.

DETAILED DISCLOSURE OF THE INVENTION

[0012] Figure 1 shows a gas burner 6 of a cooking appliance 20 (partially depicted) comprising a safety device 1 which, on one hand, prevents gas from coming out through the burner 6 when there is no flame, and on the other hand prevents a cooking vessel 7 arranged on the burner 6 from overheating.

[0013] To that end, the safety device 1 comprises a safety valve 2 opening or closing the gas supply passage towards the respective burner 6, a thermocouple 3 connected to the safety valve 2 keeping the safety valve 2 open as long as it detects the presence of flame in the burner 6, and thermoelectric means 4 electrically connected to the safety valve 2 which are activated depending on the temperature reached in the vessel 7 arranged

on the burner 6.

[0014] Both the burner 6 and the thermoelectric means 4, as well as the safety valve 2 and the thermocouple 3, are known in the state of the art so they have been schematically depicted in the drawings.

[0015] The safety valve 2 is an electromagnetic valve opening or closing the gas supply passage towards the burner 6. Said electromagnetic valve 2, schematically shown in Figure 1, comprises a body (not depicted) in which there are housed an electromagnet 11, a shutter 12 adapted for sealing the gas supply passage towards the burner 6 against the body of the valve, a moving armature 13 coupled to the shutter 12 and movable together with the shutter 12 between a safety valve open position allowing the gas supply to flow towards the burner 6 and a safety valve closed position in which the shutter 12 closes the gas supply passage towards the burner, and a spring 15 which forces the shutter 12 together with the moving armature 13 to return to the safety valve closed position when the electromagnet 11 is not energized. The shutter 12 is coupled to the moving armature 13 through a rod 14.

[0016] Once the electromagnet 11 is energized either manually or through a specific power supply source, it is kept energized through the thermocouple 3 as long as said thermocouple 3 detects the presence of flame in the burner 6. In said position, the moving armature 13 is in contact with the electromagnet 11 (safety valve open position) and the shutter 12 does not close the gas supply passage. When the electromagnet 11 is no longer energized, i.e., the thermocouple 3 does not detect flame in the burner 6, the spring 15 acts on the shutter 12, moving it together with the moving armature 13 to the safety valve closed position, closing the gas supply passage towards the burner 6.

[0017] The safety valve 2 further comprises a support 18 of the electromagnet 11. The support 18 is made of an electrically conductive material, preferably a metallic material. The electromagnet 11 further comprises a core 11a made of a ferromagnetic material and a winding 11 b comprising a first end connected to a ground terminal 19 and a second end connected to a phase terminal 14, both terminals 14 and 19 being respectively connected to the phase and ground terminals of the thermocouple 3. The safety valve 2 further comprises a casing 17 which encloses the electromagnet 11, the moving armature 13 and partially the support 18 therein.

[0018] In addition, the thermoelectric means 4, schematically depicted in the drawings, comprise at least one thermoelectric sensor which, in the embodiment shown, is supported in the burner 6, in particular it is arranged centered with respect to the burner 6 for the purpose of being arranged centered with respect to the cooking utensil 7 which is placed on the burner 6. In other non-depicted embodiments, the thermoelectric means 4 can be arranged proximally to the cooking utensil 7 in any other position.

[0019] The thermoelectric sensor is electrically connected in parallel to the thermocouple 3. The thermoelectric sensor converts at least part of the heat energy generated in the burner 6, when it is operating, into electric energy. Therefore, when the thermoelectric sensor detects a predetermined temperature threshold in the cooking vessel 7, it generates a current I2 towards the electromagnetic valve 2.

[0020] The safety device 1 further comprises a switch 5 electrically connected to thermoelectric means 4 and to the electromagnetic valve 2, in particular said switch 5 connects thermoelectric means 4 to the electromagnetic valve 2. Said switch 5 allows the current I2 generated by the thermoelectric means 4 to flow towards the electromagnetic valve 2 in the direction opposite the current I1 generated by the thermocouple 3 (keeping the electromagnetic valve 2 energized) once a specific difference in potential has been reached in said switch 5.

[0021] The current I2 circulating towards the electromagnetic valve 2 through the switch 5, in the direction opposite the current I1 generated by the thermocouple 3, is greater than said current I1 generated by the thermocouple 3 when the thermoelectric means 4 detect the specific temperature threshold in the vessel 7 and the difference in potential has been reached in the switch 5. When the current I2 generated by the thermoelectric means 4 exceeds the current I1 generated by the thermocouple 3, the electromagnetic valve 2 is de-energized, closing the gas supply passage towards the burner 6. In contrast, when a specific difference in potential is not reached in said switch 5, current I2 does not pass through said switch 5, so the thermocouple 3 continues to keep the safety valve 2 energized and the gas supply passage towards the burner open.

[0022] A safety device 1 not requiring an external power supply once the burner is operating is thereby obtained. This safety device is a simple, economical and optimized device.

[0023] The switch 5 is an electronic switch, which prevents electric contact failures as occurs with mechanical switches.

[0024] In the embodiment shown in the drawings, the switch 5 is a diode. In other embodiments not depicted in the drawings, the switch 5 is a transistor.

Claims

1. Safety device adapted for gas burners, comprising an electromagnetic valve (2) opening or closing the gas supply passage towards at least one burner (6), a thermocouple (3) connected to the electromagnetic valve (2) keeping the electromagnetic valve (2) open as long as it detects the presence of flame in the burner (6), and thermoelectric means (4) connected to the electromagnetic valve (2) which are activated depending on the temperature reached in a vessel (7) arranged on the burner (6), **characterized in that** it comprises a switch (5) connected to

thermoelectric means (4) and to the electromagnetic valve (2), allowing the current (I2) to flow towards the electromagnetic valve (2) in the direction opposite the current (I1) generated by the thermocouple (3) once a specific difference in potential has been reached in said switch (5).

2. Safety device according to the preceding claim, wherein the current (I2) circulating towards the electromagnetic valve (2) in the direction opposite the current (I1) generated by the thermocouple (3) is greater than said current (I1) generated by the thermocouple (3) when the thermoelectric means (4) detect a specific temperature threshold in the vessel (7).

3. Safety device according to claims 1 or 2, wherein the switch (5) is an electronic switch.

4. Safety device according to claim 3, wherein the switch (5) is a diode.

5. Safety device according to claim 3, wherein the switch (5) is a transistor.

6. Cooking appliance comprising at least one burner (6), **characterized in that** it comprises a safety device (1) according to any of the preceding claims.

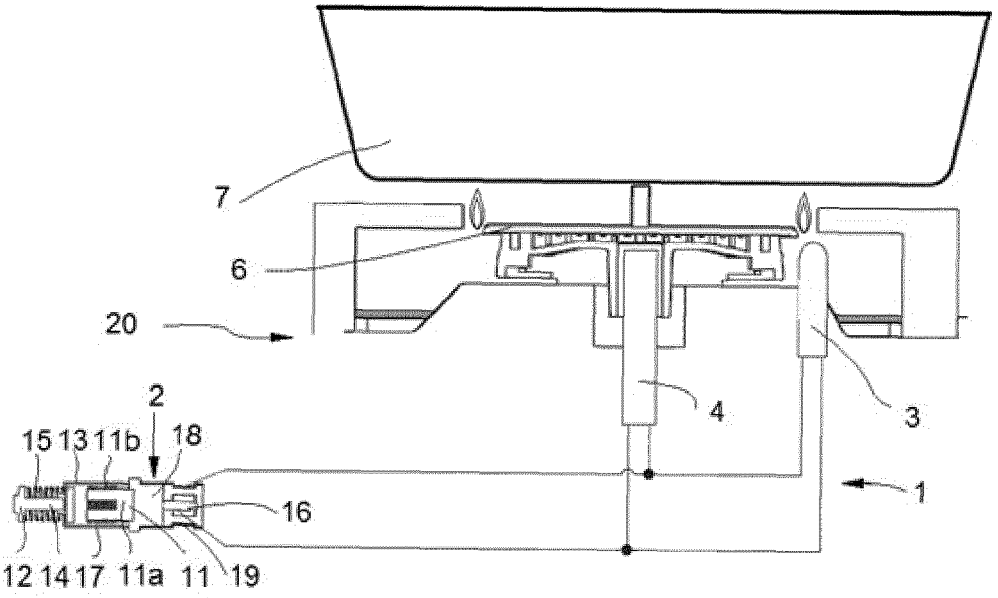

FIG. 1

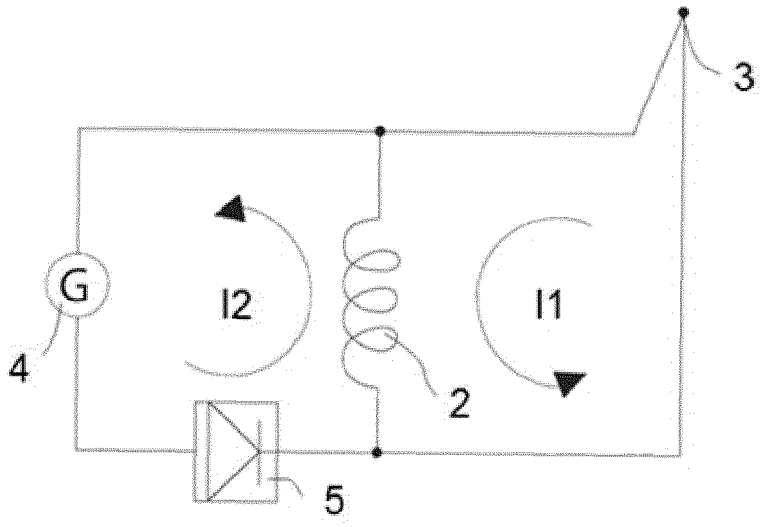

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 15 38 2170

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2014/246010 A1 (DENG DAVID [US]) 4 September 2014 (2014-09-04) * paragraphs [0050], [0080] - paragraph [0094]; figures 5-9 *	1-3,6	INV. F23N5/10 F23N5/24
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Y	US 4 645 124 A (ALLUTO LUIGI [IT] ET AL) 24 February 1987 (1987-02-24) * column 4, line 6 - line 7 *	4	
X	US 2010/275897 A1 (MAY RANDALL L [US]) 4 November 2010 (2010-11-04) * paragraph [0027] - paragraph [0029]; figures *	1-3,6	
X	JP S61 105025 A (MATSUSHITA ELECTRIC IND CO LTD) 23 May 1986 (1986-05-23) * abstract; figures *	1-3,6	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 September 2015	Mootz, Frank

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
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E : earlier patent document, but published on, or after the filing date
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 38 2170

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

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- US 20060166154 A1 **[0005]**