



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.02.2006 Bulletin 2006/05

(51) Int Cl.:
F23N 5/10 (2006.01) F23N 5/24 (2006.01)

(21) Application number: **05380106.4**

(22) Date of filing: **26.05.2005**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR LV MK YU

• **Herzog Delgado, Juan**
20240 Ordizia (Gipuzkoa) (ES)

(74) Representative: **Fernandez Guzman, Juan**
Apartado 213 (Dpto. Propiedad Industrial)
20500 Mondragon (Gipuzkoa) (ES)

(30) Priority: **30.07.2004 ES 200401863 U**

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

(72) Inventors:
• **Guirado Tristan, Jose A.**
20200 Beasain (Gipuzkoa) (ES)

Remarks:

A request for correction to the Description has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) **Flame safety thermocouple and thermocouple body**

(57) The flame safety thermocouple (10) is adapted to a cooker gas burner (BU) with both a long flame (F1) and a short flame (F2). The sensing head (11, 12) encloses a hot junction (HJ1) at an upper end (1) of small mass, and it comprises a frustoconical portion (12) which has a flame reception wall of a given axial length L2 and an angle of divergence $\alpha-2$ ($\alpha 2$) adapted to the form of the short flame (F2), wherefore the temperature gradient is low between said flame reception wall (12) and the hot

junction (HJ1). The outer sleeve (13) is connected to a larger diameter tubular base (14) for the cold junction (CJ2), a low thermal resistance from the sensing head (11-12) being obtained through said tubular base (14), and thereby a rapid deactivation of the actuator after the flame is extinguished. One embodiment of the thermocouple (10) has a secondary hot junction (HJ2) of opposite polarity, welded on the inner thermoelectric rod (15) and positioned under the sleeve segment L3 exposed to the ambient air.

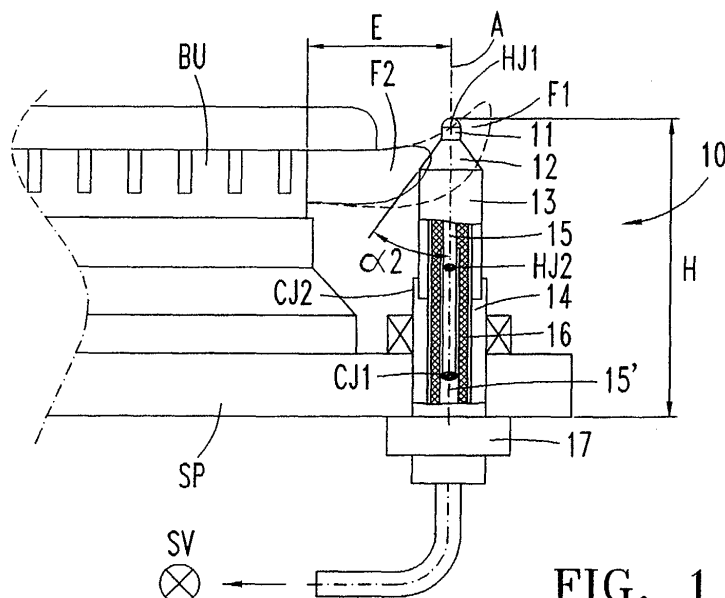


FIG. 1

Description

Technical field

[0001] The present invention is related to a safety thermocouple for detecting flame failure, wherein the construction of the tubular thermocouple body is adapted to a cooking gas burner for a quick valve actuation.

Prior art

[0002] Safety thermocouples are known for detecting flame presence or absence when installed in the vicinity of a cooker gas burner provided with a crown with radial flame outlets. This type of thermocouple has a temperature sensing head and one of the flames impinges on a surface area of the sensing head generating an electromotive force (e.m.f.) that supplies the safety valve actuator, holding the valve open. After the flame has gone out, the electromagnetic valve is closed by the force of a spring when, as a result of cooling, the e.m.f. generated drops below a threshold value specific to the valve electromagnetic valve. The valve e.m.f. threshold and response time values obtained for the latching and delatching of the actuator are dependent on the type of valve used and on the scatter of values in their production. The position of the thermocouple in relation to the flame is chosen in order to maintain a balance between the two latching and delatching times wanted, since a faster response to heating brings about a lengthening of the delatching time during cooling. EP-597157-A, EP-552135-A, GB-2249383-A and FR-2062094-A show examples of a thermocouple of known construction fitted to a cooker top burner.

[0003] In FIG. 2 a thermocouple is represented with a construction that corresponds to the prior art adapted to a cooker top burner "BU". The thermocouple 20 is positioned with its vertical axis "A" on a support "SP" in the burner. The flame emitted by the burner BU is regulated between two flame sizes of different calorific power, the maximum power long flame "F1" and the minimum power short flame "F2". The thermocouple sensing head 21-22 is positioned at a given distance of horizontal separation "E" from the burner "BU", and at a given vertical height "H" from the support "SP" adjusted in relation to the flame outlet, so that, once the flame is extinguished, the thermocouple 20 does not continue to be warmed by the residual heat of the burner body.

[0004] According to the prior art (FIG. 2) the thermocouple 20 is constructed from an outer tubular sleeve 21-23 made from a thermoelectric alloy, for instance Ni-Cr, a poor heat conductor, which makes up the outer conductor of the thermoelectric couple. A rigid conductor 25 of a different alloy, which makes up the inner conductor of the couple, is guided into the sleeve 21-23 of the transmission body. The thermocouple sensing head 21-22 comprises a smaller diameter upper end 21 press-stamped on one end of a thermoelectric rod 25

and then welded at its tip. The hot junction "HJ1" constructed in this way is in thermal contact with the metal surface of the head 21-22 heated by the flame. As a result of the stamping of the sleeve 23, the flame reception head at the end of the sleeve 23 also comprises a frustoconical transition portion 22 of an intermediate diameter.

[0005] The base 24 of the transmission body (FIG. 2) comprises a larger diameter tube than the sleeve 23 made of brass, a good electrical and thermal conductor, and connected to the sleeve 23 telescopically and welded to it, forming a "cold junction" CJ2. The tubular body 23-24 has a uniform inside diameter snug-fitting to an inner insulating sleeve 26 for the inner conductor 25. The insulating sleeve begins behind the conical portion 22 and extends as far as behind the support "SP". In the tubular base 24 the end of the inner rod 25 is welded to another semi-rigid copper rod 25' for the electrical connection of the thermocouple cold junction "CJ1". The cold junction CF1-CJ2 is spaced at the height of the means of support "SP" for the thermocouple at the end provided with the support means 27. At the lower end the thermocouple tubular body 23-24 is provided with a supporting lip or ridge 27 for fixing the thermocouple and its vertical positioning on the support "SP" associated with the burner.

[0006] Examples of thermocouple construction like that described above are those shown in US-3332803, US-3556864, US-4021268, FR-2696531-A3, EP-1215473 and JP 07031087, Rinnai Corp (date of publication 03.09.96), which have an adapter or connector for fixing the thermocouple to the support so as to adjust the position E, H of the sensing head in relation to the flame F1. The sensing head 21-22 is swept by the long flame "F1" and the junction HJ1 is heated up to about 500°C to generate the rated e.m.f. value. When the user changes the power of the burner BU, the short flame F2 does not reach the surface of the head 21-22.

[0007] In the prior state of the art (FIG. 2) the construction of the thermocouple 20 is of the type with dual "hot junctions" spaced apart from each other in the axial direction, as described in EP-607099-A2, wherein the e.m.f. generated by the secondary junction HJ2 is opposed electrically to the e.m.f. generated at the primary junction HJ1, in order to increase the speed of response during cooling and reduce the delatching interval. The end 21 of the thermocouple head 20 has a diameter of around 2 mm, the outer sleeve 23 of the body a diameter of around 3.3 mm, and the tubular base 24 of the body an approximate diameter of 6 mm. The length of the end 21 of the head is around 4.5 mm and the angle of inclination α_1 (α_1) of the frustoconical area 22 in relation to a vertical axis "A" of the thermocouple is around 13 degrees or less.

[0008] On account of the small diameter and the length of the sensing head 21-22, the latter presents an almost vertical flame reception wall away from the flame hole. An approximation of position "E" of the thermocouple 20 to adapt it to the two flame lengths F1 and F2 would cause

an excessive temperature in the head 21-22, affecting the length of life of the thermocouple or causing the wall of the head 21-22 to glow red - above 650° C. A change in the position "H" of the head 21-22 in order to offer the frustoconical surface 22 of the head to the short flame would cause a drop in temperature at the junction HJ1, in particular during initial heating, and consequently, the prolonging of the valve delatching time interval.

[0009] When the burner flame F1 is extinguished, the time of cooling down to the delatching threshold value V_{de} depends not only on the rate of dissipation of heat from the head 21-22 through the body 23-24, but also on the temperature value reached in the metal wall of the head 21-22 due to impingement of the flame F1.

[0010] In FIG.s 4 and 5 dotted lines are used to represent the typical curves 28L and 28S of the e.m.f. (mV) / t (sec) corresponding to the response of the thermocouple 20 of the prior art (FIG. 2) heated by the long flame F1 or short flame F2 respectively, and the typical cooling curve 28C after the flame has gone out. A highest "armature delatching" threshold value V_e of some safety valve SV actuators among the overall production, is around 2.5 mV under load, so an initial time " t_1-t_0 " of heating with flame F1 is around 4 seconds (FIG. 4), and threshold value V_{de} in the same actuator unit for the "armature delatching" and valve cutting-off is 2.2 mV, somewhat less than that due to a hysteresis " ΔV_{de} ", so that after extinguishment of the long flame F1 at time " t_e " (FIG. 5), the deactivation and closure of the valve "SV" occurs after an interval of time " t_3-t_e " of around 20 seconds. However, due to the scatter of results in the production of the electromagnetic actuator of valve SV, some units have a delatching threshold value V_{de-min} of around 1 mV under load. As a result, the cooling interval " t_3-t_e " for the delatching of an SV actuator whose value V_{de} is minimal is prolonged up to 40 seconds (FIG. 4).

[0011] A further problem appears when the thermocouple 20 of the prior art (FIG. 2) is heated by a long flame F1, which is generating a high e.m.f. value (mV), as in curve 28L in FIG. 4, and the user changes the gas flow of the burner BU to minimum, continuing cooking with the short flame F2. The frustoconical portion 22 of the head is not reached by the short flame F2 due to the small α_1 angle (α_1) = 10-13 degrees of its heat receptor wall 22, and also to the considerable length of the upper end 21, which mainly forms the heat reception surface of the head. For this reason, in the case of an SV valve actuator which has a high delatching threshold value V_{de} , for example $V_{de} = 2.2$ mV, the thermocouple 20 does not generate a sufficient maintenance e.m.f. above said value V_{de} , and the cooking process is interrupted involuntarily. In FIG. 4 the e.m.f. response (mV) of the thermocouple 20 from the instant " t_s " of switching from the long flame F1 to the short flame F2 is represented with curve 28S. Now, when the temperature of the junction HJ1 drops, the e.m.f. (mV) generated falls gradually after a cooling interval " t_s-t_2 " below a high threshold value

$V_{de} = 2.2$ mV, and the SV valve actuator is deactivated, shutting off the cooking process when this is not wanted by the user.

5 Disclosure of the invention

[0012] The object of the invention is a construction of a flame thermocouple, supplying an electromagnetic safety valve and adapted to a gas burner for cooking, said thermocouple construction comprising a temperature sensing head fitted with an inclined metal wall exposed to the burner flame and a tubular body fitted with a means of positioning on the burner, so as to provide a rapid response in both the thermocouple heating and cooling intervals, including the heating of the thermocouple head by means of a short flame corresponding to the minimum output power of the burner.

[0013] Compared with the prior art thermocouple, the construction of the thermocouple according to the invention provides a faster response time in the generation of a high E.m.f. (mV) value V_e from ignition, without the metal wall of the head covering the hot junction from being overheated. This result is achieved by means of an increase in the area of the metal wall of the sensing head swept by both the long and short flame of the burner. During cooling the thermocouple of the invention also provides a shorter valve cut-off response time, by means of a sensing head of minimal length and mass, and as a consequence a low thermal resistance from the hot junction to the tubular conduction base, for the cooling of the hot junction when the flame is extinguished.

[0014] By means of the improvement of the construction of its flame reception head, the construction of the thermocouple of the invention also provides a certainty in the generation of a sufficiently high e.m.f. (mV) value in the circumstance when the flame is shortened by the user, in order to continue the cooking process with less power. The e.m.f. (mV) generated by the thermocouple exceeds a threshold value V_{de} for delatching the electromagnetic actuator, thereby preventing the unwanted interruption of cooking with any of the production actuator units.

[0015] The sensing head of the thermocouple of the invention is constructed with a hot junction enclosed in a short and small-diameter end of the head, for the purpose of reducing its thermal mass without sacrificing the length of life of the thermocouple, whilst the frustoconical portion of the head is constructed with a divergent metal wall, which has an angle of inclination α_1 that is more open towards the direction of the flame than the prior art thermocouple, in order to expose an extensive sweep area to the flame, whilst said divergent wall surface also approaches the end of the flame, in particular so that it is reached at least by the tip of a short burner flame.

[0016] It is an objective of the thermocouple according to the invention to reduce the temperature gradient between the frustoconical metallic wall and the generator junction HJ1, whereby a temperature is obtained at the

hot junction of around 500°C without the flame reception metal wall presenting the red colour associated with overheating, by means of reducing the thermal resistance between the frustoconical wall and the tubular base made of a good conducting metal that forms the cold junction, which dissipates the heat transmitted by the heated wall of the head. This objective is achieved by overlapping the tubular heat-sink base on the thermoelectric material sleeve, a segment of greater length than the segment of sleeve that is discovered and exposed to the air.

[0017] An added advantage of this construction of the sensing head is that the hot junction inner rod is guided in the frustoconical portion of the head with sufficient clearance to prevent the risk of a short circuit between both thermoelectric conductors.

Description of the drawings

[0018]

FIG. 1 is an elevational view of a flame safety thermocouple according to the invention, installed in a top burner for cooking.

FIG. 2 is an elevational view of a prior art thermocouple fitted in the burner of FIG. 1.

FIG. 3 is a longitudinal sectional view of the thermocouple according to the invention in FIG. 1.

FIG. 4 is a diagram of the e.m.f. (mV) /time generated by the thermocouple in FIG. 3, during its heating.

FIG. 5 is a diagram of the e.m.f. (mV) /time generated by the thermocouple in FIG. 3, during its cooling.

Detailed description of an embodiment of the invention

[0019] In reference to FIG. 1 and FIG. 3, a flame safety thermocouple construction 10 is adapted to a cooker burner "BU" with radial flame outlets in transverse direction to a central axis "A" of the thermocouple tubular body 11-14. The thermocouple 10 is installed on a burner support "SP", in a vertical position in relation to the axis A, which is situated at a given distance "E" from the burner flame outlet, and at a height "H" from an annular support ridge 17 in the burner. The space "E" is determined a sufficient distance away from the burner in order that the thermocouple should no longer be warmed by its residual heat. The height "H" or total length of the thermocouple, around 30 mm, is determined so that the sensing head is facing the outlet hole of flames F1 and F2.

[0020] The thermocouple 10 is adapted for heating the junction HJ1 by a long flame F1 or a short flame F2 from the burner (FIG. 1), which impinges on or sweeps the surface of the thermocouple head 11-12, giving rise to an e.m.f. (mV) generated (FIG. 4) from the instant t0 of ignition (FIG. 4). A safety valve "SV" is supplied with the e.m.f. (mV) generated by the thermocouple, keeping the electromagnetic actuator of the SV valve activated.

[0021] In reference to FIG. 1 and FIG. 3, the heat re-

ception head 11-12 comprises an upper end 11 and a frustoconical portion 12 with a surface exposed to a short flame F2, and it is situated facing to the flame outlet. The frustoconical portion 12 with an inclination α_2 (α_2) relative to the axis "A", exposes its whole area to the sweep of the short flame F2, in accordance with the form of the short flame F2, whose flame end normally rises.

[0022] The sensing end 11 of the thermocouple head is constructed of short length L1 and small diameter "d" so as to reduce its mass to the minimum possible. The inner thermoelectric conductor rod 15 is chosen as thin as possible in order to reduce the mass of the upper end 11 of the thermocouple, without sacrificing its length of life. The connection of the two thermoelectric "conductors" 11 and 15 of the couple forms a primary hot junction HJ1.

[0023] In a thermocouple embodiment 10 (FIG. 3) the length L1 of the end 11 is less than 2 mm, preferably between 1 mm and 1.5 mm, needed for the press-fitting of the inner rod 15. The diameter "d" of the end 11 is shorter than 2 mm, preferably less than 1.5 mm. The angle α_2 (α_2) of divergence from the frustoconical wall 12 is between 15-30 degrees, preferably 20 degrees. Its wall W1 has a thickness of around 0.25 mm, which means the thinnest possible to resist wear and thermal stress cracking. The length L2 of the frustoconical portion F2 is determined by the typical size of the flame end of the short flame F2, where $L_2 = 2.5$ mm to 3.5 mm. The diameter D1 of the sleeve is determined starting from the diameter "d" of the end 11 of the head, and after conforming the frustoconical portion 12 of the head by means of said divergence angle α_2 (α_2) and said length 12 adapted to the end of the flame F2.

[0024] The transmission body 13-14 of the thermocouple 10 comprises a cylindrical sleeve 13, made of a thermoelectric alloy and having a diameter D1 and a length "L3+L3'", and a tubular base 14 that is a good heat conductor having a length L4 of around 20 mm. It is coupled telescopically to the sleeve 13 and then welded to it to form the second cold junction CJ2. Its diameter D2 is around 6 mm and its wall thickness W2, around 1.5 mm, sufficiently thick for the dissipation of the heat transmitted from the head 11-12. The tubular body 13-14 has a uniform inside diameter adjusted to an inner insulating sleeve 16 for the inner conductor 15.

[0025] A portion of the sleeve 13 with a length L3 of around 6 mm remains exposed to the air, and a second portion with a length L3' greater than L3 is overlapped into the tubular base 14. The thermal resistance is thereby reduced between the head 11-12 and the tubular conductor base 14. This successfully achieves a quick cooling of the thermocouple hot junction HJ1 after extinguishment of the flame, through increasing the dissipation of the heat from the hot head 11, 12 by way of the large thermal contact surface between the sleeve 13 and the tubular base 14. This minimal thermal resistance in the heat dissipation path further contributes to reducing the temperature gradient between the divergent flame (F1,

F2) reception wall 12 and the e.m.f. generating junction HJ1, whereby a sufficiently high temperature, around 500°C, is achieved at the hot junction HJ1, without the need for the metal wall 12 to be heated in excess.

[0026] The small thermal mass of the end 11 enclosing junction HJ1, initially after burner ignition, is heated quickly by conduction from the frustoconical wall 12 that receives the flame, in particular the short flame F2. Therefore, the e.m.f. curve 18L represented in FIG. 4, needed for energizing the valve SV actuator above the latching threshold value "Ve" of its armature, is achieved quickly.

[0027] In reference to FIG.s 4 and 5, the thermocouple 10 represented in FIG. 1 and FIG. 2 is an example of two hot junctions, the primary HJ1 and the secondary HJ2, spaced apart in an axial direction, which have e.m.f. values opposed to each other. The secondary hot junction HJ2 is placed under the exposed segment L3 of the thermoelectric sleeve, and so the e.m.f. generated which it generates is substantially lower than the primary junction HJ1. The difference in e.m.f. between them is the resultant output e.m.f. of the thermocouple 10 represented by the curves 18L, 18S and 18C in FIG. 4. The dotted line curve 28S of the known thermocouple 20 (FIG. 2) is superimposed in the same diagram of FIG. 4. Its frustoconical portion 22 of the head is not reached by the short flame F2, due to the considerable length of the end 21 and the small angle $\alpha_1 = 10\text{--}13$ degrees of the exposed wall 22.

[0028] The primary junction HJ1 has to be heated quickly with flame F1 and cooled quickly too after the extinguishment (FIG. 4). The heating of the secondary junction HJ2 has to be retarded in relation to the primary junction HJ1 during the initial period "t1-t0" up to the holding of the electromagnetic actuator, so as to achieve a quick rise of the resultant e.m.f. 18L above the high threshold value $V_e = 2.5$ mV. The cooling of junction HJ2 also has to be retarded in relation to junction HJ1 during the final actuator delatching interval "t3-te", for a quick drop in the resultant e.m.f. curve 18S below a lowest actuator delatching threshold value $V_{de} = 1$ mV.

[0029] For this purpose the secondary junction HJ2 is situated apart, for example 14 mm from junction HJ1. An inner conductor cable 15' is welded to a thermoelectric wire 19 of the secondary junction HJ2, forming a cold junction CJ1, a long way apart, for instance 13 mm in length, from the secondary junction HJ2. Following the heating curve 18L in FIG. 4, the initial interval of time "t1-t0" for heating with flame F1 is only 2.5 seconds for the high "latching" value V_e actuator, $V_e = 2.5$ mV under load. Following the cooling curve 18C in FIG. 5, the time interval "t3-te" after extinguishment of the long flame F1 is only 10-17 seconds in accordance with the "delatching" threshold value V_{de} between $V_{de} = 2.2$ mV and $V_{de} = 1$ mV, considerably lower than the prior art thermocouple 20, wherein following the curve 28C in FIG. 5, results "t3'-te" = 20-40 sec.

[0030] The thermocouple 10 is later heated during the course of the cooking process by a short flame F2 from

the instant "ts" of flame change, the curve 18S in FIG. 4 representing the e.m.f. (mV) generated. The safety valve SV remains actuated and the cooking process is not interrupted, because, despite the shortening of the flame F2, the value 18S of e.m.f. generated continues to be higher than the whole scatter interval "RVde" (FIG. 5) in the production of the delatching value between 2.2 mV and 1 mV.

[0031] The constructional features of the thermocouple 10 adapted to both flames F1 and F2 of a cooker burner according to the invention may also be applied to a thermocouple of the type with a single hot junction HJ1 situated at the end 11 of the head, instead of the embodiment having two opposite hot junctions HJ1 and HJ2, which has been depicted in the drawings.

Claims

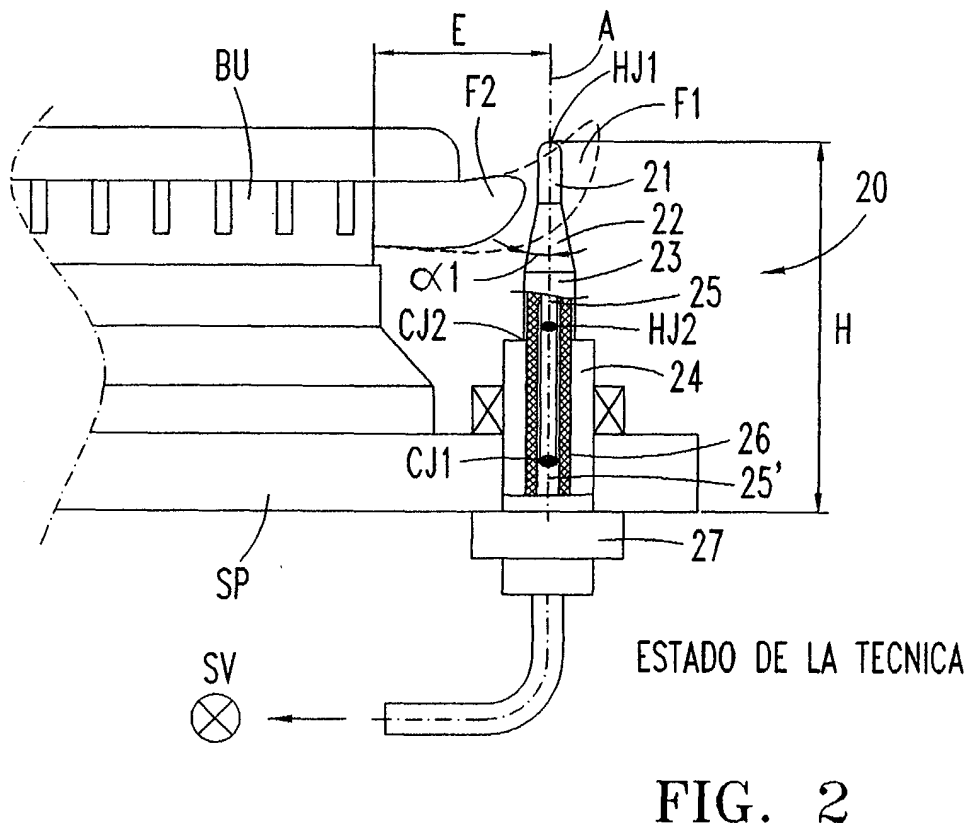
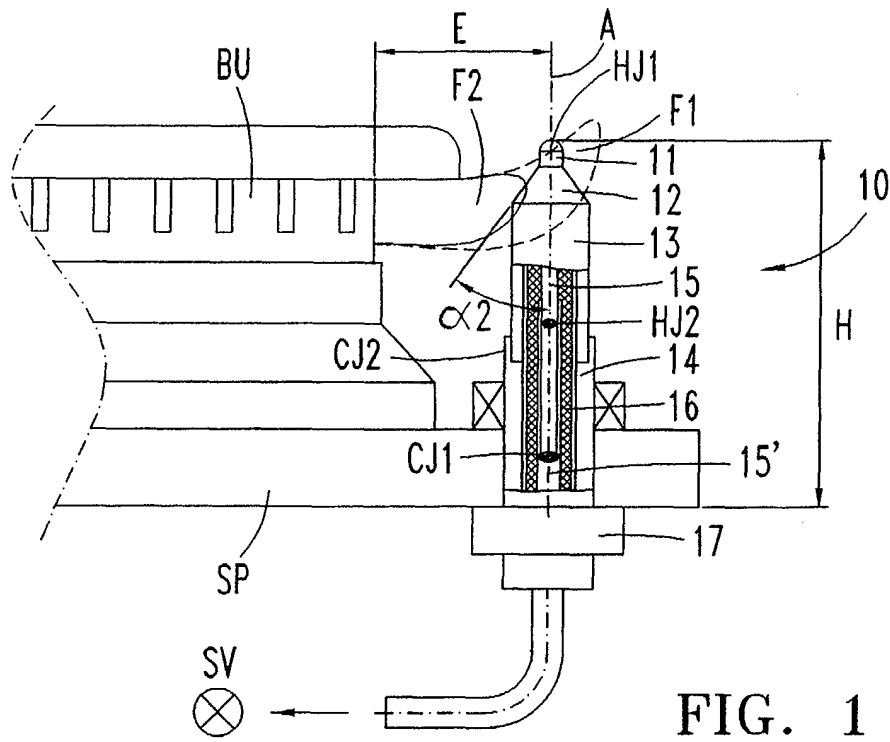
1. Flame safety thermocouple adapted to a cooking gas burner (BU) with radial outlets, which produces both a long flame (F1) and a short flame (F2), the thermocouple being of the type with a sensing head (11,12) and a cylindrical transmission body (13, 14) constructed with at least a metallic sleeve (11-14) of a given total length (H) and an inner thermoelectric rod (15), and enclosing at least one hot junction (HJ1, HJ2) welded at an upper end (11) of the sensing head, wherein the long (F1) and short (F2) flames are directed at the sensing head (11,12) in a direction transverse to the axis (A) of the thermocouple, for the generation of the e.m.f. (mV) (18L,18S,18C) necessary for the supply of a safety gas valve (SV) provided with an electromagnetic actuator having a determined threshold value V_e for latching the armature during the heating of the thermocouple, and a determined threshold value V_{de} for delatching and cutting off the valve during cooling, and the thermocouple (10) further comprising a tubular base (14) made from conductive alloy and welded to the body sleeve (13) forming a cold junction (CJ2), and a means (17) for the support and positioning of the thermocouple on the burner (BU), so that the sensing head (11-12) is spaced a given distance (E) away from the outlet of the flames (F1, F2) on the burner, **characterised in that** the sensing head (11-12) receiving the burner flame (F1, F2), is constructed by means of said end (11) enclosing the hot junction (HJ1) in the form of a tip of a given length L1 and a diameter "d" considerably smaller than the diameter D1 of said thermoelectric sleeve (13), and of a frustoconical portion (12) in thermal communication with the hot junction (HJ1), having a wall for the reception of the flame (F1,F2) divergent towards the latter, with a given angle of inclination α_2 in relation to the axis (A) of the thermocouple, and a given length L2 in the axial direction and a diameter D1 the same as the thermoelectric sleeve (13), being

said geometric dimensions L1, L2, d, D1 and α_2 of the sensing head (11, 12) adapted to the form of the short flame (F2) for sweeping an area of divergent wall (12), and the length L2 and the diameter D1 considerably larger than those of the upper end (11) enclosing the hot junction (HJ1), whereby the temperature gradient between said flame reception wall (12) and the hot junction (HJ1) is low.

2. The flame safety thermocouple according to claim 1, wherein said frustoconical portion (22) is formed by a wall with an angle of divergence α_2 greater than 15 degrees and the length L1 of the end (11) of the head less than 2 mm.
3. The flame safety thermocouple according to claim 1, wherein said frustoconical wall (22) is formed by means of said divergence angle α_2 between 15-30 degrees and an axial length between 2.5 and 3.5 mm.
4. The flame safety thermocouple according to claim 1, wherein said frustoconical wall (12) is formed by means of said divergence angle α_2 between 15-30 degrees, the diameter of the thermoelectric sleeve being around 4 mm and the diameter "d" of the end (1) of the head less than 2.5 mm.
5. The flame safety thermocouple according to claim 1, wherein the transmission body (13,14) of the thermocouple is constructed by means of an outer sleeve (13) made from thermoelectric alloy, and a tubular base (14) made from a good heat conducting alloy is connected to the sleeve (13) forming a cold junction (CJ2), and a means of support and positioning (17) of the thermocouple on the burner (SP) is adapted so that the sensing head (11-12) is facing the outlet of the flame (F1,F2) and spaced a given distance (E) away from it, whereby the short flame (F2) reaches said receiving wall (12) in the frustoconical portion, which is diverging an angle of α_2 between 15 and 30 degrees for heating said hot junction (HJ1).
6. The flame safety thermocouple according to claim 1, wherein the transmission body (13,14) of the thermocouple being constructed by means of an outer sleeve (13) shared with the sensing head (12) made from thermoelectric alloy of a given uniform diameter D1, on the latter is connected telescopically a tubular base (14) made of a good heat conducting alloy, forming a cold junction (CJ2) with the thermoelectric sleeve (13), in such a way that a first segment of the sleeve (13) of a determined length L3 following the sensing head (11-12), is discovered exposed to the ambient air, and a second segment of sleeve (13) of the same or greater length L3' than the exposed segment L3, is overlapped into said tubular base (14),

thus being obtained a low thermal resistance to heat dissipation from the sensing head (11-12) through the tubular base (14), whereby the deactivation of the valve (SV) actuator after the burner flame (F1,F2) is extinguished, occurs after a short time interval (t3-te).

7. The flame safety thermocouple according to claim 1, wherein the diameter "d" of the end (11) of the sensing head where said primary hot junction (hj1) is enclosed is less than 2.5 mm, said angle α_2 of divergence from the frustoconical portion (12) between 15-30 degrees and the transmission body (13,14) of the thermocouple, constructed by means of an outer sleeve (13) shared with the sensing head (12), is made from thermoelectric alloy of a uniform diameter D1 around 4 mm, on the latter is connected telescopically a tubular base (14) made from a good heat conducting alloy, forming a cold junction (CJ2) with the sleeve (13), in such a way that a first discovered segment of the sleeve (13) of a length L3 following the sensing head (11-12), is exposed to the ambient air, and a second segment of the sleeve (13) of the same or greater length L3' than the exposed segment L3, is overlapped into said tubular base (14), thus being obtained a low thermal resistance to heat dissipation from the sensing head (11-12) through the tubular base (14), and a further secondary hot junction (HJ2) is welded to said inner thermoelectric rod (15) with a second inner conductor segment (19) of different alloy from one another, being positioned under said exposed segment L3 of thermoelectric sleeve (13), and having of electrical polarity opposed to the primary hot junction (HJ1), the resultant e.m.f. value (18L,18S) between both hot junctions (HJ1, HJ2) being greater than the threshold value Vde so as to keep the valve (SV) actuator activated during the presence of the flame (F1,F2), whereby the deactivation of the valve (SV) actuator after the burner flame (F1,F2) is extinguished, occurs after a short time interval (t3-te).



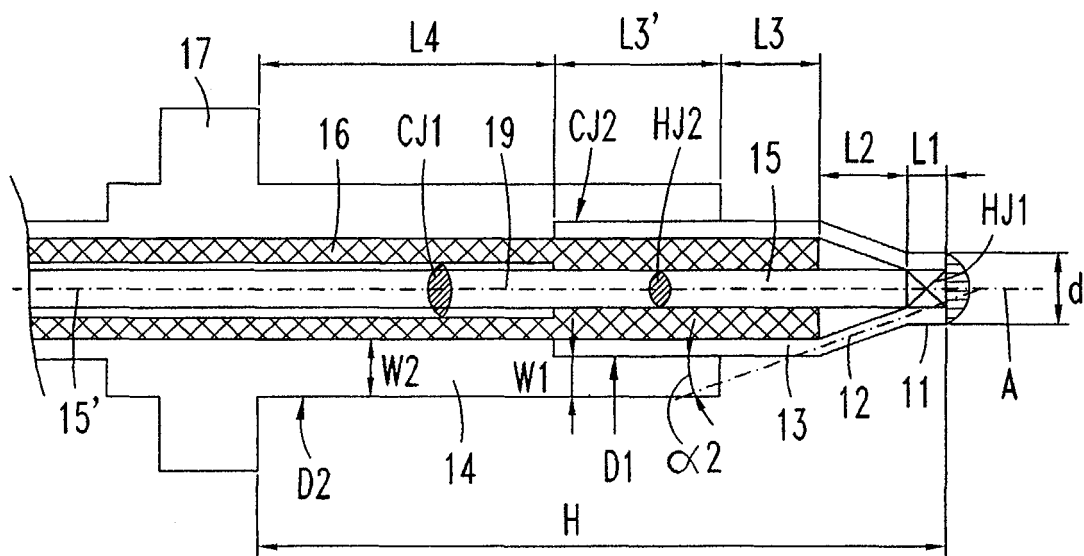


FIG. 3

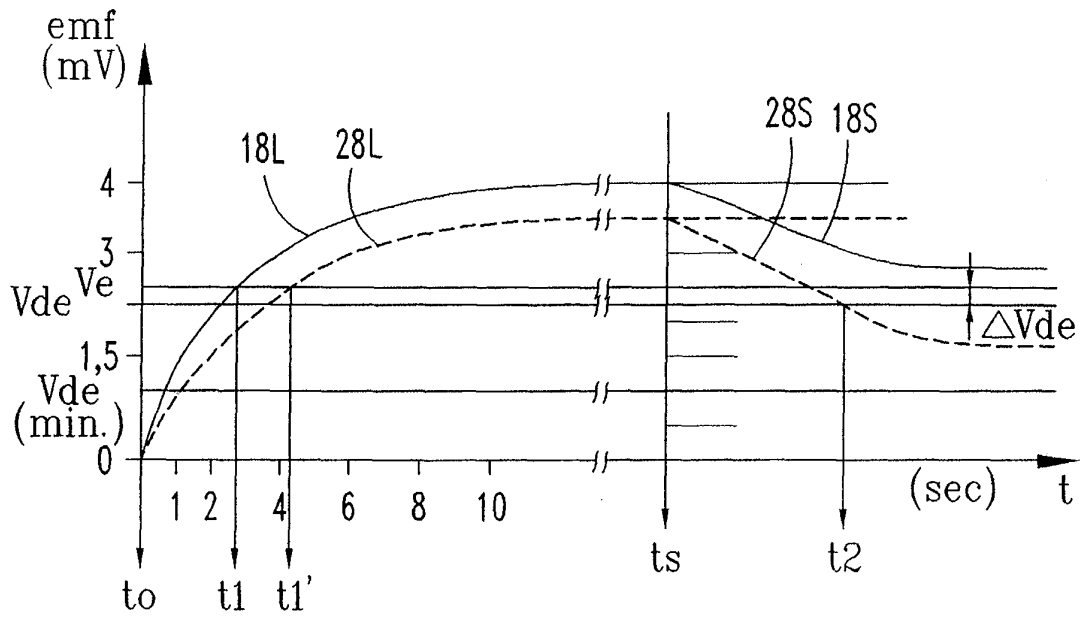


FIG. 4

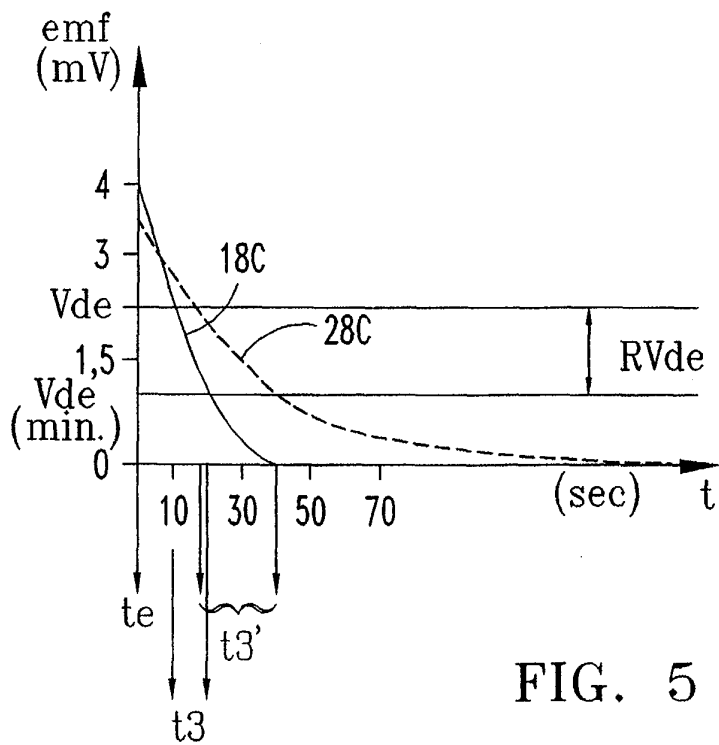


FIG. 5