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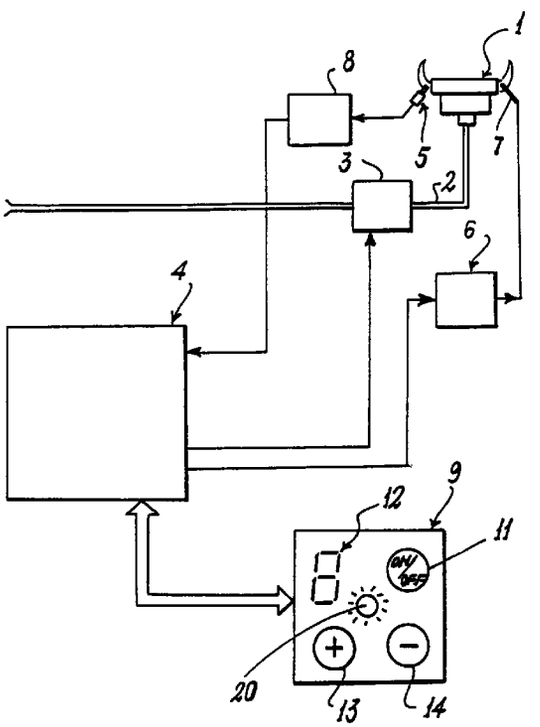
(54) System for automatically seeking the minimum power deliverable by gas-fired atmospheric burners

(57) An atmospheric burner (1) is associated with a flame presence sensor (5, 8) and an electrical-discharge ignition device (6, 7). It is fed via a flow rate control device (7). Both the ignition device and the flow rate control device are controlled by a microcontroller (4).

A user interface (9) enables the user to select the desired power by sending to the microcontroller (4) a request for altering the flow rate and hence for altering the minimum power deliverable by the burner (1).



EP 0 773 409 A1

Description

This invention relates to a system for setting the minimum level of a gas-fired atmospheric burner, particularly for cooking hobs, ovens and like domestic appliances, the burner being associated with flow rate regulator means and flame detection and ignition devices.

The minimum flame power deliverable by any gas-fired atmospheric burner is influenced by a large number of factors, resulting in the minimum flame power not being able to be correctly set by the final user if using known burners and the relative currently used flow rate regulator means (taps).

One of the factors most influencing regulation is clearly the gas pressure at the burner. This pressure can undergo daily fluctuation determined by the number of users simultaneously drawing gas from the mains for their appliances. It can also be influenced by the fact that the various users are connected to the mains at different points thereof, resulting in various pressure drops and pressure fluctuations.

Consequently to ensure that on rotating the tap into the minimum flame power position the flame remains alight under "any" operating conditions, a minimum power regulator screw is currently provided on the tap. This screw is used to preset at the manufacturing stage the minimum gas flow rate required to ensure that the flame is present when the gas pressure is the minimum prescribed by regulations. When the appliance provided with a burner preset in this manner is installed on the premises of the final user, the installer makes a fine adjustment using this screw. In this manner the minimum gas flow rate is ensured, but only under the operating conditions prevailing at the moment of this adjustment.

In the case of pressure change, a higher air percentage present in the pipes, surrounding draughts able to disturb the flame, dirt on the burner or any other influencing circumstance, the minimum flow rate preset in this manner can undergo change to the extent of resulting in extinguishing of the burner.

To solve the aforesaid problems the invention provides an automatic control system the characterising aspects of which are defined in the accompanying claims.

The invention will be more apparent from the detailed description of a preferred embodiment thereof given hereinafter with reference to the accompanying drawing, which shows schematically a control arrangement for a gas-fired atmospheric burner.

In the figure, the reference numeral 1 indicates a conventional gas-fired atmospheric burner connected to a gas source via a pipe 2 into which there is connected a gas flow rate control device 3, which may be a pulse-duration modulation controlled solenoid valve, a proportional valve, a motorized tap or similar means enabling the gas flow rate to be regulated non-manually. The device 3 is controlled by a microcontroller (or the like) indicated by 4. About the burner 1, such as to be grazed by the relative flame, there are provided a flame detector (such as a thermocouple) 5 and an electrical-discharge ignition device 6 the electrode of which is indicated by 7.

The thermocouple 5 is connected to an input of the microcontroller 4 via an electronic signal conditioner 8, the purpose of which is to provide said input with a digital signal indicating flame present or flame absent.

To the microcontroller 4 there is connected a user interface 9, ie a device provided with controls (of touch, knob, slider, pushbutton or similar type) on which the user acts to obtain the required flame power at the burner. The illustrated example shows in particular an ignition pushbutton 11, a display 12 showing the chosen power and two pushbuttons, one 13 for increase and one 14 for decrease, for selecting the desired power.

A certain number (for example 9) of preset flame power levels is memorized in the microcontroller 4, the lowest level being that which enables the flame to remain alight at the minimum gas pressure prescribed by regulations. This hence ensures the existence of the flame under any operating condition on initial ignition of the burner if minimum power level is selected by the pushbuttons 13, 14.

If the user wishes to obtain a power level less than that memorized (for example because the particular cooking operation requires a long time at a very low power level), the user operates the selection pushbuttons, for example by keeping the finger pressed on the power decrease pushbutton 14 after this has attained the lowest level. The microcontroller 4 then acts on the flow rate control device 3 so as to slowly reduce the power delivered by the burner 1. At the same time the microcontroller 4 continues to check the presence of the flame by reading the digital signal provided by the conditioning circuit 8 connected to the thermocouple 5.

The flow rate reduction finally reaches the point at which the flame of the burner 1 is extinguished. This occurrence is sensed by the thermocouple, and a corresponding signal reaches the microcontroller 4 to enable it to determine the final flow rate level able to maintain the flame alight. The microcontroller 4 then relights the flame by operating the electrical-discharge ignition device 6, 7 and acting on the flow rate control device 3 to obtain a flow rate which facilitates burner ignition (this flow rate value is memorized in the memory of the microcontroller 4).

Having achieved relighting, the microcontroller returns the gas flow rate to the minimum level just determined, as required by the user. The burner 1 can now operate at the real minimum flow rate relative to the particular operating conditions of the moment.

Simultaneously, all the operating conditions of the burner regulation system are recalibrated on the basis of the new minimum-level conditions in accordance with the new parameters contained in the microcontroller.

If these operating conditions should change such as to result in extinguishing of the flame (for example

due to pressure fall, draughts in the working environment, dirt accumulating on the burner during cooking, etc.), the microcontroller 4, having been informed of the absence of flame at the burner 1, gradually increases the gas flow rate (within a preferred range but to less than a maximum value of minimum flow rate) and keeps the ignition device 6, 7 in operation, to then halt the increase in flow rate when it is informed that the flame is alight, this corresponding to a new minimum flow rate level.

If this ignition does not occur within the said flow rate range, a suitable visual indicator for example is activated, indicated by 20 and positioned on the interface 9.

In addition, the system is able to return to the preset minimum flow rate value which preceded the extinguishing of the flame.

This is achieved by the microcontroller 4 sensing the signal (originating from the thermocouple 5) indicating that the flame has been relit at the new flow rate value, sensing the lack of signal from the interface 9, and comparing the flow rate value reached after re-ignition, with the preset value.

Claims

1. A system for automatically seeking the minimum power deliverable by gas-fired atmospheric burners (1), comprising a flame presence sensing device (5, 8), a flame ignition device (6, 7), a device (3) for controlling the gas flow rate to the burner (1), and a device (9) enabling the burner (1) to be controlled by the user, characterised in that these devices are connected to a microcontroller (4) which operates the flame control device (3) and the flame ignition device (6, 7) on the basis of signals which it receives from the remaining two devices (9 and 5, 8), such that extinguishing of the flame leads to an increase in the gas flow rate, with the flame ignition device (6, 7) being operated until the flame is re-established.

2. A system as claimed in claim 1, wherein the device (3) controlling the gas flow rate to the burner (1) is a flow regulator valve controlled by the microcontroller.

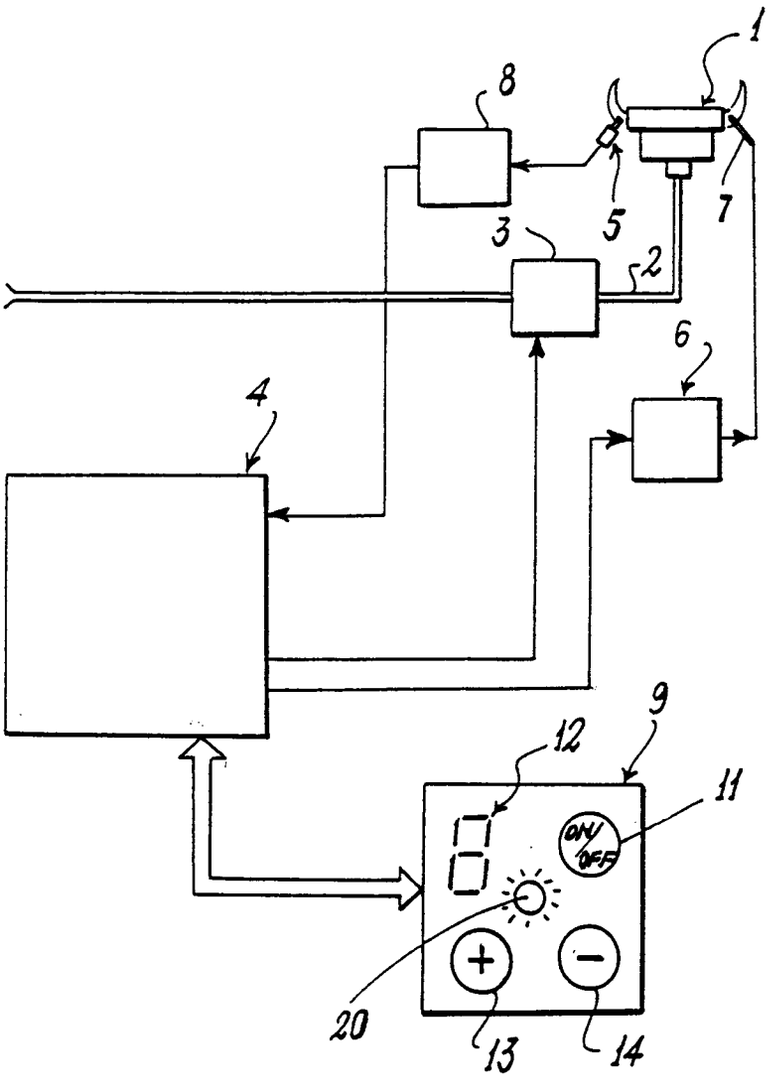
3. A system as claimed in the preceding claims, wherein the flame presence sensing device (5, 8) comprises a thermocouple and a conditioning device, this latter informing the microcontroller (4) whether the flame is alight or whether the flame is extinguished.

4. A system as claimed in the preceding claims, wherein the flame ignition device (6, 7) operates by electrical discharge.

5. A system as claimed in the preceding claims, wherein at the request of the user, formulated via the control device (9), a given minimum flow rate is decreased until a lesser flow rate value at which the flame becomes extinguished is reached, this lesser value then being increased until the flame has been relit.

6. A system as claimed in one or more of the preceding claims, wherein the extinguishing of the flame of the burner (1) due to a change in operating conditions results in relighting of the flame at a gas flow rate level which ensures that the flame is maintained under these changed operating conditions.

7. A system as claimed in claim 6, characterised by comprising a warning light (20) which is activated if, after the gas flow rate has been changed within a predetermined range but to less than a maximum value of minimum flow rate, it is not possible to relight the flame after it has been extinguished.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EUROPEAN SEARCH REPORT

Application Number
EP 95 11 7841

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATENT ABSTRACTS OF JAPAN vol. 014, no. 071 (M-0933), 9 February 1990 & JP-A-01 291017 (NORITZ CORP), 22 November 1989, * abstract; figure *	1-3	F23N5/20 F24C3/12
A	EP-A-0 562 538 (MATSUSHITA ELECTRIC INDUSTRIAL) * page 8, line 51 - page 20, line 17; figures *	1-7	
A	EP-A-0 124 330 (AUTOFLAME) * abstract; figures *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F23N
F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 April 1996	Kooijman, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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